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Contents

Critically Describing the Effectiveness of Antibullying Interventions Used at Schools

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Abstract. Bullying at schools has been among the public concerns that prevailed as it causes many negative consequences, including poor academic performance, poor physical and mental health, in addition to suicidal or criminal acts.
Purpose- To critically describe the effectiveness of the antibullying interventions at schools.
Methodology- A descriptive qualitative study that was conducted utilizing a critical review of literature. The study has utilized the available electronic database. References were mainly chosen among the ones published in the last five years; special consideration was given to studies conducted in UAE.
Findings- Several programs were developed and implemented to manage bullying. Interventions entailed constructing strict anti-bullying school policies, and utilized various involvement levels; being whole school, or one group such as parents, teachers or students. Many interventions were rooted in sociocultural theories to enhance resilience and positive behaviour development among students. Antibullying interventions in the UAE were mostly targeting awareness with compromised measurement of effectiveness.
Implications- Identifying the best antibullying interventions may contribute to increasing awareness among stakeholders, and thus facilitate decisions that may inform the policy making pertinent to managing bullying at schools in the UAE.
Originality/ value- Limited number of studies were conducted in the UAE.

Keywords: School Bullying · Anti-Bullying programs · Anti-bullying interventions · Bullying in the UAE schools

1 Introduction

Bullying has attracted the world's attention and became a global priority (UNESCO 2018), as 70% of the students reported that they have witnessed bullying at schools, and 20% of them have experienced it (CDC 2014). The variation in bullying rates were correlated with income inequality, families' and schools' support (Elgar et al. 2013).

For bullying to occur, there has to be a disparity in strength between the perpetrator and the victim, besides a repeated intentional physical, verbal, or emotional harm (Olweus 1994). Additionally, bullying behaviours vary according to the culture and may range from isolation in the east to physical and verbal harm in the west (Toda 2016).

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Furthermore, bullying can happen in real world as well as virtually (Gradinger et al. 2015).

The major predisposing factors for bullying, as perceived by students include; lack of classroom management, lack of awareness about bullying among students, lack of supervision and punishment of bullies by teachers, in addition to some victim's characteristics, such as, being less attractive or low achiever. Furthermore, victims usually have no or low support of parents or teachers (Li & Hesketh 2021).

Regardless of the form of bullying (physical, verbal, cyber, or others), it usually results in negative consequences, which may lead to harming self or others (Aboagye et al. 2021), (Nickerson et al. 2020). Therefore, the prevalence and consequences of bullying have necessitated that governments develop antibullying interventions at schools. However, effectiveness varied between programs and countries (Swearer et al. 2017).

The purpose of the study is to critically describe the effectiveness of the antibullying interventions used in schools.

A main question that the study will answer is that: What are the types and characteristics of the effective antibullying interventions that can be used to reduce the rates of bullying among adolescents at schools?

2 Significance

Although the Middle East countries are among the areas of the highest percentages of bullying UNESCO (2018), they have a deficiency in the anti-bullying programs (Gaffney et al. 2019). This necessitates developing programs to manage the bullying epidemic and anti-bullying policies that are built on zero tolerance for bullying (Li & Hesketh 2021), (Shawki, Al-Hadithi & Shabila, 2021) which requires extensive research. However, adopting readymade programs might not be helpful as there are variations in the bullying behaviour between the western an Eastern country. Besides, programs that were tailored to a specific culture, may not be as effective if utilized in other cultures. For instance, the Olweus Bullying Prevention Program (OBPP) was very efficient in Norway, yet, it did not show similar results when used in the USA and Malaysia (Smith, 2016).

Despite of the high prevalence in the UAE that may reach 30% (OECD 2019), only few scholars have studied antibullying interventions in UAE. The deficit in research within the UAE may be due either to underreporting of bullying cases, or to the cultural sensitivity of the topic. This study may shed some light on this crucial phenomenon, and thus aid in increasing the governmental fund for research targeting developing, customizing or adopting and testing effective antibullying programs in the UAE.

3 Theoretical Framework

More than one theory was adopted to explain the related aspects of bullying. Firstly, bullying as a behaviour is perceived differently according to the culture, and the context, and is rarely being objectively interpreted. This was the main framework of the sociocultural approach that was referred to by Maunder & Crafter (2018)). Additionally, the (Conservation of Resources) theory was used to explain the motivation and the behaviours of the bystanders who are watching the bullying act. The theory claims that

individual affective differences result in various coping processes to lessen stress, and preserve resources such as power (Itzkovich, Barhon & Lev-Wiesel 2021).

Comprehensively, Rigby (2022) claimed that bullying may be due to individual factors, environmental factors or the interaction between them. Accordingly, the inherited characters may make the individual prone to be a bully via exhibiting behaviours as adaptive strategies to achieve dominance goals. Additionally, the availability of the external conditions in the environment such as the lack of teachers' and parents' support, or the availability of unsupervised areas at schools. Furthermore, the interface between both the individual and the environment may either enhance or hinder the potential for the bullying act to occur.

4 Literature Review

This section tackles the effects of bullying, followed by some of the international school antibullying interventions, and finally, antibullying management in the UAE.

4.1 Effects of Bullying on Adolescents

Interconnectedness between bullying and mental or physical health problems among adolescents were studied by many researchers. Surprisingly, bullying was identified as one of the main risk factors of suicide among adolescents (WHO 2021). Similarly, substance use, loneliness, anxiety, suicidal ideation and attempts (Aboagye et al. 2021) lack of sleep, and solitary (Hasan et al. 2021), anxiety, distress (Sampasa-Kanyinga et al. 2018), depression and suicidal ideation (John et al. 2018), criminal acts (Shawki, Al-Hadithi & Shabila, 2021), shooting at schools in 71% of the cases (Nickerson et al. 2020). Ultimately, bullying may lead to deterioration in academic performance and there is a substantial relation between bullying and school dropout (Fry et al. 2018).

4.2 Examples of Anti-Bullying Interventions

Several anti-bullying interventions were developed. For instance, 'Olweus Bullying Prevention Program' targeted the whole-school, starting with the individual, moving to the community at large. The program defined unacceptable behaviours and their consequences, highlighted the "Hot-Spot" areas where victims are more likely to be bullied at, and recommended utilizing an individual approach with potential bullies and victims (Gaffney et al. 2019). Similarly, 'DFE Sheffield Project' in UK involved the whole school, including environmental development, integrated exercises in the curriculum. The project has shown effectiveness on the long-term of anti-bullying efforts among boys. However, bullying among girls has risen, and the percentage of self-reporting of bullying to teachers has remained unaffected. (Gaffney et al. 2019)

However, 'KiVa Anti-Bullying Program' reinforced empowering the bystanders. It utilized a well-designed curriculum to combat bullying via instilling anti-bullying attitudes, empathy and self-efficacy. (Gradinger et al. 2015). It entailed training teachers, and providing the students with virtual games, policies, disciplinary actions, a meticulous control of the playground, and increasing awareness among parents (Gaffney et al. 2019).

On the other hand, 'NoTrap! Anti-Bullying Program' was a web-based program that recruited students to facilitate anti-bullying discussions aiming to intensify empathy and enhance problem-solving skills. The program has decreased bullying by 35% (Gaffney et al. 2019).

Moreover, Viennese Social Competence (ViSC) Program' focussed on social competencies enhancement among secondary students. It entailed training the teachers to spot bullying and mange it through structured scenarios, besides, identifying prophylactic measures via engaging students in deriving creative methods to prevent bullying (Gradinger et al. 2015).

Finally, the 'InspirED Mission' Program has taken into consideration the development of the adolescent's brain and consequential thinking. It reinforced emotional intelligence via social media to boost positive behaviour change. The project entailed formulating a team with members from the students and the teachers to build a positive emotional school environment (Swearer et al. 2017).

4.3 Bullying Prevalence and Management in the UAE

Prevalence and nature of bullying in the UAE was explored by Rigby, Haroun, and Ali, (2019) who studied more than 1700 students in the age group of 12–15 (Grades 6 to 9). The results revealed that 16% of the surveyed students do not perceive the school as a safe environment. This percentage was a little lower than the findings of Pengpid, and Peltzer, (2020) based on the data retrieved from around 24 thousand adolescents who participated in the "UAE Global School-Based Student Health Survey (GSHS)" during the years 2005, 2010, and 2016. Results showed that although physical attacks have diminished, bullying prevalence has significantly risen among both males and females. Similarly, Alomosh et al. (2020) utilized "The Illinois Bully Scale and Quia survey" after tailoring to the UAE culture to study bullying among 1300 students enrolled in the UAE schools. Results revealed that 33% of students were involved either as bullies, or victims. Verbal bullying was prevalent followed by cyberbullying. These numbers were comparable with the statistics issued by PISA (31.1%) regarding school bullying in the OECD countries (OECD 2019).

Additionally, Alketbi, Grivna, & Paulo (2021) reported a 7% increase in bullying at UAE schools in eleven years. However, 40% of the students believe that school staff including teachers ignore bullying, and they can stop bullying if they utilize more strict approach (Alomosh et al. 2019).

To attend to the bullying problem, a national strategy to prevent bullying was developed by the UAE government (Alketbi, Grivna, & Paulo 2021). Additionally, the MOE Cyber Security Awareness Program was effective in teaching children how to recognize and respond to online risks (AL Nuaimi and Fong 2020). The MOE guidelines also intended to enhance safe virtual learning environment to prevent cyberbullying (Siyam & Hussain 2021).

5 Methodology

A descriptive qualitative approach was utilized to provide in-depth understanding of the phenomenon (Fraenkel, Wallen & Hyun 2012). The philosophical underpinning is the constructivist paradigm. The related research studies were critically reviewed and discussed if they were published in English Language, between 2016 till date. However, substantial older articles cited in the recent articles were explored. Articles were sought based on the following criteria; the purpose, and location. Accordingly, bullying prevalence, effect, anti-bullying interventions, and finally the location as focused search was targeting studies conducted in the UAE. The prevalence of bullying as measured by the numbers of students who have reported being bullied, or the number of reported bullying incidents by the teachers and the schools' personnel. Then the studies that described the impact of bullying, and finally the studies that evaluated anti-bullying programs at schools, being worldwide, or in UAE.

As bullying is one of the topics where there is interconnectedness between education and health, being mental or physical, eligible articles were selected from the available online databases within Google scholar, the British University in Dubai Library, as well as SEHA E. Library.

6 Results and Discussion

Literature review has yielded numerous antibullying interventions including legislations, national laws, schools' policies, or anti-bullying programs. However, McGeough (2020) undermined the impact of the current US policies in lessening bullying at schools.

Several anti-bullying programs have shown effectiveness in reducing bullying in schools by 15–20% (Swearer et al. 2017). Many of these programs have advocated for working with all parties involved in the bullying, including bystanders, in addition to boosting online safety measure, yet, implementation has diverged. The programs utilized four main tactics to manage bullying. These include; the whole school, the peer involvement, the teachers' and parent's involvement, in addition to the positive behaviour change among adolescent's.

The whole-school approach targets the school community as a whole, which sounds promising, yet was not the most beneficial when compared to other approaches (Gaffney et al. 2019). The peer involvement approach reinforces the role of the bystanders as the perceived approval and admiration of the behaviour may work as an incentive for the perpetrator (Aboagye et al. 2021). The third approach focusses on raising awareness among parents and teachers. It entails integrating the antibullying intervention in the curriculum, besides enhancing constructive relationships between teachers and students. Puhl, Suh & Li, (2017) affirmed that parental support is vital. However, the fourth approach calls for the 'Positive behaviour change' as it considers the adolescent's consequential thinking in order to overcome the low effectiveness of the current anti bullying interventions (Swearer et al. 2017).

Measurement of the effectiveness of the previous programs is essential and requires a valid tool. It is worth noting that, bullying can be echoed in several forms, depending on the gender, age group, location and the culture. Consequences of exposure to bullying

vary as well. Thus, the tools to measure bullying may not be an accurate descriptor of the magnitude of the issue if used in different socioeconomic groups or cultures, which may hinder the measurement of effectiveness of the antibullying interventions.

UAE is in process of establishing the ground for anti-bullying interventions, however, meticulous emphasis on the evaluations is needed (Alketbi, Grivna & Paulo 2021). AL Nuaimi, and Fong (2020) argued that in the interventions that target increasing awareness, even if knowledge was acquired, there was no evidence that the knowledge was reflected into behaviour. The UAE ministry of education has developed guidelines to prevent cyberbullying. Nevertheless, these efforts were neither unified among the various Educational regulatory authorities in the UAE, nor integrated in the curriculum.

7 Conclusion and Recommendations

A large number of students are exposed to bullying every day, which may lead to serious psychological or physiological problems. Therefore, anti-bullying interventions aimed at enhancing children's self-efficacy, understanding that bullying is ethically erroneous (Thornberg et al. 2012), building resilience among adolescents, and encouraging the reporting of bullying.

Adopting a diversified approach might be helpful, where a general whole school intervention, with a meticulous supervision over the more prone areas for bullying, and an enhancement of positive behaviour among adolescents, integrated activities in the curriculum with proper training for teachers and parents to be able to early detect the students' involvement. The roles of the psychologist and the school nurse have to be nurtured in order to work with more susceptible students being perpetrators or victims. Therefore, allocating adequate financial resources to fund antibullying interventions is crucial (McGeough, B. 2020).

In the UAE there is a scarcity of research in the field of anti-bullying interventions. Further research is needed to develop a culturally appropriate interventional program that is tailored to prevent the bullying behaviour at schools in the UAE. Additionally, in order to be able to evaluate the effectiveness of any antibullying intervention that may be used, there is a need to use a culturally tailored tool to measure the bullying behaviour. Furthermore, governmental legislations and schools polices shall be tailored to address the various bullying behaviours.

The insufficiency of research pertinent to anti bullying interventions within the UAE was a limitation encountered. This might be due either to under reporting of bullying cases, or to low number of publications due to the cultural sensitivity of the topic.

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The Impact of Job Satisfaction on Teachers' Performance in the UAE

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Abstract. Job satisfaction greatly affects job performance. This is of a prodigious value in education as the teachers' performance impacts the quality of education and thus the Human Development Index (HDI) of the nation.
Purpose: to investigate the effect of job satisfaction on the performance of teachers in the United Arab Emirates (UAE) utilizing a scale that was used in business management previously.
Methodology: The research used a quantitative empirical method, whereby the impact of the independent variable (teachers' satisfaction) was measured on the dependent variable (teachers' performance). The data used was primary data collected via a survey distributed to a convenient sample. Respondents included 112 teachers working in UAE. SPSS application was used for data analysis. Reliability, factor analysis and construct validity were tested, and shown adequate sample and reliable tool. Regression model was applied, in order to test the two developed hypotheses.
Findings: revealed that job satisfaction is associated with job performance among teachers.
Implications: Results may help decision makers to enhance the teachers' satisfaction in order to improve teachers' performance.

Keywords: teachers' job performance · teachers' job satisfaction · teachers in UAE

1 Introduction

Education is one of the three vital dimensions of the Human Development Index (Roser 2014). Therefore, the UAE Governmental expenditure on education per student exceeds 10% of the GDP per capita (Human Development Reports 2022). Additionally, teacher's performance is indispensable to the education process and impacts not only the students but the community at large. Therefore, it is crucial to explore factors that enhance teachers' performance. Research has shown that job satisfaction can affect employees' performance significantly (Sabuhari et al. 2020).

In the UAE, there were more than 70,000 teachers working at public and private schools teaching the multicultural population of students. (MOE Statistics 2018).

Less satisfaction of teachers in UAE may be due to leadership of principals, lack of participation in curriculum decisions, and lack of respect in society (Ibrahim & Al-Taneiji 2019). The teachers' motivational factors included teaching enjoyment,

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professional development, and rewarding feelings when working with students. While the maintenance factors included job insecurity, motionless salaries, and excessive teaching loads. Results emphasized wages, job security and reasonable workload, are all vital factors for increasing teachers' satisfaction. On the other hand, (Gudep 2019) highlighted the importance of work life balance on the job satisfaction of the teaching staff in the UAE.

The purpose of this study was to investigate the effect of job satisfaction on the performance of teachers in UAE utilizing a scale that was used in business management previously. The research used a quantitative empirical method.

2 Background and Rationale

Despite of the large number of teachers in the UAE, teachers' satisfaction and performance have not been studied profoundly. Dissimilar to the attention given to this topic worldwide, except for few studies that tackled the perceptions of the private school teachers' (Matsumoto 2019). Additionally, the public-school teachers believed that they were excluded when school decisions are made (Abu Dhabi Education Council 2009). Therefore, it is recommended to enhance the communication and feedback with teachers in order to bridge the gap between reform plans and their application by the primary implementers who are the teachers (Matsumoto 2019).

Results of this study may aid the decision makers to identify the vivacious factors that may enhance teachers' performance, and its association with the job satisfaction of teachers and thus boost the quality of education.

Research Questions

1. **Does teachers' satisfaction impact teachers' performance in the UAE?**
2. **Is there an impact of demographic factors on the satisfaction and performance of teachers in the UAE?**

3 Literature Review and Conceptual Framework

3.1 Teachers' Job Satisfaction

Bas, Küçük & Kisa (2020) defined job satisfaction as "the expression of the satisfaction or positive emotions of the employee when her/his work or experience are evaluated". This state enhances the voluntary involvement in work (Ibrahim & Al-Taneiji 2019).

According to Lavy & Bocker (2018) the meaningful relationships between teachers and students may enhance job satisfaction. Thus, the sense of meaning by teachers is associated with positive work outcomes. Likewise, Činčera et al. (2019) reported two focal determinants of job satisfaction among teachers, namely, inquiry-based learning and participating in learning communities.

3.2 Teachers' Performance

According to Riwukore, Global & Street (2021), the Indonesian underprivileged education was due to the abysmal teachers' performance. Therefore, teachers' education, shall consider equipping the candidates with the required capacities, to enhance possessing essential instructional competencies as a prerequisite to independent practice (Waller 2018). Similarly, Barasa (2020) emphasised the value of teacher's training, being pre-service or in-service qualification. Moreover, Riwukore, Global & Street (2021) affirmed the significant impact of competence and motivation on teachers' performance. Furthermore, job satisfaction was one of the factors that impact teaching performance, in addition to, resources, management support, remuneration, emotional support, work pressure, and the quality of teacher-student relationships. (Orbe, Espinosa & Datukan 2018).

3.3 Job Satisfaction and Performance

Enormous scholarly attention was given to the association between job satisfaction and job performance. Education research has associated the quality of teaching with the quality of teachers. Additionally, some researchers even claimed that satisfaction of teachers is a predictor of their performance (Wolomasi, Asaloei & Werang 2019), as job satisfaction can significantly contribute to performance improvement. (Eliyana et al. 2019) (Simatupang et al. 2017). Additionally, Činčera et al. (2019) have linked the quality of science teaching with teachers' satisfaction and self-efficacy. Moreover, Rasto & Maulani (2019) suggested to improve teachers' motivation and satisfaction in order to improve their performance.

Theoretical Framework

Badri et al. (2013) have utilized the social cognitive model in studying the teachers' satisfaction in Abu Dhabi. The model entails personality/affective traits, participation in goal-directed activities, self-efficacy expectations, work conditions, and some environmental factors. Accordingly, teachers are satisfied if they have the competence and self-efficacy, positive work conditions, support, in addition to their own qualities. Similarly, Granziera & Perera (2019) have examined a social cognitive model, via relating the self-efficacy of teachers with engagement, work engagement and job satisfaction.

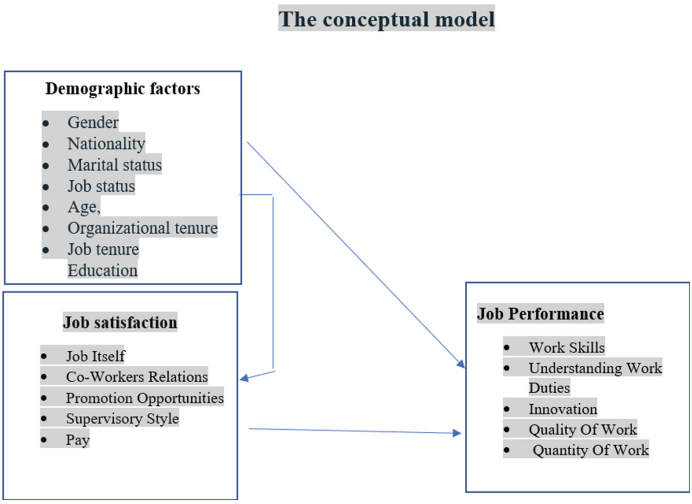
Hypotheses

This study aimed to test the association between the job satisfaction and the self-reported teachers' job performance, additionally, it will test the impact of the demographic and career variables on both job satisfaction and job performance. Consequently, this paper hypothesizes the following:

H_0 1: Job satisfaction has no positive impact on self-reported job performance among teachers in the UAE.
H_a 1: Job satisfaction has a positive impact on self-reported job performance among teachers in the UAE.
H_0 2: Demographic factors are not significantly linked to both job satisfaction and self-reported job performance among teachers in the UAE.

Ha 2: Demographic factors are significantly linked to both job satisfaction and self-reported job performance among teachers in the UAE.

The conceptual model was based on Sulaiman's Model (2007) on satisfaction and performance.



4 Research Methodology

Quantitative research approach was utilized, in order to describe current conditions, investigate relationships, and study cause-effect phenomena. Quantitative primary data was obtained from the respondents. The independent variable for this study is the job satisfaction. The dependent variable is the teacher's performance. The questionnaire was transformed into an online survey utilizing google forms. The study was conducted between April and June 2022.

Sample

The population in this study composed of the teachers working in the UAE. Blind random selection was not possible based on identifiers, as the researchers had no access to such records, thus convenient sampling was adopted. The questionnaire link including the purpose and the consent were shared online with the various WhatsApp groups of teachers' that the researchers have access to. 112 respondents answered the survey completely, with a response rate of 22.4%.

Questionnaire

The Questionnaire, was adopted from (Suliman 2007), permission was granted from the Author. Therefore, face and content validity were ensured as the questionnaire was a reliable scale. It contains a cover letter providing information about the study and assuring anonymity of respondents, and an informed consent.

The questionnaire consisted of general demographics, followed by questions on satisfaction and performance of teachers in the UAE to determine the effect of each independent variable on the dependent variable, either simultaneously or partially.

Variables pertinent to demographic and career data were measured utilizing 2–6 points scales. While job satisfaction (multifactorial) was measured via a scale of 20 items, representing the following factors: payment, promotion, relationship with the supervisor, relationship with the co-workers, and the job itself. Work performance (multifactorial) was measured using 14 items representing rating of work skills, understanding work duties, quality, quantity, and innovation. The 5 points Likert scale was used to measure both satisfaction and performance.

5 Results

SPSS software (version 28.0) was utilized for data analysis. The various statistical tests needed to answer the questions elicited in this research included, construct validity (factor analysis), reliability test (Cronbach Alpha) and linear regression.

5.1 Descriptive Statistics

Demographics frequency statistics have elicited that the majority of respondents 94.6% were females, 77.7% married, 41.1%, having a university degree, and 31% had a master's degree. More than half of the sample aged 36–46 years. 75% were non-UAE nationals and working at mid-level management 68%. Furthermore, the majority 85% had 19 years or less of job tenure (Table 1).

Table 1. The description of the study sample

	Nation-ality	Gender	Marital status	Education	Age	Occ. Tenure	Job Tenure	Job Level
UAE national	24							
Non-UAE national	88							
Male		6						
Female		106						
Married			87					
Unmarried			25					
Less than high school				1				
High school				1				
College degree				19				
Graduate degree				46				
High diploma				10				

(*continued*)

Table 1. (*continued*)

	Nation-ality	Gender	Marital status	Education	Age	Occ. Tenure	Job Tenure	Job Level
Masters or above				35				
Less than 25 years					3			
25–35 years					32			
36–46 years					58			
47–57 years					17			
58 years or above					2			
One year or less						30		
2–7 years						41		
8–13 years						19		
14–19 years						16		
20 years or above						6		
One year or less							11	
2–7 years							28	
8–13 years							30	
14 to 19 years							27	
20 years or above							16	
First level								19
Middle level								76
								17
Total	112	112	112	112	112	112	112	112

Common Method Bias

The common method bias of the questionnaire used in this study was checked, and no single factor was accountable for the majority of variance, which is 50% or more. The test revealed that the first unrotated factor has captured 24.42% of the variance, and there were 7 factors responsible for 66.796% of the variance as shown in Table 2. Accordingly, the instrument used is not biased.

Table 2. Common Bias Factor Test

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1.	8.948	26.317	26.317	8.306	24.429	24.429
2.	4.872	14.330	40.647			
3.	2.744	8.071	48.718			
4.	1.873	5.509	54.226			
53	1.525	4.486	58.713			
6.	1.401	4.122	62.835			
7.	1.347	3.961	66.796			

Reliability Test (Cronbach's Alpha)

The 5 points Likert scale was used to measure both satisfaction and performance. Items were scored as follows: SA = 5, A = 4, N = 3, D = 2, SD = 1.

There were 7 negatively worded items that were recorded prior to analysis. Additionally, one question was deleted due to a variation between the Arabic and the English versions (question No 20).

Cronbach alpha values for both the global variables and for the sub factors or the dimensions ranged between acceptable and high correlation (0.637 to 0.93), however, the value for the innovation factor was 0.2, therefore, factor 1 of innovation was deleted so the score becomes 0.762. Reliability tests are presented in Table 3.

Table 3. Initial Reliability Tests

Initial Reliability Statistics				
Variable Description	α Values	Number of Items	Removed Items	New α Value
Job Satisfaction: All Items	.868	20		
Job Satisfaction: Factor 1: Pay	.637	5		
Job Satisfaction: Factor 2: promotion	.789	4		
Job Satisfaction: Factor 3: supervisory style	.863	3		
Job Satisfaction: Factor 4: Relation with co-workers	.741	4		
Job Satisfaction: Factor 5: Job itself	.837	4		
Job Performance: All Items	.849	14		
Job Performance: Factor 1: understanding Duty	.938	3		
Job Performance: Factor 2: Skills	.868	3		
Job Performance: Factor 3: Quality	.688	2		
Job Performance: Factor 4: Quantity	.840	2		
Job Performance: Factor 5: Innovation	.243	4	one item Innovation 1	.762

Factor Analysis

Exploratory Factor Analysis was utilized to divide variables which are correlated and thus combines items that are highly correlated with each other. To decide on the multidimensionality of both global variables, the factor analysis was done for the job satisfaction 20 items, and then for the 14 job performance items. Factors were identified and classified based on eigenvalues more than 1.

The Total Variance Explained Matrix (Table 4) has shown that in regard to job satisfaction 6 factors could explain 69.708% of the variation. While for job performance 3 factors were identified and were responsible for 70.877% of the variation.

Table 4. Job Satisfaction Total Variance

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.189	30.943	30.943	6.189	30.943	30.943	2.932	14.661	14.661
2	2.342	11.710	42.653	2.342	11.710	42.653	2.841	14.203	28.864
3	1.835	9.173	51.826	1.835	9.173	51.826	2.636	13.182	42.046
4	1.315	6.573	58.399	1.315	6.573	58.399	2.274	11.370	53.416
5	1.165	5.823	64.222	1.165	5.823	64.222	1.729	8.644	62.060
6	1.083	5.417	69.639	1.083	5.417	69.639	1.516	7.579	69.639
7	.885	4.425	74.064						
8	.737	3.686	77.750						
9	.641	3.205	80.956						
10	.541	2.707	83.663						
11	.486	2.428	86.091						
12	.460	2.301	88.392						
13	.399	1.997	90.389						
14	.376	1.878	92.267						
15	.348	1.742	94.009						
16	.340	1.699	95.709						
17	.283	1.415	97.123						
18	.242	1.212	98.335						
19	.183	.914	99.249						
20	.150	.751	100.000						

Extraction Method: Principal Component Analysis.

While for job performance, the Total Variance Explained Matrix (Table 5) has shown that 3 factors were identified and were responsible for 70.877% of the variation.

Table 5. Job Performance Total Variance

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.679	47.705	47.705	6.679	47.705	47.705	4.133	29.522	29.522
2	2.072	14.800	62.505	2.072	14.800	62.505	3.288	23.487	53.009
3	1.172	8.371	70.877	1.172	8.371	70.877	2.501	17.867	70.877
4	.761	5.436	76.313						
5	.729	5.205	81.517						
6	.591	4.224	85.741						
7	.493	3.524	89.265						
8	.408	2.916	92.182						
9	.298	2.126	94.308						
10	.232	1.655	95.963						
11	.187	1.336	97.299						
12	.182	1.302	98.601						
13	.136	.970	99.571						
14	.060	.429	100.000						

Extraction Method: Principal Component Analysis.

The Rotated Component Matrix illustrated in Table 6 shows the factor loading.

Table 6. Job Satisfaction Factor Loading

Job Satisfaction Rotated Component Matrix						
	Components					
	1	2	3	4	5	6
SS1	−751					
SS2	−819					
SS3	−774					
CO2	−648					
Job1		−630				
Job2		−894				
Job3		−836				
Job4		−783				
Promo1			−715			
Promo2			−826			
Promo3			−673			
Promo4			−721			
CO1				−759		
CO3				−751		
CO4				−782		
Pay1					−740	
Pay4					−661	
Pay5					−649	
Pay2						−842
Pay3						−688

Factor analysis for job satisfaction revealed the following factors:

Factor 1 (explaining 30.94% of the variations in the data, **factor 2:** 11.71%, **factor 3**: 9.17%, **factor 4:** 6.57%, **factor 5**: 5.82% and **factor 6** explaining 5.41% of variations (Table 7).

Table 7. New Factors Labelling for the Job Satisfaction.

New Factors labelling for the Job Satisfaction					
Factor 1 Relationship With the Supervisor	Factor 2 Job Itself	Factor 3 Promotion Opportunities	Factor 4 Relationship With Co-Workers	Factor 5 Monthly Salary	Factor 6 Other Privileges
SS1: My supervisor is quite competent in doing his/her job	Job 1: I sometimes feel my job is meaningless	Promo 1: There is really too little chance for promotions on my job	CO1: I have to work harder at my job than I should because of the incompetence of people I work with	Pay 1: I feel satisfied with my chances for salary increase	Pay 2: There are few rewards for those who work here
SS2: My supervisor is unfair to me	Job 2: I like doing the things I do at work	Promo 2: Those who do well on the job stand a fair chance of being promoted	CO3: I enjoy my co-workers	Pay 4: I feel satisfied with my chances of salary increase	Pay 3: I am unappreciated by the organization when I think about what they pay me
SS3: I like my supervisor	Job 3: I feel a sense of pride in doing my job	Promo 3: People get ahead as fast here as they do in other places	CO4: There is a sense of support and respect between co-workers	Pay 5: There are few rewards for those who work here	
CO2: I have to work harder at my job than I should because of the incompetence of people I work with	Job 4: My job is enjoyable	Promo 4: I am satisfied for my chances for promotion			

The Rotated Component Matrix, for job performance illustrated in Table 8 shows the factor loading.

Table 8. Job Performance Rotated Component Matrix

	Component		
	1	2	3
Duty 1	.849		
Duty 2	.940		
Duty 3	.927		
Skills 2	.746		
Skills 3	.633		
Qualt 1		.629	
Qualt 2		.833	
Quant 1		.862	
Quant 2		.838	
Skills 1			.531
Innov 2			.699
Innov 3			.729
Innov 4			.810

Factor analysis for job performance revealed the following three factors as shown in Table 9:

Factor 1: explaining 47.70% of the variance in the data, **factor 2:** 14.80%, and f**actor 3:** 8.37% of variations.

Table 9 shows a summary of the factors of job performance, item Innovation 1 has not loaded with any factor; therefore, it will be removed.

Table 9. Summary of Job Performance Factors

New factor labelling for job Performance		
Factor 1: Work Knowledge and skills	Factor 2: Quality and Quantity of Work	Factor 3: Innovation
Duty1: I understand on a daily basis what I need to carry out on my job, and what equipment and tools are to be used	Qualt1: My work outcomes are free from errors and accurate	Skills 1: I have sufficient client know-how to carry out my work proficiently
Duty 2: I understand my work goals and requirements	Qualt2: I am able to complete my quality work on time	Innov 2: I search for fresh new wyas of resolving problems in my work
Duty 3: I understand my job responsibilities	Quant1: My work speed is satisfactory	Innov 3: I come up with and try new ideas in my work
Skills 2: I understand the steps, procedures, and methods required to carry out the job	Quant2: I am able to complete quantity of work on time	Innov 4: I try to question old ways of doing things in my work
Skills 3: I am familiar with the skills required on the job to perform effectively		

5.2 Kaiser-Meyer-Olkin (KMO) Test

KMO result was 0.758 in Table 10 indicating that the sample was adequate. Besides, Bartlett's Test of Sphericity was significant at less than 0.001, thus there is a relationship between the variables under this study.

Table 10. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.758
Bartlett's Test of Sphericity	Approx Chi-Square	2839.244
	df	861
	Sig.	<.001

Furthermore, a reliability test was conducted again for each one of the new factors. Table 11 represents a summary of the Cronbach's alpha values:

Table 11. Cronbach's Alpha Values Summary

Variable Description	α Values	Number of Items	Removed Items	New α Value
Job Satisfaction: All Items	0.868	20		
Job Satisfaction: Factor 1: relationship with the Supervisor	.836	4		
Job Satisfaction: Factor 2: Job Itself	.837	4		
Job Satisfaction: Factor 3: promotion opportunities	.790	4		
Job Satisfaction: Factor 4: Relationship with co workers	.826	3		
Job Satisfaction: Factor 5: Monthly Salary	.578	3		
Job Satisfaction: Factor 6: Other privileges	.605	2		
Job Performance: All Items	.899	13		
Job Performance: Factor 1: Work Knowledge and skills	.919	5		
Job Performance: Factor 2: Quality and Quantity of work	.842	4		
Job Performance: Factor 3: Innovation	.786	4		

The above table revealed that most factors showed high reliability between 0.78–0.92, with the exception of 2 factors. Only Job satisfaction factor number 5 had a Cronbach alpha of. 578, and it should be excluded from the instrument, however, this element targets the payment which is considered crucial as per the literature to measure satisfaction, consequently, it was kept.

5.3 Construct Validity

Convergent and Discriminant validity were tested via Factor analysis concurrently as shown in Tables 12 and 13.

Table 12. Convergent Validity Test Results

Pattern Matrix[3]									
	Component								
	1	2	3	4	5	6	7	8	9
Item 1 pay factor								.838	
Item 2 pay factor									.856
Item 3 pay factor									.596
Item 4 pay factor									
Item 5 pay factor								.601	
Item 1 of promotion factor					.773				
Item 2 of promotion factor					.819				
Item 3 of promotion factor					.653				
Item 4 of promotion factor					.742				
Item 1 of supervision style factor		.803							
Item 2 of supervision style factor		.814							
Item 3 of supervision style factor		.835							
Item 1 of co-workers' factor							.727		
Item 2 of co-workers' factor		.599							
Item 3 of co-workers' factor							.722		
Item 4 of co-workers' factor							.805		
Item 1 of job factor				.656					
Item 2 of job factor				.724					
Item 3 of job factor				.682					
Item 4 of job factor				.702					
Item 1 of duty factor	.843								
Item 2 of duty factor	.896								
Item 3 of duty factor	.910								
Item 1 of skills factor	.483								
Item 2 of skills factor	.794								
Item 3 of skills factor	.655								
Item 1 of quality factor			.663						
Item 2 of quality factor			.853						
Item 1 of quantity factor			.874						
Item 2 of quantity factor			.915						
Item 2 of innovation factor						.741			
Item 3 of innovation factor						.825			
Item 4 of innovation factor						.828			

Extraction method: Principal component analysis.
Rotation method: Promax with Kaiser Normalization.
Rotation converged in 9 iterations.

Table 13. Discriminant Validity Test Results

Factor Correlation Matrix									
Factor	1	2	3	4	5	6	7	8	9
1	**1.000**	**.241**	**.425**	**.304**	**−.007**	**.501**	**.300**	**−.038**	**.204**
2	**.241**	**1.000**	**.100**	**.307**	**.463**	**.023**	**.518**	**.030**	**.340**
3	**.425**	**.100**	**1.000**	**.191**	**.115**	**.624**	**.183**	**.066**	**.107**
4	**.304**	**.307**	**.191**	**1.000**	**.219**	**.081**	**.413**	**.031**	**.115**
5	**−.007**	**.463**	**.115**	**.219**	**1.000**	**−.089**	**.333**	**.245**	**.256**
6	**.501**	**.023**	**.624**	**.081**	**−.089**	**1.000**	**.188**	**−.003**	**.096**
7	**.300**	**.518**	**.183**	**.413**	**.333**	**.188**	**1.000**	**.168**	**.190**
8	**−.038**	**.030**	**.066**	**.031**	**.245**	**−.003**	**.168**	**1.000**	**.151**
9	**.204**	**.340**	**.107**	**.115**	**.256**	**.096**	**.190**	**.151**	**1.000**

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

Correlation Bivariate

Coefficient of Correlation *(r)* was computed, results showed that there was a positive correlation .283 between the 2 variables with a significance level of .002. This means that teachers who are highly satisfied tend to rate their job performance high. However, since the correlation is closer to zero than one, there should be other factors that can impact or better predict job performance of the teachers. Accordingly, the coefficient of determination (r2) = 0.080 which illustrates the percentage of the total variation in the dependent variable (Y) that is explained or accounted for by the variation in the independent variable (X) therefore, 8% of the variation is explained by the independent variable change. Consequently, the null hypothesis H0 (the correlation is zero and no linear relationship) was rejected and the hypothesis H_1: $\beta_i \neq 0$. (Tables 14, 15, 16, 17, 18 and 19)

Table 14. Descriptive Statistics

	Mean	Std. Deviation	N
JS	66.37	11.089	112
NewJP	55.2500	6.11084	112

Table 15. Correlations

		Correlations	
		JS	NewJP
JS	Pearson Correlation	1	.238**
	Sig. (2-tailed)	55.2500	.002
	N	112	112
NewJP	Pearson Correlation	.238**	1
	Sig. (2-tailed)	.002	
	N	112	112

**Correlation is significant at the 0.01 level (2−tailed).

Regression analysis was done to further study the relationship between the variables via predicting the dependent from the independent.

Table 16 a. Demographics Correlation–New JP.

Descriptive Statistics			
	Mean	Std. Deviation	N
NewJP	55.2500	6.11084	112
Gender of participant	1.95	.226	112
Marital Status of participant	1.22	.418	112
Education of participant	4.50	1.178	112
Age of participant	2.85	.774	112
No. of years worked in current organization	2.35	1.176	112
Job status of participant	1.98	.569	112
Nationality of participant	1.79	.412	112

Table 16 b. Demographics Correlation–New JP.

		NewJP	Gender of participant	Marital Status of participant	Education of participant	Age of participant	No. of years worked in current organization	No. of years worked in the position	Job status of participant	Nationality of participant
NewJP	Pearson Correlation	1	.042	.085	0.96	.155	.059	.079	.208*	.057
	Sig. (2-tailed)		.657	.370	.312	.103	.535	.408	.027	.549
	N	112	112	112	112	112	112	112	112	112
Gender of participant	Pearson Correlation	0.42	1	0.32	.000	.056	.099	.017	.147	.069
	Sig. (2-tailed)	.657		.735	1.000	.557	.301	.858	.121	.0470
	N									
Marial Status of participant	Pearson Correlation	.085	.032	1	0.27	−.312**	−.251**	−.285**	.055	.175
	Sig. (2-tailed)	.370	.735		.774	<.001	.008	.002	.567	.064
	N	112	112	112	112	112	112	112	112	112
Education of participant	Pearson Correlation	0.96	.000	.027	1	.005	.075	.079	.134	.186
	Sig. (2-tailed)	.312	1.000	.774		.959	.433	.407	.158	.050
	N	112	112	112	112	112	112	112	112	112
Age of participant	Pearson Correlation	.155	.056	.312**	.005	1	.356**	.581**	.170	.075
	Sig. (2-tailed)	.103	.557	< .001	.959		<..001	<… 001	.073	.434
	N	112	112	112	112	112	112	112	112	112
No. of years worked in current organization	Pearson Correlation	0.59	.099	.251**	.75	.356**	1	.582**	−.125	−.421**
	Sig. (2-tailed)	.535	.301	.008	.433	<.001		<.001	.188	<.001
	N	112	112	112	112	112	112	112	112	112

(*continued*)

Table 16 b. (*continued*)

		NewJP	Gender of participant	Marital Status of participant	Education of participant	Age of participant	No. of years worked in current organization	No. of years worked in the position	Job status of participant	Nationality of participant
No. of years worked in the position	Pearson Correlation	.079	−.017	−.285**	−.079	.581**	.582**	1	−.194*	−.291**
	Sig. (2-tailed)	.408	.858	.002	.407	<.001	<.001		.040	.002
	N	112	112	112	112	112	112	112	112	112
Job Status of participant	Pearson Correlation	−.208*	−.147	.055	−.134	−.170	−.125	−.194*	1	−.016
	Sig. (2-tailed)	.027	.121	.567	.158	.073	.188	.040		.863
	N	112	112	112	112	112	112	112	112	112
Nationality of participant	Pearson Correlation	.057	.069	.175	.186	.075	−.421**	−.291**	.016	1
	Sig. (2-tailed)	.549	.470	.064	.050	.434	<..001	.002	.863	
	N	112	112	112	112	112	112	112	112	112

* Correlation is significant at the 0.05 level (2−tailed).
** Correlation is significant at the 0.01 level (2−tailed).

Table 17 a. Demographics correlation–JS.

Descriptive Statistics			
	Mean	Std. Deviation	N
Gender of participant	1.95	.226	112
Marital Status of participant	1.22	.418	112
Education of participant	4.50	1.178	112
Age of participant	2.85	.774	112
No. of years worked in current organization	2.35	1.176	112
No. of years worked in the position	3.08	1.209	112
Job status of participant	1.98	.569	112
Nationality of participant	1.79	.412	112
JS	66.37	11.089	112

Table 17 b. Demographics correlation–JS.

Correlations										
		Gender of participant	Marital status of participant	Education of participant	Age of participant	No. of years worked in current organization	No. of years worked in the position	Job status of participant	Nationality of participant	JS
Gender of participant	Pearson Correlation	1	.032	.000	.056	−.099	.017	−1.474	.069	−0.82
	Sig. (2-tailed)		.735	1.000	.557	.301	.0858	.121	.470	.391
	N	112	112	112	112	112	112	112	112	112
Marital status of participant	Pearson Correlation	.032	1	.027	−.312**	−.251**	−.285**	.055	.175	−0.88
		.735		.774	<.001	.008	.002	.567	.064	.358

(*continued*)

Table 17 b. (*continued*)

Correlations										
		Gender of participant	Marital status of participant	Education of participant	Age of participant	No. of years worked in current organization	No. of years worked in the position	Job status of participant	Nationality of participant	JS
	Sig. (2-tailed)									
	N	112	112	112	112	112	112	112	112	112
Education of participant	Pearson Correlation	.000	.027	1	.005	−.075	−.079	−.134	.186	.036
	Sig. (2-tailed)	1.000	.774		.959	.433	.407	.158	.050	.710
	N	112	112	112	112	112	112	112	112	112
Age of participant	Pearson Correlation	.056	−.312**	.005	1	.356**	.581**	−.170	−.075	.042
	Sig. (2-tailed)	.557	<.001	.959		<.001	<.001	.073	.434	.658
	N	112	112	112	112	112	112	112	112	112
No. of years worked in current organization	Pearson Correlation	−.099	−.251**	−.075	.356**	1	.582**	−.125	−.421**	.76
	Sig. (2-tailed)	.301	,008	.433	<.001		<.001	.188	<.001	.427
	N	112	112	112	112	112	112	112	112	112
No. of years worked in the position	Pearson Correlation	−.017	−.285**	−.079	.581**	.582**	1	−.194**	−.291**	−.122
	Sig. (2-tailed)	.858	.002	.407	<.001	<.001		.040	.002	.198
	N	112	112	112	112	112	112	112	112	112
Pearson Correlation	−.147	.055	−.134	−.170	−.125	−0.194**	1	−.016	−.204*	
Sig. (2-tailed)	.121	.567	.158	.073	.188	.040		.863	.031	
N	112	112	112	112	112	112	112	112	112	
Nationality of participant	Pearson Correlation	.069	.175	.186	−.075	−.421**	−.291**	−.016	1	.017
	Sig. (2-tailed)	.470	.064	.050	.434	<.001	.002	.863		.856
	N	112	112	112	112	112	112	112	112	112
JS	Pearson Correlation	−.082	−.088	.036	.042	.076	−.122	−.204*	.017	1
	Sig. (2 −tailed)	.391	.358	.710	.658	.427	.198	.031	.856	
	N	112	112	112	112	112	112	112	112	112

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Regression Model 1:

A linear regression model was done.

Dependent Variable Y: New Job Performance (New JP).

Independent variable X: Job Satisfaction (JS).

The assumptions are satisfied and the relationship between the two variables appears to be positively significant <.001, and .002 for the dependent variable and the independent variable respectively, and the ANOVA table shows a p value .002 < 0.05 which rejects the null hypothesis. As for the R^2 (.080) which is weak because JS explains only 8% of the independent variable, while 92% can be explained by other variables.

Table 18. Model 1 regression results.

Variables Entered/Removed [a]

Model	Variables Entered	Variables Removed	Method
1	JS[b]		Enter

a. Dependent Variable: NewJP
b. All requested variables entered

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.283[a]	.080	.072	5.88684

a.Predictors: (Constant), JS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	332.969	1	332.969	9.608	.002[b]
	Residual	3812.031	110	34.655		
	Total	4145.000	111			

a. Dependent Variable: NewJP

b. Predictors: (Constant), JS

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig
1	Constant	44.884	3.390		13.239	<.001
	JS	.156	.050	.283	3.100	.002

a.Dependent Variable : NewJP

Regression Model 2:

Another regression model was applied to test if the demographic variables have effect on the job performance, and the results yield are as follows:

Dependent variable Y: New Job Performance (New JP).

Independent variables: Job Satisfaction + Demographics.

The model seems to be not significant.

The Significance of the Coefficients:

As the model results showed only the coefficients of constant and X1 are significant that is (0.001) and (0.013) respectively, while all the other independent variables are insignificant.

The Goodness of Fit the Model:

The results showed that R2 = 0.130. This means that only 13% of the variation in Y (New JP) could be explained by the variation of the independent variable, while about 87% is explained by other factors. As the R-square is very low the researcher Concludes that this model cannot be used for prediction, but it remains valid at a 90% of confidence level.

Table 19. Model 2 Regression Results

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Nationality of participant, Job status of participant, Gender of participant, Marital status of participant, Education of participant, JS, Age of participant, No of years worked in current organization, No, of years worked in the position[b]		Enter

a. Dependent Variables: NewJP
b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.361[a]	.130	.054	5.94503

a. Predictors: (Constant), Nationality of participant, Job status of participant. Gender of participant. Marital Status of participant. Education, JS. Age of participant. No. of years worked in current organization. No. of years worked in the position.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	539,971	9	95.997	1.698	0.99[b]
	Residual	3605.029	102	35.343		
	Total	4145.000	111			

a. Dependent Variable: NewJP

b. Predictors: (Constant), Nationality of participant, Job status of participant. Gender of participant. Marital Status of participant. Education, JS. Age of participant. No. of years worked in current organization. No. of years worked in the position.

Coefficients [a]

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
.1	(Constant	46.148	9.109	332.969	5.066	<.001
	JS	.139	.055	.252	2.539	.013
	Gender of participant	-1.380	2.569	-.051	-.537	.592
	Marital status of participant	-.392	1.455	-.027	-270	.788
	Education of participant	.320	.493	.062	.648	.518
	Age of participant	.764	.935	.097	.817	.416
	No. of years worked in current organization	-.132	.639	-.025	-.207	.837
	No. of years worked in the position	.289	.698	.057	.414	.679
	Job status of participant	-1.389	1.071	-.129	-1.297	.198
	Nationality of participant	.900	1.557	.061	.578	.565

a. Dependent Variable: NewJP

6 Discussion

Teachers' performance may be affected by various factors including the job satisfaction. Teachers' job satisfaction, is driven by the sense of meaning, motivation, inquiry-based learning and participating in learning communities. (Simatupang et al. 2017, Činčera et al. 2019), besides the engagement in reflective dialogue, de-privatization of practice, collaborative activity. (Prenger, Poortman & Handelzalts 2019).

The few studies that were conducted in the UAE indicated that teaching enjoyment, professional development, and work life balance enhance satisfaction. While the job insecurity, motionless salaries. Excessive teaching loads, lack of participation in curriculum decisions, lack of respect in society, may hinder the teachers' satisfaction. (Ibrahim & Al-Taneiji 2019), (Gudep 2019).

The adopted instrument (Sulaiman 2001, 2007) considered the multidimensionality of both variables. However, it may need to be modified in future research to include other dimensions that might be unique to education field, such as the relationship with the students, and the participation in curriculum design.

The instrument was not biased when tested by Harman Single Factor Test. Reliability tests yielded that Cronbach alpha values ranged between (0.637 to 0.93), which implies that the scales used in this study are reliable. The KMO Test of 0.758 indicates that the sample was adequate. Additionally, Both Convergent Validity and Discriminant Validity were guaranteed.

Factors analysis revealed 9 factors based on eigenvalues more than 1. 6 factors explained 69.708% of the variation for job satisfaction. While for job performance 3 factors were responsible for 70.8% of the variation.

The basic regression assumptions of linearity, normality, and homoscedasticity were satisfied. There was a positive correlation .283 between the 2 variables with a significance level of .002. This means that teachers who are highly satisfied tend to rate their job performance high, and thus the null hypothesis was rejected. Two regression models were used to test the relationship between the JS and JP variables, the first model appears to be positively significant, however the R^2 was weak since on 8% of JS can explain the JP, the second model was used to test the effect of demographics variable on the JP, but the relationship was not significant. The coefficient of determination (r^2) showed that 8% of the variation is explained by the independent variable change. Consequently, the null hypothesis H_0: $\beta_1 = \beta_2 = \cdots = \beta_k = 0$ (the correlation is zero and no linear relationship) was rejected and the hypothesis H_1: $\beta_i \neq 0$ (the independent variable affects Y).

7 Conclusion, Recommendations and Limitations

Teachers' performance is fundamental to the quality of education and the students' performance. Job satisfaction is one of the most important factors that affect teachers' performance.

Evidence from this research may shed some light of the importance of job satisfaction of teachers on job performance and consequently on the quality of education. However, there could be other factors that can impact or better predict job performance of the teachers. The study recommends to further investigate this focal construct.

One of the limitations encountered was that literature revealed that teachers 'satisfaction and performance were both affected by factors that were not considered in the questionnaire used in this study. Besides the limited time allotted for the study and the convenient sampling which may affect generalizability.

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Highlighting the Impacts of Parents' Beliefs on Students' Education

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Abstract. Purpose- To highlight the impacts of parents' beliefs on students' education due to the dearth of such studies in the field of education.
Methodology- A sequential mixed-method approach was utilised, where quantitative data were collected and analysed, and then triangulated with qualitative data. The study employed a questionnaire and semi-structured interviews completed by 51 and nine parents, respectively. Convenience sampling was used.
Findings- The obtained data showed that parents' beliefs play a key role in students' education, as these beliefs are associated with parents' expectations regarding their children. Moreover, parents' beliefs function as a guide for their children's efforts and endeavours.
Implications- This study recommends that increasing parental awareness regarding their role in their children's education would be an effective strategy that would provide students with an enhanced learning environment.
Originality/value- This study is considered of great value as it urges policy makers and leaders to increase investment in the parents' role in students' education.

Keywords: Parents · Beliefs · Impacts · Students · Education

1 Introduction

A mother is the first and ultimate teacher. It is no secret that parents have an impact on students' education, both directly and indirectly. A significant number of studies discussed the direct impacts of parents, such as parental assistance and their level of education. Meanwhile, a limited number of studies reviewed other factors related to indirect impacts such as parents' beliefs (Brown 2013). It was argued that the impacts of parents' beliefs can be seen in their emphasis on certain practices, attitudes, interests and habits that might support or hinder students' success (Lerkkanen & Pakarinen 2019).

This study aims to highlight the impacts of parents' beliefs on students' education through shedding light on such beliefs represented in their thoughts and perceptions, and how these beliefs impact students' education either directly or indirectly.

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1.1 Statement of Problem

While extensive research has been conducted regarding the influence of parents on students' academic achievement (e.g. parents' assistance or the level of parents' education), there is less research pertaining to the indirect impacts of parents (e.g. parents' beliefs) on students' education (Taylor, Clayton & Rowley 2004). According to Pesu et al. (2018), there has been a dearth of research on the links between parents' beliefs and children's self-concept of performance. Parents are considered the primary influence on their children's education, as the latter are most likely to adopt their parents' values and beliefs (Ceka & Murati 2016). According to Sapungan and Sapungan (2014), the predictor of students' success in schools is the beliefs parents hold regarding their children. Consequently, the current investigation attempts to address the literature gap regarding the impact of parents' beliefs on students' education, while providing stakeholders with a number of recommendations that might facilitate in bridging the identified gap and provide parents and teachers with greater insight into this research domain. Accordingly, and based on the problem stated above, the main and sub-questions of this research are established below.

1.2 Research Question and Sub-questions

This study seeks to highlight the impacts of parents' beliefs on students' education. To achieve this, one main and two sub-questions are established:

1) What are the impacts of parents' beliefs on students' education?
2a) What are the perceptions of parents regarding their role towards their children's education?
2b) How can children be impacted by their parents' beliefs on education?

1.3 Significance of the Study

This study shed lights on the impacts of parents' beliefs on their children's education. It considers that the parents' role is of great significance since how children act in their classes is influenced by their parents' perceptions and beliefs towards the learning process. Also, this study highlights different aspects of parents' beliefs represented in parents' assistance, the relationship with teachers and parents' expectation.

2 Literature Review

Parents' beliefs have been suggested to be an important element of students' success (Pesu et al. 2018). According to Tocu (2014), children come into contact with their parents' beliefs from birth onwards. This contact is considered a roadmap for children's education.

Parents' beliefs influence students' academic achievements through promoting children's interests via the environments they create and the knowledge they deliver at home (Lerkkanen & Pakarinen 2019). Furthermore, parents' beliefs impact the feedback that children receive from them. For instance, parents with positive beliefs about

their children's performance are most likely to provide their children with positive and encouraging feedback. Conversely, parents with negative beliefs tend to provide their children with negative feedback (Lerkkanen & Pakarinen 2019). Parents may directly convey their beliefs to their children by monitoring, encouraging, motivating and guiding them to focus on specific learning skills. According to Silver, Elliott and Libertus (2021), children whose parents were highly anxious tended to perform less effectively than their peers whose parents were characterised by low anxiety. According to Dong, Cao and Li (2020), parents' beliefs and attitudes impact the quality and quantity of children's learning.Within the same context, Pesu et al. (2018) stated that low-performing children might have negative self-perception, which is more likely to reflect their parents' beliefs.

A 2010 study by Topor et al. involving 158 participants revealed a significant association between parents' beliefs and children's academic performance. Furthermore, the results showed that the teacher–child relationship is linked with the positive beliefs and attitudes of parents. Another study conducted by Chi and Rao (2003) found that educated parents tended to provide a more supportive learning environment than less educated parents. Moreover, Yamamoto and Holloway (2010) stated that children whose parents hold positive beliefs and high expectations perform better than those whose parents hold negative beliefs and low expectations. Topor et al. (2010) hypothesised that where parents have positive beliefs and attitudes towards their children, their teachers are able to influence those children's academic performance by being motivated and engaged, and through positive relationships, which leads to improved outcomes.

3 Methodology

This study aims to answer two research sub-questions, which will then respond to the main research question: "What are the impacts of parents' beliefs on students' education?". Research involves methodically grouping and perceptively exploring knowledge or data in order to achieve a specific outcome (McMillan & Schumacher 2010). In the case of the present study, the methodological approach involved the collection of quantitative data from a questionnaire instrument completed by parents. Qualitative data were then collected through interviews with parents who participated in the survey and expressed a willingness to participate in the interviews. An explanatory sequential mixed-method approach was employed in this research, which Creswell (2014) described as involving a data-collection process through which quantitative and qualitative methods are utilized. According to Albalushi (2019), the approach can facilitate in the construction of a range of viewpoints from the two methods, while promoting analysis of greater reliability. Two phases of design are involved: (i) the collection of quantitative data, and (ii) the analysis of the outcomes to inform the qualitative phase. Creswell (2014) advised that the outcomes of the quantitative phase tend to inform the optimum member types for purposeful selection in the qualitative phase, as well as the questions for direction towards the participants at that stage.

3.1 Instrumentation

The first instrument was a questionnaire that was distributed to parents, which aimed to investigate their perceptions regarding the research questions, with validity assured

through the sample's representation and size, together the questionnaire's careful development and pilot. The convenience sampling technique was employed in this study according to the participants' availability. Structured interviews conducted with parents represented the study's second instrument. The trustworthiness of this instrument was ensured by using a consistent interviewer. According to Abdallah (2018), interviews facilitate deep insight into the participants' points of view, while encouraging their perspectives to be reported in a direct manner. Nevertheless, it should be borne in mind that the respondents' subjectivity in terms of their attitudes, beliefs, and views collectively increase the level of bias in qualitative data (Navarro Sada & Maldonado 2007).

3.2 Data Collection and Analysis

The quantitative data were collected through an electronic questionnaire, with the questions designed using Google Forms. A link to the questionnaire was sent to the participants via the WhatsApp application and email. The interview data were also collected through Google Forms, with links sent to the participants using the email addresses that the parents provided in the questionnaire. Descriptive analysis was used in the first phase of the data analysis (quantitative data), and then thematic analysis was conducted in the second phase of the data analysis using the four stages of coding approach developed by Bryman (2008) that helps researchers gather and classify interviewees' answers in codes.

4 Data Analysis

This section presents the analysis of the data and the study results, and comprises of two parts that focus respectively on the quantitative and qualitative data. The data analysis process is outlined, in accordance with the research questions, in order to best highlight the impacts of parents' beliefs on students' education.

4.1 Quantitative Analysis

The majority of the participating parents work in the field of education, as the author aimed at gaining more reliable and related responses. Figure 1 below illustrates the participants' professional backgrounds.

A total of 51 parents participated in the questionnaire. As mentioned above, most of the participants have an educational background. Regarding the first question, around 84% of the participants confirmed that parents' beliefs play a significant role in shaping students' success. Similarly, approximately 72% of the parents said that the level of parents' education has an impact on children's education. Furthermore, around 68% of the parents believed that parents communicate their beliefs towards children's education through out-of-school hours, follow-up with the school and students' teachers, and assistance in homework. Through this analysis, it was clear that the parents' responses were consistent and relate to each other. This correlation of the parents' responses helps to establish the reliability and suitability of the gathered data. Figure 2 illustrates the parents' responses in detail.

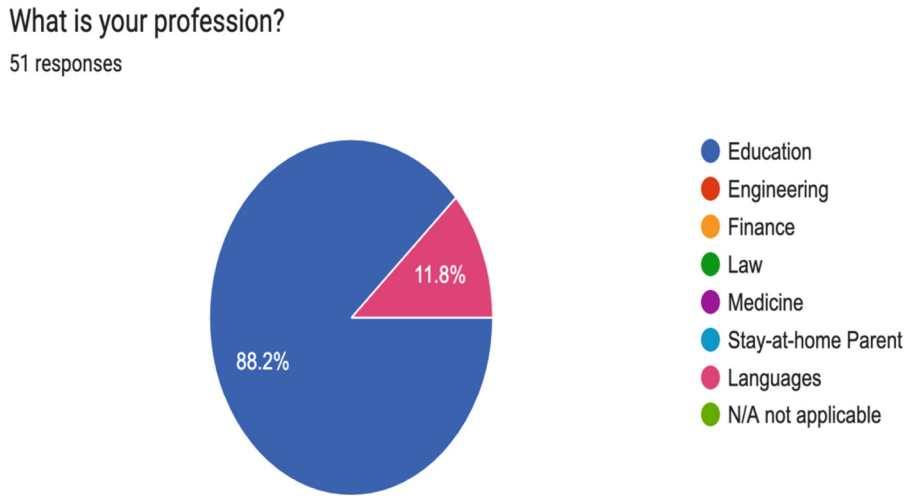

Fig. 1. Participants' professional backgrounds

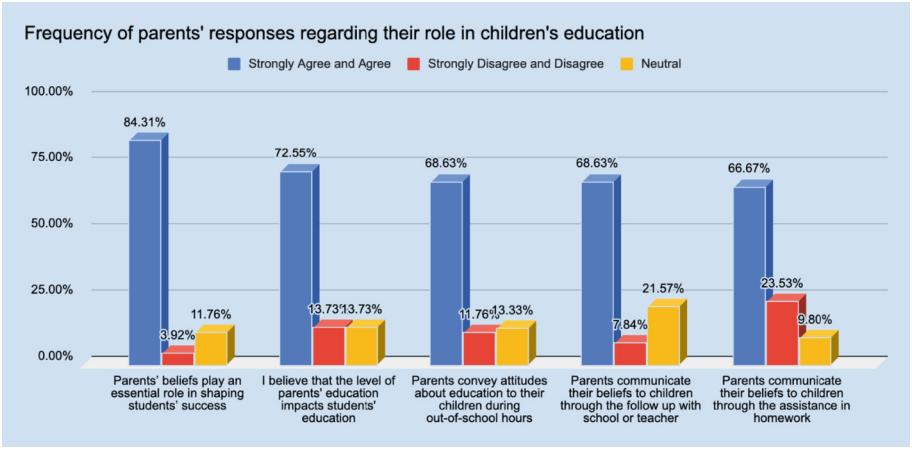

Fig. 2. Parents' responses regarding their role in children's education

Around 74% of the parents agreed that constant conversation about the future between parents and children is one of the ways that parents communicate their beliefs, while only 10% of the parents disagreed. Furthermore, approximately 73% of the parents agreed and strongly agreed that parents communicate their beliefs to children through the choice of videos, YouTube content and online resources that children are allowed to watch. Moreover, they indicated that parents' attitudes towards children's education at home are seen and reflected in students' learning behaviour at school. Similarly, about 76% of the parents agreed that parents convey their beliefs to children through the clubs and the activities they send their children to, while around 8% disagreed. Furthermore, around 63% of the parents believed that parents convey their beliefs through the choice

of reading books for their children, while around 10% disagreed and 27% were neutral. Finally, approximately 80% of the parents indicated that home discussion towards school impacts children's education, while around 8% of the parents disagreed. Figure 3 below visually presents the parents' responses.

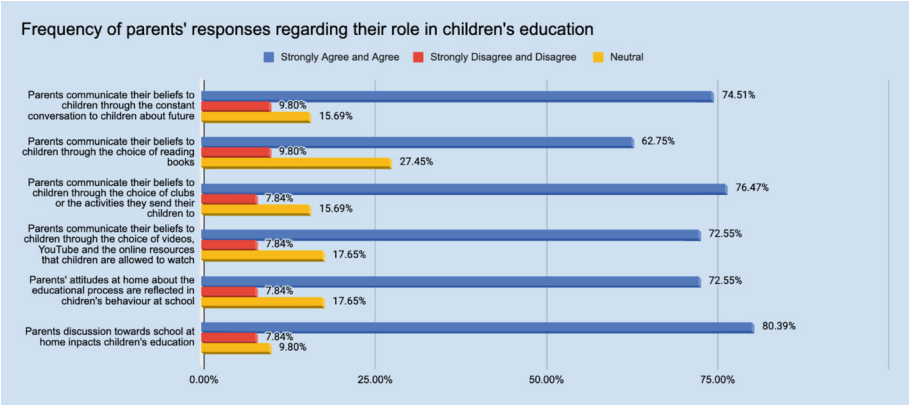

Fig. 3. Parents' responses regarding their role in children's education

4.2 Qualitative Analysis

A total of nine parents participated in the structured interviews. All answers were classified in three main codes related to the research questions. Generally, the parents' views were in line with the data obtained from the questionnaire. The first code concerned the parents' role towards their children's education. All the participants confirmed that parents play an important role in their children's education. In this regard, Participant 1 asserted: *The stronger the relationship between parental involvement and children's education, the more likely children are to achieve better grades and score higher on tests.* This response correlates with the quantitative data, where around 84% of the participants concurred with this view. Moreover, Participant 2 stated: *Parents are the real custodians for their children's education. They act as home language managers, without which real language progress can't be traced.* Most of the participants emphasised the vital role of parents in guiding children and facilitating their learning journey. Furthermore, they confirmed that all parents' endeavours and efforts are derived from and guided by their beliefs towards their children's education.

The second code was the parents' main responsibilities regarding children's education. Most of the parents mentioned the importance of following-up with the school and teachers, achieving the assigned tasks and monitoring children's progress. Participant 3 asserted: *Parents can partake in their children's education by helping with school activities or communicating with teachers. They can also be engaged at home in many ways, including guiding their children to complete learning tasks and other commitments, and involvement in discussions about values and attitudes regarding education.* Moreover,

Participant 4 stated: *Parents' main responsibilities are represented in helping children with homework, monitoring the school process at home.* While Participant 5 said: *The process of choosing a suitable school for children is one of the main responsibilities of parents, and this primarily comes from parents' beliefs.* To link this code with the quantitative data collected, more than 72% of the parents reported through the questionnaire that parents' responsibility towards their children is of great importance and correlates with students' progress.

The third code related to the connection between parents' beliefs and expectations, with all the parents confirming a strong connection between the two. The parents stated that expectations stem from beliefs, and that beliefs direct and guide expectations to better impact children's education. Participant 6 said in this regard: *Parents' beliefs and expectations are deeply connected. Parents' beliefs are formulated when they give birth to a child. Parents begin thinking and building expectations about their child's future from birth, and this is a proven fact.* Within the same context, Participant 7 stated: *Yes, I think there is a strong connection between them because expectations usually are a result of the beliefs. I think parents' expectations are so important because learning is an organised process and the first thing to be organised is expectations.* To sum up, all the parents' responses in the structured interviews indicated that parents' beliefs are the main factor in children's education, as beliefs guide parents to set high expectations for their children and motivate them to follow-up with the school and teachers. The data obtained from the questionnaire and structured interviews thus indicate a strong relationship between parents' beliefs and their expectations towards their children's education.

5 Conclusion

This study aimed to answer the main research question: What are the impacts of parents' beliefs on students' education? It represents an attempt to fill a gap in the literature concerning the role of parents' beliefs in children's education.

The first finding of this research, obtained from the triangulated data of the explanatory sequential mixed-method approach, indicated that parents' beliefs play a primary role in students' education. This was supported by most of the parents who responded to the questionnaire, where around 84% reported that parents' beliefs play a key role in students' success. Similarly, the parents' perceptions in the structured interviews highlighted the vital role of parents' beliefs in children's learning, whereby they considered parents' beliefs as the motivation that guides all of their efforts to support their children. Moreover, the reviewed literature underpins the quantitative and qualitative data presented in this study, particularly in terms of Lerkkanen and Pakarinen (2019) and Topor et al. (2010).

One of the primary findings of this research is that parents believe that all manner of parental support represented through assistance in homework, following-up with teachers, and the activities or clubs that children attend are guided and directed by parents' beliefs. Moreover, the obtained quantitative and qualitative data confirmed that parents are the primary source of learning, as their beliefs guide the processes of selecting schools and books for children. This input clearly impacts children's learning and progress, and

thus their education. Essentially, this study concurs with Echeverría-Castro et al. (2020) that parents' active role in their children's education is guided by their beliefs.

To conclude, this study contributes by highlighting the impact of parents' beliefs on students' education. All the data obtained from the parents and the reviewed literature confirmed the crucial role of parents' beliefs, which guide and direct parents' endeavours to support their children in their educational journey. Moreover, this study contributes by filling a gap in the literature regarding parents' beliefs towards their children's education, while contributing to the knowledge that parents' beliefs represented through indirect actions such as the process of choosing schools, clubs, books and online resources to watch are of considerable importance as they create a roadmap for parents and children in the learning journey.

5.1 Implications

This study finds that parents' expectations, assistance, relationship with teachers and the process of choosing schools, activities and online resources for their children to watch are all guided and directed by parents' beliefs. Based on this finding, the study recommends that training parents and increasing parental awareness regarding their role in their children' education would be an effective strategy that would provide students with an enhanced learning environment (Stipek et al. 1992). Moreover, this study suggests that leaders and policy makers investigate and invest in the role of parents and their beliefs, which might lead to improved achievement in the context of student education (Brown 2013).

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Jordanian Expatriates' Family Language Policy in Dubai

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Abstract. This pilot study explores the Family Language Policy (FLP) of two Jordanian expatriate families in Dubai and is underpinned by Spolsky's FLP theoretical framework which has tripartite components of ideology, practice, and management. A qualitative constructivist approach and case study are adopted as the main methodology. Data were collected through in-depth semi-structured interviews with the parents and observation of the natural utterances of children. The purpose of the study is to refine the data collection instruments regarding both the procedures and the content of the gathered data to glean initial themes. Key findings identified contextual and cultural challenges while piloting the instruments which resulted in necessary methodological modifications to the data collection procedures. Implications include highlighting the benefits of pilot studies, modifying interview questions and observation procedures in response to challenges that face emerging researchers when conducting similar studies, and sharing the value of developing reflexive, culturally competent, and ethically responsive research practices in the field of Arabic sociolinguistics.

Keywords: Expatriation · Family Language Policy · Pilot Study · Reflexivity

1 Introduction

The growth of globalisation and increased global mobility caused demographic shifts in countries welcoming migrants, transnational families, and jobseekers. The United Arab Emirates (UAE) received an influx of workers and experts called 'expatriates.' Haak-Saheem and Brewster (2017) define 'Expatriation' as "to be relocated to a country of which they are not a citizen; intend to be there for a year or more but for their stay not to be permanent; have a regular job in the host country" (p. 424). According to UN, the fifth-largest international migrant stock in the world is in the UAE (Malit & Al Youha 2013) creating a superdiverse population (Hopkyns, Zoghbor & John Hassall 2018). This engendered a 'demographic imbalance' with Emirati locals becoming a minority and expatriates the majority (Dubai Statistics Center 2020). Consequently, English emerged as the lingua franca despite Arabic being the official language (Randall & Samimi 2010). Thus, the Arabic-speaking community in the UAE mostly comprises Emirati locals and Arab nationals while English language is used pervasively in several sociolinguistic domains, such as families, media, education, work, and business. Hence, the bilingual

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model in the UAE has shifted to becoming subtractive in nature wherein English is the primary language used in communication (Al-Issa & Dahan 2011; Sullivan 2015; Musmar 2018; Hopkyns 2020). As a result, numerous studies focused on the implications of this subtractive bilingual model in this unique context on Emiratis' linguistic hybridity and cultural identity (Hopkyns, Zoghbor & Hassall 2021). However, limited studies focus on the implications of this subtractive model on expatriate families and their children. To address this gap, a pilot study was conducted on two families to test data-gathering instruments and ensure trustworthiness before the full-scale research.

1.1 Research Problem

Family Language Policy (FLP) research has been conceptualised in the works of King, Fogle, and Logan-Terry (King & Fogle 2006, 2013; King, Fogle & Logan-Terry 2008) and Spolsky (2012a, 2012b). After the widespread of English as a global language, FLP research focused on three topics: the centrality of the family domain in children's linguistic competence, the necessity of intergenerational home language transmission, and the reversal of language shift. This pilot study represents a small-scale research project that is conducted prior to the final full-scale one and addresses methodological challenges to assure trustworthiness.

1.2 Research Questions

1 What are the methodological challenges encountered by the researchers in piloting the data collection instruments? A sub-research question is: how did the researchers adapt the methodology to respond to challenges?
2 What are the initial themes that emerged from the pilot study in the case of the two Jordanian expatriate families and their FLP?

1.3 Significance of the Study

This study is timely and relevant given that His Highness Sheikh Mohammed bin Rashid Al Maktoum, Ruler of Dubai, launched the UAE declaration of Arabic language in 2021 (Saleh & Mohamed 2021).In addition, the study aims to contribute to the existing body of literature on FLP and Arabic sociolinguistics concerning methodology. Smith-christmas (2016) Albirini (2016), and Bassiouney (2020) identified the lacunae for future research in the field of FLP as there is a lack of studies situated in the Middle East/Arab region -since the majority of FLP studies are situated in Western, industrialized societies- and the need for methodological innovations.

1.4 Theoretical Underpinning

This study is underpinned by Spolsky's (2012a, 2012b) Family Language Policy (FLP) theoretical model that comprises language beliefs, practices, and management (Fig. 1). Spolsky posits that "the home is probably the most important domain for language maintenance" (2012a, 2012b, p.11). King, Fogle, and Logan-Terry define FLP as "explicit and overt planning in relation to language use within the home among family members"

(2008, p.1), and argue that FLP represents a comprehensive framework for understanding language use and language choice within the family sphere and tries to answer questions on how languages are learned, managed, and negotiated among family members.

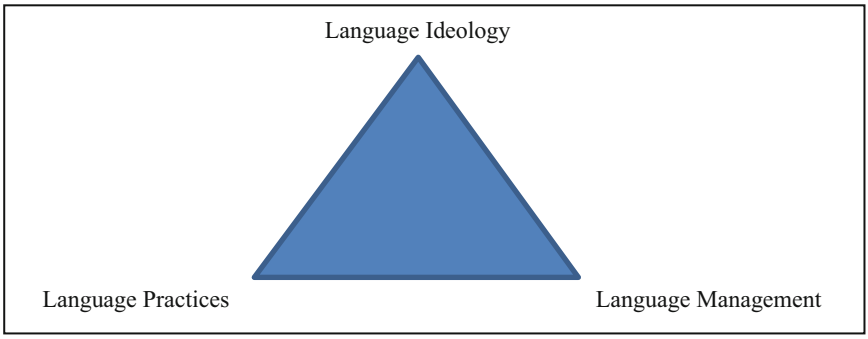

Fig. 1. Spolsky's Family Language Policy Model (adapted from Gaynor 2018)

2 Methodology

2.1 Data Collection

The study employed a purposive sampling technique that defined the selection criteria of the participating families:

1- Both parents hold a Jordanian passport.
2- Family has been living in Dubai for a minimum of two years.
3- Family has school-age children.
4- Both parents are native speakers of Arabic.

The lead researcher approached families from her friendship circle (since she belongs to this speech community) and the ones who showed interest and met the eligibility criteria signed informed consent forms.

Context: After several trials of trying to find eligible families, two Jordanian expatriate families met the criteria and agreed to participate in the pilot study in May-June 2022.

Instruments: Face-to-face in-depth semi-structured interviews with the mother and father, and two to three audio recorded observations of the children's natural utterances. The observation was planned to be video-recorded; however, the participants expressed their reservations regarding this method; the lead researcher altered it to audio recording which received the participants' informed consent. Throughout the research process, the researcher kept a reflexive journal and reflected upon with the participants' feedback and suggestions.

2.2 Participants

Table 1 shows the participants' pseudonyms to ensure the confidentiality of their identities (Johnson & Christensen 2017), the families' demographic profile, and given consent. Family 1 had two children, one girl and one boy while Family 2 had one girl and two boys. All participants consented fully to participate, except for Lina who partially provided her consent. This is considered one hurdle that is discussed in the results section.

Table 1. Participants' Profile and Consent Forms for Interviews and Observations

No	Participant Pseudonym	Role	Gender	Age	Interview Consent (audio)	Observation Consent
Family 1						
1	Dawood	Father	M	45	Yes	Yes (audio)
2	Amal	Mother	F	43	Yes	Yes (audio)
3	Lina	Daughter	F	17	No	Yes then No (audio)
4	Samer	Son	M	11	Yes	Yes (audio)
Family 2						
1	Ahmad	Father	M	44	Yes	Yes
2	Nadia	Mother	F	40	Yes	
3	Zeinab	Daughter	F	17	Yes	
4	Mohammed	Son	M	14	Yes	
5	Taha	Son	M	11	Yes	

3 Data Analysis

Interviews: Parents were interviewed for 34–48 min using an audio recorder. The topics of interviews commenced with some demographic information such as name, age, gender, education, profession, number of children, and their ages (Merriam & Tisdell 2016). This was followed by the languages they speak. Then, participants were asked to elaborate on language shift-related topics, such as codeswitching between Arabic and English, schooling, language acquisition and bilingualism, the parents' thoughts, beliefs, practices, and what strategies do/did parents implement at home to manage the languages used in this domain and maintain the home language. Interview data were analysed using thematic content analysis (Williams & Moser 2019).

Observations: Observations of natural speech took place in the following social activities: child play time, family lunchtime or/and dinnertime, gaming, after-school pickup time, and bedtime chitchat. The settings included: kitchen, living room, car, kids' bedrooms. Natural speech was transcribed and analysed linguistically to provide evidence to language shift through codeswitching patterns and the dominant language.

4 Results

4.1 Methodological Challenges and Adaptations

Contextual Challenges and Recruiting Families: The first contextual challenge occurred when members of participating families tested positive for COVID-19. In 2022, families were still concerned about the pandemic, and schools and universities were still implementing the mandatory provision of wearing masks in closed places (Patterson 2022). Though the UAE relaxed the social distancing rule in the first quarter of 2022, families were still worried and this resulted in difficulty finding voluntary participants at the beginning of the year 2022.

Another contextual challenge that faced the researcher in the second round was that after recruiting families to participate in the pilot study, both families ended up relocating to other GCC countries. Dubai is well known for being a transient emirate wherein expatriates stay for a relatively short period and return to their home countries or move to other countries seeking better opportunities (Rinella 2019). This is part of the contextual challenges that researchers might face and feel obliged to restart the whole recruiting process as it requires flexibility while accepting ambiguity throughout the process (Merriam & Tisdell 2016).

In the third round of recruiting, one family that provided consent and had been interviewed withdrew before the observation took place. Parents expressed their reservations regarding the topic as they reflected on their family's linguistic practices for the first time and realized that the interview questions were eye-openers. The mother said, "It's a wakeup call, things need to change." The mother became cognizant of the fact that there was no conversation happening to be observed. Every member was habituated to sitting on their devices, when at home. The example from this family could perhaps be worth further investigating as a phenomenon that could be a result of modernity, technological advances, and perhaps the pandemic. These changes may have impacted on the socialization and communication patterns in the family.

Even though the recruitment of families was planned to take a month in the research pilot plan, it took nearly five months. A fourth round of trials commenced to find eligible participants. Nevertheless, one of the participants withdrew midway. The consent issue emerged as a prominent challenge in the pilot study. Lina, who expressed her restlessness, asked to not be observed in the middle of the observation data collection process. When asked about the data that was already collected before her decline then, she had no objection to that data being used in the pilot study. It is necessary to point out that Lina wanted to stop at that point in time and her right not to continue was fully respected instantaneously. Hence, the data collected from her was limited, which is one ethical hurdle that qualitative researchers might face when conducting observations.

Cultural Challenges: The observations in Jordanian families were faced with few hurdles. Although parents read the consent form, signed it, and were fully aware of the procedures, the moment that the researcher planned an observation the mothers in both families felt uneasy about video recordings. These examples of two Jordanian families could be limited and ungeneralisable, yet they do reflect the extent of privacy boundaries within their micro-culture that characterizes them when it comes to video-recording the children's utterances. Hence, they both agreed that audio recording is a

better alternative that makes them feel more at ease. Juxtaposed against the FLP literature that is mostly situated and carried out in Western contexts (Curdt-Christiansen 2020), in which the researchers reported negligible instances of hurdles or difficulties emerging when conducting their ethnographic research on families that were not related to the researcher, the researchers in the current study report facing cultural challenges that required adaptations in the methods.

Adaptation of Interview Questions: The interview questions had minor modifications. New questions were added to the semi-structured interview questions. In the reflective journal, the lead researcher pinpointed that there were questions that seemed vague to the participants, hence, they were rephrased to become more succinct. Two questions were also added; one on the extracurricular activities related to Arabic or Islamic such as after-school calligraphy and Quran memorization, in which parents enrolled their children as a means to strengthen the use of their mother tongue; the other one was on strategies parents applied to or wish to apply to preserve Arabic language use in the home environment to allow parents to explicitly ponder their strategies or lack thereof which could result in the lack of a linguistic directionality/family policy.

Adaptation of Observation Method: The researcher negotiated the best model of audio observation with the mothers. This resulted in altering the role of the lead researcher from being a participant-observer to a non-participating and unobtrusive observer and the role of mothers from mere participants to co-researchers. The benefits of adopting this participatory model of observation arise from the reduction of Hawthorne's effect (Cohen, Manion & Morrison 2018) and optimizing mothers sense of ownership and partnership (Creswell 2012; Creswell & Creswell 2018). This major adaptation of the observation method required a brief face-to-face training in which the researcher provided guidelines on the procedures of when, where, and how to record. The mothers started sending short and long audio recordings that they were happy to share.

4.2 Initial Themes of FLP

After visiting the transcribed data, three themes emerged from the thematic analysis that are underpinned by FLP:

4.3 Language Ideology

Positive Attitudes and the Perceived Value of Languages: All parents were native speakers of Jordanian dialect. Parents in both families reported that their competency in Arabic was excellent and reflected a positive attitude towards speaking it. Fathers said that their English is excellent, however, mothers indicated that their English skills are weak/Good**.** This could be indicative of the fathers' value of languages and embracing bilingualism (Razem 2020a, 2020b), and even more accurately additive bilingualism (King & Fogle 2006). For both families, identity construction was a major theme that was linked to Arabness and Islam (Razem & Pandor 2023).

Parental Perceived Value of Schooling and the Role of School: In both families, parents were well educated. Both fathers are business owners while mothers are housewives.

Parents chose to enrol their children in private international schools. This could be indicative of a high standard of living of these families. Fishman (1991) and Spolsky (2012b) asserted that parental choice of school has a huge impact on the language development of children, language choice, bilingual model, and language shift.

Language Practices: The analysis showed that the data gleaned on language practices from the parents' interviews is congruent with the data gathered from observing the natural utterances of children.

Language Management: Parents reported using several types of language management strategies to help their children develop both languages while maintaining the use of home language, Arabic, daily at home. In both families, mothers played a crucial role in trying to control, manage, and negotiate language practices of their children. The fact that families perceived Arabic as the home and heritage language led to the parental natural desire to maintain it at home.

5 Conclusion

This pilot study unravelled methodological challenges, prompting flexible adjustments and gleaning key themes. Contextual challenges arose when the researcher sought to find eligible participants. The first key modification was to the interview questions. The interview protocol was an insightful opportunity for the lead researcher to gain practical experience and enhance her interviewing skills prior to conducting the doctoral study. To respect participants' privacy and agency, observation procedures were altered from video to audio recordings. Mothers became coresearchers, receiving face to face training on audio recording their children's natural utterances, which is an essential development in the observation protocol. Obtaining children's consent was a paramount ethical requirement for retaining the audio recordings. The pilot study fostered reflexivity and respect for participants while grounding key themes in Spolsky's FLP theory. It significantly shaped the research design and offered invaluable firsthand experience on research with families.

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The Impact of Bullying in an Inclusive Classroom Among Students of ASD and Peers in Social Development and Academic Performance in UAE

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Abstract. The physical, social, emotional, intellectual, and mental health of students with Autism Spectrum Disorder (ASD) can be affected negatively if a problem occurs in an inclusive classroom setting.

The purpose of this study is to investigate how bullying affects students with ASD. This thorough literature review looks at how bullying affects students with ASD including social development, academic performance, and school participation. Bullied children who grow up to be adults have anxiety and despair that affect their school engagement. Students with ASD are unable to get along with typically abled students due to bullying. The paper highlighted the importance for educators to prevent and treat bullying of students with ASD. However, the study has severe drawbacks such as a lack of empirical research conducted in the UAE. The study recommends releasing further studies in the UAE carrying out more research on other factors that impact bullying of kids with ASD to raise awareness of this issue.

Keywords: Bullying · Social Development · Academic Development · Autism · ASD

1 Introduction

To achieve equal quality education, the UAE has expanded special education to include broader categories for higher grades since 1979 (MOE, 2010). According to the 2006 laws for social acceptance, inclusive education is essential (Arif and Gaad, 2008). Similarly, in line with the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), a UAE law from 2006 safeguards the rights of people with disabilities (KHDA, 2019).

According to MOE SEN policy 2010, ASD implies severe deficits. This study systematically investigates how bullying affects ASD students' and their classmates' social and intellectual development in inclusive classrooms.

The article will address the following research question:

1. How does bullying effects ASD students in their performance in an inclusive school?

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The study's focus on bullying's impact on children with Autism Spectrum Disorders is extremely pertinent to the field of special education needs because it tackles the difficulties that ASD kids encounter in both social development and academic achievement.

To enhance the practice of inclusive education practice and policies, the research on the effects of bullying on students with Autism Spectrum Disorder in the UAE is crucial. This research aims to shed light on the experiences of those students and fill the knowledge gaps.

It summarises major findings, addresses difficulties autistic students face in the classroom, and makes recommendations for further study.

2 Background

Inclusion is a phenomenon and a global movement that is high on the international agenda. As a way of delivering a suitable education for all kids, educators must pay attention to inclusion. (Gaad and Almotairi, 2013)

In the UAE, the prevalence rate for autism spectrum disorder (ASD) is 112.40 per 10,000 children, making it the world's second-highest autism rate. (Autism Rates by Country, 2022).

Autism is a complicated illness from mild to extreme range. The functioning level in people with autism mainly refers to cognitive ability, which can range from serious mental impairment to excellent talents. While a person's cognitive capacity will influence whether he or she is vocal or nonverbal and whether he or she will operate with increasing levels of independence, all people with autism have considerable difficulties behaving correctly in social situations. (Debbaudt, 2001).

Students with ASD face bullying in schools. Parents and instructors frequently claim that students with autism spectrum disorders (ASC) are bullied by their peers during the school years. (Hebron et al., 2015).

When compared to normal rates of equivalent everyday work, the quality of life of persons with ASD is poor. Academic and non-academic demands were shown to be influenced by communication, organizational, and time management abilities. (Anderson et al., 2018).

Students with ASD struggle to "read" social cues and understand how to interact in constantly shifting social circumstances. They struggle to anticipate others' behavior and decipher facial expressions and body language to infer what they are thinking or experiencing. Children with ASD are more vulnerable to bullying because of their inability to understand social cues. (Stobart, 2009).

3 Methodology of Systematic Literature Review

The following (Table 1) were the inclusion criteria for the systematic review of the literature.

Results were tabulated with examples, tools, and essential points in Google Sheets. Relevance to the assessment of "Effects of bullying on ASD students' performance in inclusive schools" For being irrelevant, biassed, or old, more than 70 out of 100 articles were removed. There were 25 studies included.

Table 1. Inclusion Criteria Across Reviewed Studies.

Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	Criteria 6	Criteria 7
Focus on ASD children and their behavior in school	Qualitative and Quantitative Methodologies	Research Areas	Focus on Social Interactions among students with Special Educational Needs	Gender and Age	Sources of Publications	Keywords
It was anticipated that the majority of publications included in the SRL would deal with ASD children and their behaviors in the school. This could include research on the consequences of bullying for ASD kids, risk factors for bullying among ASD students, how ASD students behave in regular classrooms, their academic success, their social development, and other related subjects	Studies using qualitative, quantitative, or mixed-method research designs were included in the SLR. This made it possible to include a wide variety of research in the review that offered various types of information on the subject	Studies from the social and human psychology, sociology, and education sectors were taken into consideration for the SLR since they were thought to be pertinent to the research issue. Studies from disciplines like politics, economics, commerce, and business, however, were not included in the research results because they were deemed to be indirectly related to the subject	The SLR included studies that examined social interactions among students with special educational needs, such as those with Autism Spectrum Disorders, as well as interactions with teachers and their peers	To offer a bigger sample size and a deeper understanding, both gender and age groups of students with ASD were included in the study. The relevance of article selection criteria (title, abstract, and research significance) was utilized to select articles. The investigation excluded studies from questionable journals and websites as well as those that were more than 3 decades old. The significance of each journal article was evaluated and examined using an online tool that assesses journals and scientific issues	The majority of the research came from the British University in Dubai's online library and some publications were looked for on Academia, a website for exchanging scientific papers. Additionally, a few studies were found using the Google Scholar search engine	To find pertinent studies, keywords like "effects of bullying ASD children", "factors of bullying ASD students", "behavior of ASD students in mainstream school", "academic achievement of ASD students", "social development of ASD students", and, "students with ASD" were used

4 Literature Review

This section focuses on research relating to the bullying of ASD students. The literature review is structured around the investigation of what bullying is and how it affects ASD students' performance in inclusive schools.

4.1 Autism Spectrum Disorder (ASD)

Autism is a neurologically based developmental condition that severely limits a person's capacity to communicate, socialize, and make decisions. It affects boys four times more than females and is usually observed in youngsters by the age of three. It is believed that at least 12 million individuals worldwide, regardless of race or ethnicity, are affected by it. The prevalence of autism is rapidly increasing. (Debbaudt, 2001)

Autism can be diagnosed as early as 18 to 24 months; distinctive symptoms can be recognized from usual development as well as other delays or developmental problems around this age. (Zeidan et al., 2022).

Autism symptoms range from moderate to severe. Cognitive ability determines one's level of functioning, from skill to disability. Communication and independence are impacted by cognitive capacity. All autistic people experience social difficulties regularly.

Autism has no known cure; however, the medicine may assist with some symptoms in rare circumstances. Parents and educators frequently go to considerable lengths to assist children with autism in adjusting their habits, making it simpler for them to integrate into society. Genetic and environmental indicators are still being studied, but the reasons are unclear. Autism was once generally triggered by the way parents reared their children. Autism, on the other hand, is now known to be biologically determined and to be a permanent impairment. Those who are impacted have the highest chance of recovery if they are diagnosed early and have access to educational programs. (Debbaudt, 2001).

4.2 Bullying and its Types

Bullying, according to the findings, is almost like student torture. According to the researchers, bullying came from a variety of sources, including friends, and took a variety of verbal and physical forms. (Bitsika and Sharpley, 2014)

Several studies have examined the types of bullying. Tipton-Fisler et al. (2018) state that bullying is the most common sort of bullying experienced by kids with ASD at schools, with verbal abuse being the most prevalent type.

As stated by Cappadocia et al., 2012, verbal (e.g., name calling) and social (e.g., spreading rumors or purposefully leaving someone out) kinds of bullying are the most prevalent among school-aged children (Scheithauer et al., 2006; Woods and White, 2005). Furthermore, until 2012, there were few studies on bullying among ASD students. Only a few research have looked at bullying experiences among children with ASD. According to preliminary studies, individuals with ASD are more likely to be bullied than their normally developing classmates. (Cappadocia et al., 2012). However, as inclusion is getting more practical; a recent study published in 2022, has stressed the importance

of understanding bullying as more than just a result of systematic factors in the class, school, or community (Amundsen et al., 2022).

A review by Hwang et al., 2018 claims that (1) bullying is defined as a perpetrating behavior by children and adolescents who hold and/or try to maintain a dominant position over others; (2) bullying requires a clear intent to cause mental and/or physical suffering to another; and, (3) it is a dynamic and complex social interaction (Olweus, 1994; Morita, 1985; Nansel et al., 2004). Fekkes et al., 2005 discuss it further by claiming that When there is a power imbalance between the perpetrator and the victim, certain undesirable behaviors occur. Bullying can be 'physical' (e.g. striking, shoving, kicking),' verbal' (e.g. calling names, inciting, making threats, spreading slander), or a combination of both (e.g. making gestures or social isolation). According to the author, Name-calling (90.3 %), spreading rumors (89.1 %), being neglected or not allowed to participate (60.8 %), being made fun of (74.3 %), being kicked, hit, or pushed (63.1 %), or having things taken away or hidden were among the specific bullying behaviors experienced by those children who indicated that they had been bullied almost daily on the general bullying question (37.3 %).

4.3 Bullying in ASD

In consonance with the findings, all the mainstream instructors polled believed that kids with SEN were troublesome to other pupils in the classroom. (Gaad and Khan, 2007)

Hsiao et al., 2022 state that students with Autism are more likely to be bullied than other students. Their recurrent issues with social interaction and communication may help to understand why they are the focus of bullying.

Bullied children are more likely to have psychosomatic symptoms, poor social and emotional integration, low school dedication, symptoms of depression, anxiety, and clinically significant social issues, according to research on the general population. (Cappadocia et al., 2012). Stakeholders, especially parents of special needs are concerned about whether the child has indeed been bullied and/or bullies others. (Kloosterman et al., 2013)

Few research has investigated school rejection for children students with autism spectrum disorder (ASD), and bullying is one of the primary causes. (Ochi et al., 2020). According to Hwang et al. (2018), when compared to their peers in the community, children with ASD are more likely to be victims or perpetrators of bullying. This is because the students could be having problems understanding the event within the flow of time, and matching visuals and noises that happen simultaneously. Starting at the lowest of perceptual reception and working up through the cognitive system from there, the organizing of information proceeds logically. The traditional organization of the classic content is present here. (Metcalfe, 2011)

Moreover, children with ASD suffer bullying more often, both as perpetrators and victims, than children in the general population.

Bullying, which is defined by the sentiments of pupils who are or are not bullied, and psychological suffering produced by a psychological attack, is one of the primary reasons for school refusal. (Ochi et al., 2020)

As stated by Tipton-Fisler et al., 2018, Bullying was the most common sort of bullying experienced by kids with ASD at schools, with verbal abuse being the most prevalent type.

Students with autism who have been bullied often seek revenge. Due to their autism or outbursts, their response could be impulsive or odd. Teachers detect revenge but may not notice the initial mistreatment. Students who have autism acknowledge retribution but not the initial harassment. When challenged, bullies deny what they have done. People with autism frequently vent their rage in public. This calls into question their standing with the legal system.

Bullies, teases, and tormentors frequently target people with autism in school, at work, and in their communities. They might not even be able to speak freely or protect themselves, and they may not even be aware that they are being targeted. The abusers will not be deterred by the possibility of being caught and punished. When bullies, taunting, torture and harassment aren't afraid of being discovered, they're more likely to escalate. Harassment might escalate into physical violence. To identify witnesses or other victims of disability discrimination, assault, or intimidation, investigators should undertake interviews in schools, communities, and workplaces. (Debbaudt, 2001)

4.4 Social Development

Children with ASD have a lot of trouble with reciprocal social relationships, as well as social communication skills, according to Hawang et al., 2018. (Frith and Hill, 2004; van Roekel et al., 2010).

As reported by the research, children with ASD-like behavioral challenges resulting from communication and socialization deficits have a high prevalence of bullying encounters, at least according to their parents. (Bitsika and Sharpley, 2014).

It would be beneficial for all students to have a schedule of various activities that may aid in preserving peer interaction. Schedules and activities should be highly structured for people with autism spectrum disorders, and they should also get specialized assistance to promote social interaction (Cuesta-Gómez et al., 2022).

Furthermore, verbal abuse is the most common kind of bullying, the ASD student struggles to develop a social life. When one student's word is pitted against another's, the autistic student loses credibility as a fact reporter. However, his or her hasty admission is recorded. He or she might be suspended, expelled, or charged with a crime. (Debbaudt, 2001).

Similarly, they may have trouble seeing a different perspective or recognizing a communication failure. They frequently fail to include other people's perspectives in the decision-making and make bad social judgments because of their failure to effectively forecast other people's perspectives. (Debbaudt, 2001).

For students with ASD, having a close relationship with classmates is essential. Because a disproportionate percentage of autistic students lack psychosocial support from peers, they appear to be more sensitive to bullying. (Amundsen et al., 2022).

Bullying is tough due to communication issues. As cited in Tipton-Fisler et al. (2018), verbal abuse is the most prevalent type the most common sort of bullying experienced by kids with ASD at schools. Some studies have revealed that people with autism who

have no intellectual handicap but have major social and communication difficulties are the ones who are most likely to be victimized (Rowley et al., 2012).

4.5 Academic Development

School-related sources of stress, including bullying, poor academic performance, and change in the classroom or teachers, have a direct impact on people with ASD. (Ochi et al., 2020)

Bullying has an impact on the academic achievement of ASD students in school settings.

The fact that over half of the students said they were bullied in class might be a hindrance to focus in class and, as a result, academic progress. (Bitsika and Sharpley, 2014).

Moreover, Sreckovic et al., 2014 stated that recent longitudinal research indicated that children who had been bullied had considerably (GPAs) lower grade point averages and school achievement than kids who had not been bullied. (Sreckovic et al., 2014).

It was further reported that school absences have also been observed as a result of victimization in the general community. (Sreckovic et al., 2014). This demonstrates how bullying affects students with ASD to the point where they anticipate being away from school.

Selective auditory attention processing issues are a challenge for autistic students (Schwartz and Wang, 2020).

Due to their inability to concentrate on one stimulus among many, ASD students suffer from the cocktail party effect. Due to communication issues, a review found that bullying rates were greater among those with ASD. Bullying can take many different forms, including verbal and social, and it can harm a person's well-being and academic performance. Bullying can result in psychosomatic issues, loneliness, and decreased academic involvement. Parents of kids with disabilities have concerns. The likelihood of being rejected from school increases in those with ASD. According to Paul et al., 2018, Individuals with ASD are more prone to be socially disengaged than those who are typically developed, which may lead to school rejection. (Ochi et al., 2020). Bullying affects academic success because of ineffective communication. School dropout is one of the long-term impacts. Bullying is complicated, deliberate, and related to power disparities. It was also cited by Bitsika and Christopher, 2014, that one of the major long-term negative outcomes of bullying is a harassed child's absence from school, which can lead to permanent school dropout (Fried and Fried, 1996).

Bullying hurts ASD students' academic performance in inclusive schools, according to the literature evaluation. Students with ASD struggle with bullying, which negatively affects their well-being. Studies have revealed a variety of elements of bullying among teenagers with ASD, indicating the need for more research and successful solutions. Common themes include acknowledging the importance of bullying, its various forms and impacts, the significance of challenging behaviors, and the need for greater research. Divergent definitions and points of view exist among stakeholders as well.

5 Discussion and Conclusion

Bullied children might suffer from physical, social, emotional, intellectual, and mental health problems. Bullied children are likely to experience depression and anxiety, feelings of melancholy and solitude, and a lack of interest in previously enjoyed activities are all symptoms of anxiety. These problems may last well into adulthood. Illness, Academic attainment (GPA and standardized test scores) and school engagement might be affected. Students with ASD have a higher likelihood of missing, skipping, or dropping out of school. This analysis responds to the research question of how bullying affects ASD children's achievement in an inclusive educational environment.

Overall, the findings demonstrate that kids with ASD in inclusive classes are unable to build good relationships with their classmates because of bullying. Most ASD students are humiliated and tormented by their peers, and they try to avoid them by avoiding school. Students with ASD have worse academic achievement and social development as a result of this.

According to Fekkes et al. (2005), healthcare practitioners and education should play an important role in effectively controlling bullying since bullying has a detrimental impact on children's health and lives.

Furthermore, Stakeholders including parents and educators of ASD students should take care of the learning environment to avoid bullying.

6 Limitations

The study is constrained by the researcher's inexperience. Although it broadens the scope, using a systematic literature review lacks structural adherence. Inconsistent or insufficient data could be the consequence of manual data gathering and correlation. The analysis of a single researcher might contain bias. There is a dearth of empirical research on bullying including ASD in the UAE, and it is unknown how it affects adolescents with ASD.

7 Recommendations

Since studies only discuss bullying of ASD students by their peers, future systematic literature reviews should investigate other factors that have an impact on bullying ASD students. Including teachers' perspectives on their students' inclusion in mainstream schools could lead to more comprehensive studies. Additionally, it is advised to use quality to limit the search area.

It is advisable to exclude out-of-date items that are older than 20 years. The term related to bullying of students in UAE schools should be the subject of further published studies i.e., more studies need to be published to raise awareness regarding bullying ASD students in mainstream schools in the UAE.

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The Impact of the Zone of Proximal Development Concept (Scaffolding) on the Students Problem Solving Skills and Learning Outcomes

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Abstract. Schools regularly use the zone of proximal development (ZPD), also known as scaffolding, to help students learn new skills. Students who do not receive enough scaffolding may not be able to acquire the skills at all, while students who receive too much scaffolding may suffer when it is taken away. Additionally, this will have an impact on their capacity for problem-solving and learning outcomes. This systematic literature review's goal is to examine how ZPD and scaffolding effect students' learning outcomes and the growth of their problem-solving abilities.

Through a selection of pertinent publications that have undergone extensive analysis, the study addresses three main research topics.

The study's findings revealed that in order to achieve a high level of learning independence for the students and the ability to adapt to new situations leading to more advanced skills, a re-definition of certain concepts along with modifications and amendments on how to apply these new redefined ones, using more advanced teaching methodologies with incorporating technology to help students in exploring new ideas using critical thinking techniques and providing constructive feedback, are needed.

Keywords: zone of proximal development · learning outcomes · problem solving skills · forms of scaffolding · re-conceptualize · sociocultural theory

1 Introduction

The zone of proximal development (ZPD), also known as scaffolding, is a concept that is frequently utilized in schools to assist children learn skills. As the student gains proficiency, the expert gradually withdraws assistance until the student can complete the task on his or her own. ZPD as defined by Vygotsky, was designed with the development of children in mind. It depicts how children's cognitive development progresses. Vygotsky stated that rather than utilizing a static measure such as an IQ score to determine a student's educational aptitude, a developmental measure was required.

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Many research find that scaffolding is a good way to assist children learn new abilities and solve issues on their own, through providing a short-term help that will be eliminated after the students have mastered the new skills.

However, there are competing motives to give more or less assistance to students when determining the appropriate quantity of assistance to provide. Children who receive more scaffolding may struggle when it is removed, while students who do not receive enough scaffolding may not be able to gain the abilities at all.

And this in turn, will affect their learning outcomes and their problem-solving abilities.

The purpose of this systematic literature review is to study the impact of ZPD and scaffolding on the learning outcomes of students and how they affect the development of their problem-solving skills.

My scholarly study tackles three primary research concerns through a collection of relevant articles that are thoroughly reviewed:

1. How does the assigning content based on the zone of proximal development of a student affect his/her mastering of the material?
2. How efficient is scaffolding by adults as a technique when it comes to boosting problem-solving outcomes?
3. Do we need to re-conceptualize the concepts of ZPD and scaffolding and to achieve better learning outcomes for students and promote their skills of problem-solving?

The paper elaborates on the findings displaying the different arguments of many studies on the implications of the ZPD and scaffolding in teaching and learning, as well as on the efficiency of scaffolding by adults in boosting problem-solving outcomes.

Furthermore, it discusses if there is a need to reconsider the associations of these concepts in the teaching process.

2 Conceptual Framework

The zone of proximal development (ZPD or Zoped) is described as the difference between a child's "actual developmental level as determined by independent problem solving" and the child's "potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978).

The ZPD refers to a learner's capacity to do tasks successfully with the assistance of more skilled others, and it's often used in conjunction with aided or "scaffolded" learning. The creation of ZPDs necessitates assistance with cognitive task structuring as well as sensitivity to the learner's current skills.

Scaffolded learning, often known as ZPD, is a two-fold concept. To begin with, it represents a new approach to intelligence testing: analyzing children's intellectual potential in optimal conditions, that is, circumstances that are tailored to the child's specific learning needs and build on his or her current talents. Second, the ZPD is a model for determining how social engagement with more experienced partners affects children's intellectual development. As a result, it establishes connections between the mind of the particular child and the minds of others. According to Obikwelu et al. (2013),

scaffolding is a method of instruction which can help a youngster bridge the gap between what he or she currently knows and what they are expected to learn.

The controversy over the implications of the ZPD and scaffolding concepts in teaching relates to their positive and negative impacts on learners' learning outcomes and their problem-solving abilities. Some educators find the concept of ZPD and scaffolded learning is ambiguous and lacks a detailed picture of a child's preferred learning method, current level of competence, or intrinsic motivation. According to Lee (2011), actual learning does not occur when adults just give detailed instructions and demonstrate the work to youngsters.

3 Literature Review

The literature review is organized according to the questions' topical order:

Q1- How Does the Assigning Content Based on the Zone of Proximal Development of a Student Affect His/her Mastering of the Material?

In China, Learnta TAD which stands for "Teacher + Artificial Intelligence + Data," A learning platform for K-12 kids is a system that gives teachers information on their learners' progress in school and uses AI algorithms to recommend the best learning path, allowing teachers to choose the topic students should focus on.

In 2019, Learnta TAD data was obtained from 7913 students in middle and elementary school who completed 250,783 task cards with different skills assigned with each task.

Zou et al. (2019), who were the researchers of the study, used computerized student achievement assessments via a curriculum based on a knowledge graph to compare "Ready-to-Learn" (RtL) information within the ZPD against "Unready-to-Learn" (UtL) content by the students. During the class, students under the supervision of their teacher perform the required tasks. According to the homework contract, students should finish independently their assignments at home.

According to the research, students' participation rates vary based on their overall academic accomplishment. In-class assignments were completed at a rate of 75.7% and 74.7% for Math and English respectively, while activities to be done at home were completed at a rate of 65.3% for Math and 70.3% for English. This revealed the more likely completion of activities during the class than at home.

In the light of their study, results indicated that students would grasp more skills if they were given activities within their ZPD (Ready-to-Learn content) rather than (Unready-to-Learn content), which means not aligned with their ZPD. In addition, according to their findings, learners were more likely to understand mathematics in their classes than at home.

Q2- How Efficient is Scaffolding by Adults as a Technique When It Comes to Boosting Problem-Solving Outcomes?

Scaffolding research, which started in the 70s, typically focused on the relationship between scaffolding provided by the parents their children's problem-solving abilities.

In 2003, Conner and Cross conducted a study to look at the impact of maternal scaffolding on kids' abilities to solve problems. A total of 45 mother-child dyads were

included in the study (children aged 16, 26, 44 and 54 months). Every mother was asked to help her child in constructing a tower in the correct order by utilizing all the essential blocks. From no parent interaction through parent demonstration, there were seven levels of maternal scaffolding. According to the research, mothers with contextual scaffolding had a positive impact on the immediate and subsequent results of their children during problem-solving interactions.

These findings back up a study by Bates (2005) in which scaffolding was assessed using six types of response (corrective feedback, give answer, accept child's response, reinforces, allows child to continue, and asks child to demonstrate knowledge) and six types of feedback (questioning, directing, guiding, pointing, specific pointing and nonverbal pointing) provided by mothers to their kids during play sessions, depending on the children's needs. In a game setting, Bates looked at the role of maternal scaffolding on kids' attempts to solve comparison problems in quantities. This study included 36 mothers, each with a child aged between three to five years old).

According to Wittwer and Renkl (2008), before giving scaffolding, the adult must determine the children's current comprehension levels. The above studies have made a substantial contribution to the understanding of children's problem-solving abilities by offering scaffolding focusing on the demands of children with their capability. However, more research into various types of scaffolding is needed to establish if there are any relationships between scaffolding and problem-solving abilities of children.

Q3- Do We Need to Re-conceptualize the Concepts of ZPD and Scaffolding and to Achieve Better Learning Outcomes for Students and Promote Their Skills of Problem-Solving?

Although the concepts of scaffolding and the Zone of Proximal Development are used frequently in teaching and learning, educators nowadays start to consider the re-conceptualization of these concepts to achieve better problem-solving and learning outcomes.

When Vygotsky mentioned peer collaboration, it's worth noting that he only referred to "more able peers," meaning that there must be an intellectual asymmetry between participants in any collaborative endeavor.

Several researchers have noted (Cowie and van der Aalsvort, 2000) that learning can also happen via interaction among students having similar levels of cognitive ability, and as that is, 'symmetrical' interactions may also result in learning and development. Analyzing the participants' communication in this specific setting can allow us to have a deeper grasp of the learning process.in general.

A new notion can be useful, according to Mercer (2000a) and Mercer (2000b), for understanding how interpersonal communication might contribute to the education and conceptual growth. This he called the Intermental Development Zone (IDZ). This idea reflects how the interactive process of teaching and learning is founded on communication and cooperative activity, of a dynamic specific context for shared knowledge. In contrast to the original ZPD, the IDZ is not an individual aptitude, but a dialogic process generated and sustained by people. This coherent textual framework promotes a shared focus of participants and is adapted to the level of changing knowledge as the activity progresses in a professor's and student's successful interaction.

For the re-conception of both ZPD and 'scaffolding,' in order to take into account collaborative learning, they discovered that a concept based on the conscious intentions of a teacher outside of dialogue should be shifted into concepts based on dynamic process characterization, which reciprocally and responsively employ language in dialogue between learners. Furthermore, some educators find that scaffolding must go beyond the providing of leading questions in the instillation of systematic and creative thinking. They think that actual learning happens when assisting students in thinking systemically and creatively by learning from examples and generating their own thoughts, without substituting the examples they have acquired mechanically; guiding them to develop their ideas meaningfully; and leading them to consider other alternatives while maintaining associations between these alternatives (parts) to the goal (whole).

4 Methodology

In the planning stage of my literature review, I started to formulate my study questions of the topic that I chose, which later has directed my search and selection of studies to be included in the review.

My proposed research question was: (How does the concepts of ZPD and scaffolding affect the students' learning outcomes and their problem-solving skills?). After doing an initial search on the topic, I did a quick mapping to identify the types of research linked to the research question.

Only English articles and studies from the last 2 decades (the year of 2000 till 2020/2021) were included in the SLR. The studies focused the results of implementing the ZPD on learning outcomes and the role of scaffolding in developing children problem-solving abilities. Articles in the domains of education and social psychology were incorporated in the literature search. On the other hand, studies in the areas of public health, economy, and politics were omitted in the search process. In addition, articles and research conducted before the year of 2000 were not included.

The keywords used in the search were: 'zone of proximal development', 'learning outcomes', 'problem solving skills', 'forms of scaffolding', 're-conceptualize' and 'sociocultural theory'. Most of the articles and the research were collected from ResearchGate, an online scholarly professional network for shared scholar articles and research papers. Moreover, some articles were obtained from the British University in Dubai online library, EBSCO, Web of Science; few were accessed from Google scholar search engine.

The relevance of each journal article was determined using SCIMAGOJR, an online tool that reviews and evaluates journals and scientific topics. In addition, articles labeled as peer-reviewed were considered. Then, articles and research collected and accessed were evaluated based on their relevance to the SLR title. Abstracts and parts of the introductions were examined to evaluate their value to the SLR topic. Each study's data was compiled and organized into a table for the systematic literature review, to facilitate being assessed for its relevance to the research questions.

5 Discussion

Teaching and learning have evolved dramatically in recent years because of the introduction of educational concepts based on information technology (IT) (Whitaker, New, & Ireland, 2016). Given the outcome-oriented application in teaching with an emphasis on higher-order learning, technology-enhanced scaffolding for individual problem solving in an innovative learning environment is critical. (Raes et al., 2012). On highlighting the necessity of tying students' problem-solving work to content, skills, and tactics, it's crucial to raise difficulties with them, from non-reflective work and compelling them to engage fundamental disciplinary ideas in their tasks. The engagement of users in work is shaped by the tools they utilize. As a result, technologies can be built to impact users' perspectives, learner-to-learner and learner-to-teacher discourse, and the ways they express themselves in work products.

To conclude, deep cognitive learning cannot take place if a student's level of comprehension is too low (i.e., the support is not within the child's ZPD since too little help is supplied). In other words, the child is unable to connect his or her prior knowledge and the cognitive effort associated with processing the data is excessive (Wittwer et al., 2010). If the learner's level of control matches his or her comprehension, the learner has enough mental skills to actively process the information and make connections between it and previously learned material in long-term memory. However, there are many other elements that affect the impact of the use of scaffolding within the ZPD on the learning outcomes and problem-solving skills, as well as help to determine the amount of support to be provided and methods of providing it, such as the use of technology, the nature of the task, if it is a group work task or individual task, the ability to communicate, teachers' quality reflected on their teaching strategies and the usage of the platform's learning support which requires different pedagogies than in typical classrooms.

6 Limitations, Recommendations and Implications for Future Research

Most of the limitations in the study came from the fact that there is few experimental research on the impacts scaffolding provided by teachers during classes. Only tutoring studies on one student interacting with a highly skilled peer to perform organized and/or hands-on activities, use an experimental design for face-to-face, non-parental scaffolding.

However, in contrast to instructor scaffolding, most of the studies focused on parental scaffolding. Parental scaffolding differs from teacher scaffolding in that the parent knows his or her child better than a teacher knows his or her students, making the support more customizable. Furthermore, the parental scaffolding studies noted above were conducted in one-on-one scenarios, which are not analogous to classroom scenarios where one teacher is responsible for approximately 30 students at a time.

It is suggested that in future systematic literature studies, different types of scaffolding learning to be chosen to compare the benefits and drawbacks of each style on students learning outcomes and problem-solving abilities. Future research should focus on the circumstances in which these styles are implemented, like whether it is an online

classroom, or a regular class. It's also a good idea to reduce the search area, especially the sample, by selecting certain material or subject categories like effect of scaffolding on problem solving abilities in mathematics, or the impact of the ZPD on teaching Science or Chemistry.

For a greater significance of the findings, it would be beneficial to limit the sample by focusing on a certain group age of students, such as in students in foundation stage or in senior grades.

7 Conclusion

Undoubtedly, incorporating the concepts of scaffolding and the ZPD in classrooms, in the same way introduced by Vygotsky has shown a great effect on the development of students' skills, especially in the aspects of solving problems and untangle challenges.

However, a re-defining of these concepts along with modifications and amendments on how to apply these new redefined ones, using more advanced teaching methodology with incorporating technology to help students in exploring new ideas using critical thinking techniques and providing constructive feedback, are needed in order to achieve a high level of independency of learning for the students and the ability to adapt with new situations resulting in more advanced skills in problem-solving and better learning outcomes.

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An Investigation of the Development and Implementation of Teacher's Licensing in Saudi Arabia Based on Local Stakeholders' Perceptions, Compared with International and Regional Practices

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Abstract. Saudi Arabia- is moving steadily toward Vision 2030. Accordingly, the Educational & Training Evaluation Commission (ETEC) has teamed up with the Ministry of Education in Saudi Arabia to update and raise the 'Teacher Licensure Programme' bar.

Purpose- The study aimed to investigate the development and implementation of the 2019 teacher licensure program in Saudi Arabia.

Methodology- The study adopted the exploratory sequential mixed method. The paper consisted of three stages. Initially, six policies were reviewed to compare international, regional, and local licensures. Second, the study collected quantitative data from 300 teachers from public schools through an online survey. The last stage collected qualitative data through a school leaders' questionnaire.

Findings- Stage one findings were linked to international and regional practices. A comparative study revealed a lack of career development at the college level and during in-service training in Saudi Arabia. Furthermore, there is a need for a standardized teacher evaluation system that includes constructive feedback and reflection. Based on stage two findings, teachers expressed negative views regarding the current licensing programme. In addition, stage three findings confirmed stage two results from the perspective of school leaders and policymakers.

Implications- Educators should consider building long-life learners by aligning licensing standards with the exam and desired outcomes, ensuring stakeholders' involvement, create a continuous PD program.

Originality/value- This study filled a critical gap in the theoretical field of teacher licensing in the Gulf Region. Additionally, the research suggested a flexible framework based on the best practices and the perceptions and experiences of the stakeholders. The framework asserted that the licensing examination is one of a number of methods for evaluating teachers.

Keywords: Teacher quality · Teacher Licensure · teacher licensing exam · Saudi Vision 2030

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1 Introduction

Years ago, university certification led to automatic employment, and countries would assume that graduate teachers were fully equipped with the required skills and knowledge. However, the latter concept has weakened through the years, and the responsibility of recruitment was taken entirely by the government and the Ministry of education.

Locally, the current Kingdom of Saudi Arabia licensing programme measures new and experienced teachers with essential skills and knowledge. However, keeping in view the regional visions, Saudi Arabia reinforced the diversity in the region to attract the country's best minds to fill the needs. The KSA government is undergoing significant reform under the National Transformation Plan (NTP), and education is at the centre of Vision 2030 (Patalong, 2016). Vision 2030 seeks to align the needed skills with the modern labour market (Moshashai and Bazoobandi, 2020) and overcome the challenges.

However, teacher licensure exams remain central to the legitimate teaching certification process, and substantial effort is devoted to improving the status quo's validity and reliability.

1.1 The Research Questions

The study revolved around the following question: What is the status of teacher licensure in Saudi Arabia? And the following sub-questions:

1 What are the common themes associated with developing and implementing the 2019 updated version of teacher licensing?
2 What are teachers' perceptions of the teacher licensure programme in KSA?
3 Are there any demographic differences in teachers' perceptions of the T.L program in KSA?
4 How do school leaders and policymakers perceive the teacher licensure programme policy and practice in KSA?

1.2 The Significance and the Aim of the Study

The current study has the potential to highlight on the importance of continuous improvement and evaluation of the licensing programme in Saudi Arabia. In response to regional future visions and expectations, Saudi Arabia in particular, this study has adopted varied instruments for additional reliability. The comprehensive data and findings from the data analysis generated valuable references for further study. The study aimed to investigate the development and implementation process of the 2019 T.L. programme in the KSA. Accordingly, the study provided policymakers a recommended framework that could be considered when assessing the T.L. to provide better market-based skills and take relevant measures to implement vision 2030.

2 Theoretical Underpinning

2.1 Conceptual Framework

Teacher Quality. The most assuring approach to improving public education outcomes is improving teacher quality, which is considered one of the few subjects where education

stakeholders agree (Teacher et al., 2010). In Mitchell et al. (2001), teacher quality cannot be defined clearly because it is complex and can change with social demands and values. Therefore, teacher quality will continue to evolve as societies develop new skills, raise standards, and meet complex demands.

Licensing Test Accountability. The issue of licensing test accountability has contributed to teacher licensure instability since the 1990s (Cobb et al., 1999). In contrast, Shuls and Trivitt (2015) found that the licensure exam is regarded as a positive indicator of teacher effectiveness for two reasons. Candidates with good content knowledge can pass the topic to students efficiently. Second, passing the exam indicates intelligence, just as the SAT & ACT correlate positively with teacher effectiveness.

Professional Development. Educators are expected to be of the highest quality, not just when they enter the workforce. Continually learning teachers are more effective and influence school development, according to Wermke (2011). What growth do teachers need? Continuing career growth is necessary for teachers to meet educational demands and develop (Lewis, 1999) to solve problems, work smarter, and demonstrate higher quality. Virtual classes and mandatory technology integration are driving rapid change in education.

Relevant Culture. The study explored the T.L. programme in the context of the national culture of the KSA. The Gulf states share several characteristics: political, cultural, social, and economic, which have been identified as a 'Gulf state phenomenon' (Wiseman and Al-Bakr, 2013). Consequently, Gulf Region teachers face similar concerns and challenges. According to Planel (1997), countries encounter cross-cutting differences across regions, gender, social class, and ethnic groups. The study considered regional boundaries, revealing substantial similarities in beliefs and education standards.

2.2 Theoretical Framework

Constructivism Theory. Scholars like Piaget (1954), Dewey (1929), and Vygotsky (1978) assured that the learner comes to a learning environment with prior schemata that determine the learner's attitude towards the new learning (Hyslop-Margison and Strobel, 2007). Brau (2018) outlined that constructivism is divided into two main pillars: (1) cognitive constructivism suggests that building knowledge depends on an individual's interpretation of experiences, and (2) social constructivism confirms that individuals build knowledge through social interaction. According to Dagar and Yadav (2016), learners are active agents responsible for constructing information by revising the rules, analyzing, and reflecting. Thus, constructivism needs self-regulation and the ability to fit new concepts into what has been taught.

Self- Efficacy Theory by Bandura- 1997. Self-efficacy is the belief in one's ability to perform the best, affecting the current and future situation. Self-efficacy beliefs decide personal feelings, thinking, motivation, and behaviour. Hence, four major processes are included (1) cognitive, (2) motivation, (3) affection, and (4) selection. According to Bandura (2006), an individual's self-efficacy is developed from four primary resources: "mastery experience, vicarious experience, social persuasion, and physiological and emotional states" (Petchauer, 2012).

Evaluation Theories and Techniques. One of the primary objectives of the teacher licensure exam and evaluation is to measure quality for better teaching and learning. However, measuring the educational quality is a complex process because several components impact the quality, such as teachers, school culture, parents' involvement, students, and administrators. Moreover, teaching is a highly complex task which requires multiple teaching decisions at the same time. According to Papanastasiou (1999), teacher evaluation should be formative and descriptive, not judgmental, by connecting professional development with the evaluation.

Socio-Culture Theory by Vygotsky- 1978. Considering that the study was conducted in the Gulf context while seeking an international benchmark, the diversity of culture and society plays a crucial role. Pound (2015) pointed out that Vygotsky (1978) highlighted the impact of culture on identity growth. The teacher develops through social dialogues with experts and knowledgeable people.

2.3 Related Studies

Mitchell et al. (2001b) presented an extensive report on candidates' tests and the licensing test's impact on improving quality. They recommended that each state use a different evidence system to qualify a teacher.

A case study was conducted by Garner and Kaplan (2021) to examine high school teacher professional development in a complex and dynamic context during summer. The findings concluded that the collective group was not satisfied with taking the workshop during summer.

Stotsky (2009) presented a report to the New Jersey State Advisory Committee about the ineffective and biased academic licensure tests presented to urban student teachers. The author called for federal intervention to ensure that teacher licensure tests were reliable.

Wiseman and Al-Bakr (2013) synthesized the literature review and found that teacher certification had no significant evidence on students' outcomes in the Gulf countries.

Libman (2012) suggested that governments should regulate and frame licensing exams, and that students' abilities and family background are the largest source of variation in student learning. Furthermore, teacher quality is the most significant variable that impacts student learning.

Lamprianou and Arabia (2013) investigated teachers' performance on the new T.L. test in the KSA. The results revealed that university graduation and specialty year significantly impacted teachers' exam scores, while training programmes varied in influence.

Larsen et al. (2021) used data from 1991–2007 of 37 dimensions or certificate requirements and found that the stricter the requirements, the higher the teacher quality.

3 Methodology and Approach

3.1 Research Approach and Design

The study adopts a multi-phase exploratory sequential mixed method *design* in three stages: stage one collecting secondary data from official documents and websites. Stage two: collecting quantitative data from teachers' surveys and stage three: collecting comprehensive qualitative data from school leaders' questionnaire (Fig. 1).

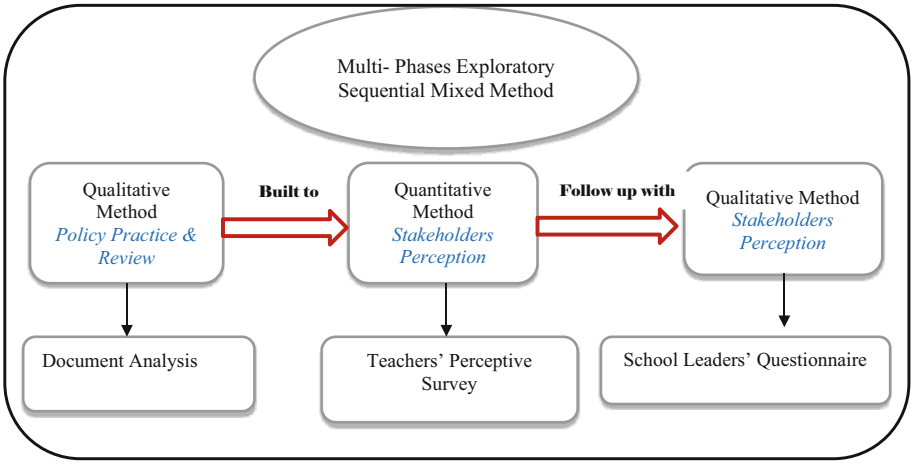

Fig. 1. The Study Mixed- Method Methodology (Source: Author)

3.2 Research Methodology

Study Context and Site. The KSA is considered an appropriate context for the research since the country just started an updated licensing program in 2019, mainly within a semi-governmental organization. The leading site of the study was the public schools where the teachers who applied were fully licensed or were in the process of licensing.

Sampling. The study provided varied sampling designs to which each sampling was chosen depending on the required data to investigate each research question. An identical concurrent mixed sampling was conducted when collecting document analysis were collected. On the other hand, a parallel sequential mixed sampling was conducted when collecting the teacher survey (Quan) and the school leaders' questionnaire (Qual) (Table 1).

Instruments: The instruments were applied to collect data for the two domains: first domain included the instruments used to explore the policy and practice of teacher licensure at the international, regional, and local levels through content analysis. The second domain used instruments that investigated stakeholders' perceptions through teachers' survey and school leaders.

Table 1. Summary of Total Sampling of the Study (Source: Author)

The study Sampling						
Documents	International Study				Regional	Local
	USA	Finland	Australia	Singapore	UAE	KSA
School leaders	12 principals		3 Supervisors			
Teachers	306 teachers from public schools					

3.3 Data Analysis

Since the study methodology is a sequential exploratory mixed method, the data collection process took three phases:

1. The qualitative approach phase one to review and analyze T.L policy and practice
2. The quantitative approach phase two to investigating the teacher perception
3. The qualitative phase three explores school leaders' perceptions

The study adopted inter-method mixing to collect data through more than two methods (Johnson and Christensen, 2014).

The qualitative data in the document's coding followed the inductive method. When themes or categories overlapped, the data overlapped naturally and presented the co-occurring codes (Johnson and Christensen, 2014). In case of a complete overlap, data were joined. In case of a partial overlap, the relationship was found. Therefore, the nominal codes were converted into numerical codes uploaded to the NVIVO Software. The study identified the relationship between the themes, such as initial licensure with students' performance and orientation programme with teachers' effectiveness.

Regarding *the quantitative data*: Collecting data from stakeholders' experience gave a chance to undergo several uncertain factors such as diversity of schools' culture, teacher background, master experience, and social persuasion on an individual. The teachers' survey responses indicated frequency rated on a five-point Likert scale. Descriptive statistical analysis indicated the correlation between the demographic variables and the teachers' perception of the T.L. programme. The study listed the scores in grouped frequency distribution through the SPSS programme.

4 Results

4.1 Thematic Analysis Findings

The study outlined nine main themes, which targeted countries that have enacted accordingly. The explored themes were as follows: (1) Description of the T.L. programme, (2) Stakeholders' Participation, (3) Professional Development, (4) Licensure Requirement, (5) Initial Preparation, (6) Feedback System, (7) Teacher Licensure Effectiveness, (8) T.L Development, (9) School Climate and support. Based on the study's analysis of policies and exemplary practices, it was concluded that every country has a distinct history.

Six countries' policy documents emphasized the importance of professional programs to evaluate teacher quality. The porpuse of teaching licensing is to regulate and guarantee teacher competency, (Arias and Scafidi 2009). According to Ingvarson et al. (2013), most countries delegate the responsibility for accreditation to government agencies such as the USA, KSA, and Canada. At the same time, in other countries like Singapore, the teaching licensing procedure would be entirely controlled by the Ministry of Education.

Several countries have implemented programs to facilitate the passing of licensing exams. In Singapore, the Ministry of Education oversees NIE, which trains teachers and awards bachelor's degrees. Australia's HALT program aims to encourage collaboration and maintain high standards among experienced teachers.

Teaching license requirements vary by country. Finland requires a five-year master's degree and experienced teacher observation. Australia demands a portfolio of effective teaching practices. Gulf countries require a bachelor's degree. All must pass an exam, but accountability varies. Australia has a continuous assessment of quality and evaluation by the National Certifying Authority.

4.2 Teachers' Perceptions of the Exam Effectiveness Findings

The study analyzed the descriptive data to answer research question 2: What are teachers' perceptions of the KSA's teacher licensure programme? Moreover, the study focused on the impact of initial preparation and school leaders on teachers' general scores. The following results were revealed (Tables 2, 3, 4 and 5):

Table 2. Construct One Analysis

First Construct: initial preparation	Yes	No	Mean	Std	Level
Orientation Program	111	189	1.63	0.0484	Strongly Disagree
received a manual	173	127	1.42	0.495	Strongly Disagree
joined paid course	45	255	1.89	0.318	Disagree
self-Study	299	1	1	0	Strongly Disagree

Table 3. Construct Two Analysis

Second Construct: school leaders support	Strong Disagree	Disagree	neutral	Agree	Strongly agree	Weighted Mean	Std	level
exchange experience with colleagues	124	89	17	45	25	2.19	1.337	Strongly Disagree
the school offered workshop	142	112	6	29	11	1.85	1.092	Disagree
internal leaders provided tips and advice	126	82	10	52	30	2.26	1.409	Disagree
external leaders provided tips and advice	153	96	28	11	12	1.78	1.031	Strongly Disagree

Correlation Coefficients. A Pearson product-moment correlation in this section was conducted to examine the relationship between general exam results and initial teacher, in addition to school support to teachers before the exam. The results showed that the general score exam was weak and negatively related to *initial preparation was* r (300) = -.216, $p < .001$, and the correlation was significant at the 0.01 level (2-tailed). The findings indicated that general initial preparation had a significant impact on teachers' general exam scores. Also, the findings displayed that school support has a moderate and positive impact on the general score of teachers' exams by r (300) = .055, $p < .345$, the correlation was insignificant.

Two-Sample Test. The study ensured several steps before conducting the two-sample t-test. The data in each group were random samples from the population, were normally distributed, and consisted of adequate sample size and almost equal variance in Std. Moreover, the dependent variables are continuous, and the independent variable was two level categories (male and female. The overall results indicated there were no significant differences (t (298) = −1.0, $p = .08 > .05$).

Analysis of Variance (ANOVA) One Way ANOVA results displayed the mean score for 1–5 years of experience ($M = 2.4659$, $SD = 1.12097$), 6–10 years of experience ($M = 2.3068$, $SD = 1.17629$), 11–15 years of experience ($M = 2.3153$, $SD = 1.20866$), and more than 15 years ($M = 2.4481$, $SD = 1.30440$).

Table 4. Construct Three Analysis

Third Construct: exam effectiveness	Strong Disagree	Disagree	neutral	Agree	Strongly agree	Weighted Mean	Std	level
Questions are related to classroom practice	91	55	93	25	36	2.53	1.322	Disagree
developed lesson plan skills	136	41	63	17	43	2.3	1.448	Disagree
developed assessment skills	134	38	58	23	47	2.37	1.492	Disagree
developed teaching and learning strategies	131	41	56	27	45	2.38	1.482	Disagree
improve teacher competency	147	34	55	22	42	2.26	1.472	Disagree
Multiple choice questions are effective in measuring teacher quality	120	36	64	22	58	2.54	1.537	Disagree

4.3 School Leaders and Policymakers' Perceptions Findings

The principals 'questionnaire was analysed by QSR NVivo 12 into four main themes then several codes were generated: (1) validate teachers' findings, (2) the impact of orientation programme, (3) school support, (4) licensed teachers' evaluation process. Findings showed that 60% of school leaders were uncertain about the reliability of teachers' exam scores. Similarly, school leaders admitted that teachers did not receive more than emotional support or a day off to prepare for the exam. Although teachers disagree with the effectiveness of the licensing exams, leaders have noticed several changes in teachers' practice such as improved communication with students, applying different learning styles, and developing more knowledge of theories and teaching strategies. According to the school leaders' responses, they confirmed that experience increases teacher quality, which supported the earlier investigation of the teachers' survey in stage two. As a

Table 5. Construct Four Analysis

Fourth Construct: PD	Strong Disagree	Disagree	neutral	Agree	Strongly agree	Weighted Mean	Std	level
Prefer to have a mentor	112	125	3	28	32	2.14	1.305	Disagree
prefer to exchange knowledge and experience with colleagues	94	64	4	70	68	2.85	1.61	Neutral
continuous training during teaching	99	79	6	61	55	2.65	1.55	Neutral
technology training	66	63	5	76	90	3.2	1.584	Neutral
professional development program according to the T.L. exam results	92	31	76	33	67	2.84	1.524	Neutral
must provide teacher portfolio as part of the licensing process	93	112	31	29	35	2.34	1.32	Disagree

standard method of evaluation, classroom observation and an evaluation form are utilized by most leaders. However, the lack of standardized methods was confirmed, which provoked the choice to use preferable procedures.

5 Conclusion

5.1 Integrated Findings

The first qualitative stage compared international and regional policies with the local licensure programme in Saudi Arabia. The comparison revealed best practices and successful experiences to propose a suggested framework. The document analysis ensured

that teachers' preparation and continuous development are essential to increase teacher quality. Referring to the literature review, teacher quality is hard to measure since teaching happens in a complex context. Accordingly, one measurement (licensing exam) would not reflect the quality. That was reflected in the study respondents' frustration with the current licensing exam. On the other hand, countries such as Finland and Singapore proved teachers' licensing success with intensive pre-service and in-service programmes. The study concluded that the shortage of long-life learning culture in public schools and the lack of school support were reflected through teachers' surveys and school leaders' questionnaires. In reference to the quantitative findings, 55% of participants demanded technology training and exchanging knowledge and experience with colleagues. While getting a mentor was the least required. Furthermore, participants revealed negative perceptions toward the difference between licensed and unlicensed teachers' performance. In this respect, the latter perceptions reflected the debate over measuring teacher quality through licensing. Thus, the study findings showed that passing the exam was not evidence of increasing teacher quality.

5.2 Limitations

The researcher started the investigation in 2021 when most schools and teachers did not consider taking the exam seriously. The problem extended to limiting the number of participants in the survey. Moreover, the study planned for school leaders' interviews, where the interviewer could ask probe questions and detailed information. However, the participants preferred to receive the questions online via a questionnaire, and the responses were limited to short answers except for a few.

5.3 Recommendations and Implications

Becoming a teacher requires more than just passing the licensure exam. Apart from this, having a university-level education and undergoing in-service training with experienced mentors and experts are also essential. Teachers expressed dissatisfaction with the exam and are seeking continuous support. The Ministry of Education can promote lifelong learning by conducting workshops and mentoring programs. The exam should serve as a measure of progress rather than a final verdict. Teachers should receive feedback on their performance and provide evidence of their best practices through portfolios and classroom observation reports (Fig. 2).

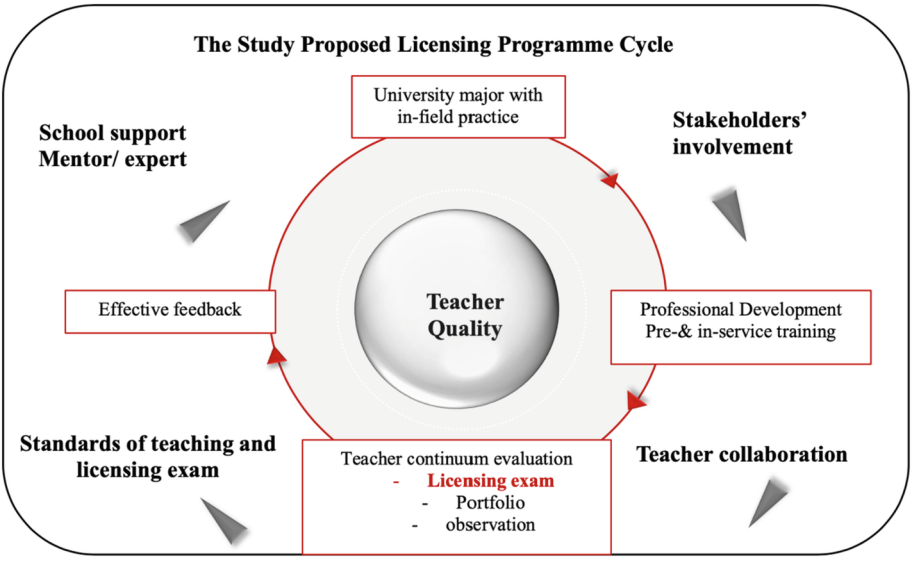

Fig. 2. The Study recommended Licensing Programme (*Source: Author*)

5.4 Regional Implications

Implementing standardized teacher licensing in the Gulf region can ensure consistent education quality while still allowing for flexibility to accommodate each country's unique visions. By placing a strong emphasis on both theoretical and practical research in the education system and licensing process, we can help improve the skills and knowledge of teachers.

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The Challenges of Implementing the Emirates Standardized Test as a Proficiency Test in the UAE: An Exploratory Study

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Abstract. This study investigated teachers' and educational leaders' perspectives regarding the challenges that EFL twelfth graders encounter in relation to the Emirates Standardized Test (EmSAT). The study context was a private school in the UAE that follows the Ministry of Education curriculum. The present qualitative study adopted the phenomenological interpretive research approach. Data were collected using semi-structured interviews with four English teachers and four educational leaders. Data were also analysed using thematic analysis that led to the creation of relevant themes. The findings revealed a number of challenges related to the EmSAT exam and recommendations to overcome these barriers. These included issues related to time constraints, anxiety, stress, lack of teaching resources, and learners' low e-maturity level. The study had some implications for teachers, educational leaders, school administrations and policymakers.

Keywords: EmSAT English · Standardized test · Proficiency test · Educational leaders · EFL teachers

1 Introduction

In the UAE, the English language is gaining a significant position as it is thoroughly employed in the business, technology, and trade sectors (Madden, 2020). The vision of the UAE Ministry of Education (2017–2021) was built upon the principle that younger generations have the right to interact and engage with the whole world using English, the most common language. As such, students in the UAE are expected to show good proficiency in English language exams in line with the internationally recognized exam results. Among these proficiency tests is the EmSAT exam, a compulsory requirement for UAE twelfth graders to graduate from high school and become eligible for university admission (Al Hammadi and Mohiuddin, 2017).

1.1 The Research Problem

Data generated by the Abu Dhabi Educational Council (ADEC) reveal that almost 95% of high school graduates do not meet universities' admission standards, especially with

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regard to EmSAT scores (Harold, 2005; Matsumoto, 2019). In addition, the Program for International Student Assessment (PISA) reports that, although the UAE has a fast-growing educational system, its students continue to demonstrate a very weak performance in international and national assessments, including EmSAT, compared to their peers in advanced economies (Kippels and Ridge, 2019; OECD, 2015). Despite all these challenges, the researcher could not identify a single study investigating the difficulties that twelve graders encounter regarding the UAE's EmSAT exam. As such, the current study proposes to fill in this gap in the literature by investigating these challenges from the perspectives of teachers and educational leaders.

1.2 Rational and Significance

The current study's rationale stems from how student assessment in the UAE is considered a significant benchmarking tool and credible means of evaluating education improvement (Ibrahim and Alhosani, 2020). Moreover, there is a necessity to investigate teachers' and educational leaders' perceptions of the EmSAT exam to identify practical measures in which students and teachers can overcome the exam challenges. Furthermore, the study findings will serve as the baseline of further research investigating students' and educators' perceptions with regard to international assessments such as PISA, TIMSS, IELTS and TOEFL, as well as national assessments such as EmSAT.

1.3 Research Questions

1. What are the perspectives of English teachers regarding the challenges of implementing the EmSAT exam?
2. What are the perspectives of educational leaders regarding the challenges of passing the EmSAT exam?
3. What are the recommendations of English teachers and educational leaders regarding overcoming the challenges encountered through taking the EmSAT exam?

2 Literature Review

This section elucidates the theoretical underpinning upon which the research has been based and provides a review of previous literature on standardized testing.

2.1 Theoretical Framework

Computer-based assessment (CBA) has emerged as a prominent method for evaluating the academic progress of students in both secondary and tertiary education (Maqableh, 2015). Previous models that depend on technology utilization, such as Davis's (1986) Technology Acceptance Model (TAM), have given way to this one. CBA is defined by Charman and Elmes 1998 as the evaluation that results from the learner's interaction with the computer. Numerous factors contribute to the advantages of utilizing CBA, including results that are accurate, cost-effective, and secure (Kreiter et al., 1999). Exam scheduling, result generation and analysis, and exam preparation time and effort reduction are

all tasks that CBA is likely to facilitate (Ko and Cheng, 2008). The current study is also grounded in the Technology Acceptance Model (TAM), which was developed by Davis in 1986. TAM has been chosen as the paradigm that effectively examines the impact of technology usage on the technological behaviour of students. Assumedly, the utilization of a system is the consequence of an anticipated response induced by motivation, which is influenced by an additional external stimulus (Al-Azawei et al., 2019) (Fig. 1).

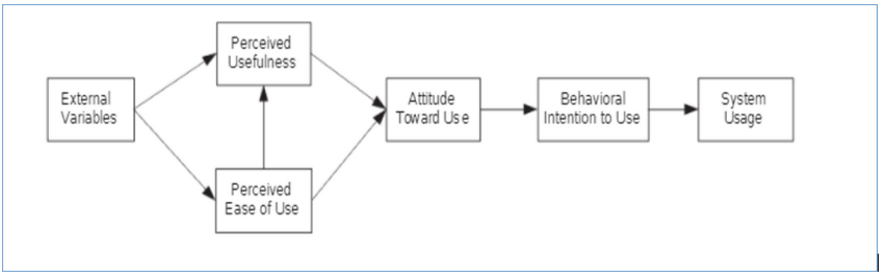

Fig. 1. Technology Accepted Model (TAM)

2.2 Previous Studies

This section provides a review of the existing literature regarding the benefits and challenges of conducting standardized tests.

The Usefulness of Standardized Tests

A number of studies stated that standardized tests are beneficial as they measure students' attainment in different areas and evaluate teachers' performance (Brown, 2019; Lai, 2023). However, some researchers are against using standardized test scores to judge teachers' achievement and performance as they believe it is insufficient to evaluate teachers (Salend, 2019; Turnipseed and Darling-Hammond, 2015). In the same vein, some researchers highlighted different aspects regarding the significance of standardized tests, including making teachers work harder and reforming the educational system by running remedial programs for struggling learners (Lai, 2023). By means of elaboration, Lai (2023) concurred that standardized tests create a healthy educational atmosphere since they promote peer tutoring, help struggling students get the required attention and care in order to make them pass tests, and encourage investing for teachers' professional development programs to promote academic achievement and performance.

The Challenges of Standardized Tests

Despite the benefits of standardized tests, there are many challenges related to them. For example, some researchers concurred that these tests have minimal alignment with the local curriculum and are inaccurate indicators of learners' exact levels (Wise, 2019). In addition, some researchers, such as Sulastri and Puspawati (2019), mentioned that standardized tests are always biased since any individual can be taught and tested under the same exam conditions. On the contrary, Brown (2019) disregarded these claims and

reported no proof that exam bias is a critical problem. Furthermore, they stated that plenty of exam writers exert much effort to eliminate all bias-related issues of tests (Goodman and Hambleton, 2005). Nonetheless, some studies identified exam anxiety and fear as a challenge that affected students' exam results (Edriss and Matthew, 2016; Kohn, 2000). These findings were in harmony with other studies in which standardized tests were claimed to determine learners' performance and achievement levels without considering the factors that might have affected them on the exam day, such as fear, family issues and anxiety (Wise, 2019).

3 Methodology

3.1 Research Methodology and Approach

The current study adopted the phenomenological interpretive research approach to investigate teachers' and educational leaders' perceptions of the main obstacles of assessing twelfth graders using the EmSAT exam. The choice of the phenomenological interpretive approach served the purpose of the study and the research questions by obtaining social reality and interpreting meaning from the collected data of the targeted participants (Viswambharan and Priya, 2016).

3.2 Research Instruments and Data Collection

Qualitative data were collected using two sets of semi-structured interviews in which the open-ended nature of the questions defines the topic being investigated and provides opportunities for the interviewer and participants to discuss some topics in depth. The choice of semi-structured interviews served the purpose of the study in which the researcher tried to identify teachers' and educational leaders' perceptions of the challenges of the EmSAT exam and the recommendations they perceive to overcome these barriers.

3.3 Participants and Sampling Techniques

Participants of the present study were four English teachers who taught grade 12 students at a private school in RAK, UAE and four educational leaders, including the school principal, head of assessment, head of the English department and head of academic affairs. The school was a private school following the UAE Ministry of Education curriculum. The selection of participants was based on convenience and purposive sampling. According to Creswell and Poth (2016), convenience sampling is the most commonly used in qualitative research since it is fast and easy to achieve the sample size. In addition, purposive sampling is employed with the educational leaders since they possess rich expertise and knowledge, which the researcher sought to obtain.

3.4 Data Analysis

Data were analysed using thematic analysis (TA). Boyatzis (1998) argued that TA is a qualitative method that helps to analyse classifications and provide relevant themes. Moreover, TA is significant in studies that attempt to investigate a phenomenon using interpretations. The choice of TA was due to its flexibility which can easily be modified based on the researcher's needs (Braun and Clarke, 2006). As such, data collected from semi-structured interviews were recorded, transcribed, and arranged into relevant, meaningful themes that answered the three research questions of the present study.

4 Findings and Discussion

The study results were reported according to the order of the research questions that governed the scope of the study.

4.1 Findings of RQ1

What are the perspectives of English teachers regarding the challenges of implementing the EmSAT exam?

English Teachers' Perspectives on the Challenges of the EmSAT Exam
English teachers identified a number of challenges that twelfth graders face regarding the EmSAT exam. For example, two participants stated that exam anxiety, fear and timing were among students' most prominent obstacles. One participant mentioned, " *The EmSAT exam questions are computerized and timed in a way that does not allow students to think well before selecting an answer. This is because the time allotted per question in the grammar and vocabulary sections ranges from 18 to 40 s."* This result was confirmed by another participant who concluded that *"Timing is a critical issue for students since it is very short and does not differentiate between students of good level and struggling students. This causes students fear and anxiety; they randomly answer questions within the given time."*

All participants confirmed that the writing section of the exam was also problematic for most students as it required them to type their answer rather than write it using paper and pencil as they are used to. Besides, among the challenges of the EmSAT exam, as identified by English teachers, was the lack of resources and study materials to prepare for the exam. The majority of participants agreed that the EmSAT exam skills needed to be taught to students to get acquainted with its content and requirements. However, this was not fulfilled since there were no books, resources, or study materials to prepare for the exam. On the contrary, one participant disagreed, and he believed that the exam covers accumulative skills that should not be restricted to a single study book or a set of resources.

4.2 Findings of RQ2

What are the perspectives of educational leaders regarding the challenges of passing the EmSAT test?

Educational Leaders' Perspectives on the Challenges of the EmSAT Exam
Educational leaders explained a number of challenges regarding the EmSAT exam, which were quite different from those reported by teachers. For example, the school principal averred, "*Lack of teacher training about the exam's structure, content, and administration is the most significant challenge since teachers can never prepare students without being trained to do so."* The head of the assessment department confirmed this point by saying, "*It seems that teachers are misplaced and forgotten when it comes to the EmSAT exam preparation and administration."* Regarding university admission, the head of academic affairs argued that the EmSAT exam is a requirement for high school graduation, and it has been planned to guarantee admission to all universities in the UAE. However, a few universities accept the exam for admissions, and the vast majority reject it for the sake of other international exams such as TOEFL and IELTS. Furthermore, she added that "*This is a real challenge as it acts against the basic motives of starting the EmSAT exam in that students avoid studying a foundation year."*

4.3 Findings of RQ3

What are the recommendations of the English teachers and educational leaders regarding overcoming the challenges encountered through taking the EmSAT Test?

Overcoming the Challenges of the EmSAT Exam
Most participants averred that integrating the EmSAT exam into the English curriculum would make it more familiar to students, increasing their success rate. Furthermore, few participants emphasized the necessity to design a study book and a set of resources that reflect the exam components in order to prepare students for the exam. Regarding training teachers and students, most participants stated, "*Students need to receive sufficient training on how to increase their e-maturity level and how to type using computer software. Similarly, teachers must be trained on the exam content and administration to support students more effectively."* However, some participants recommend reconsidering the time assigned per question to ensure that students of different abilities can answer each question within the given time. This would reduce exam anxiety and fear, resulting in better performance. In addition, a few participants disagreed with adding more time for each question of the exam, and they recommend providing more practice exams that imitate the real exam environment as a better method of avoiding fear and worries. Moreover, regarding technology failure, most participants reported, "*A backup plan has to be ready where students can do the exam using paper-pencil in case of technology failure, but most importantly is that students need to be ready for this step through training."*

4.4 Discussion

The findings of the study showed that there were many challenges regarding the EmSAT exam, as reported by teachers and educational leaders. For example, English teachers believed the exam time was very short, which caused stress, anxiety and fear. This was also thought to negatively affect twelfth graders' achievement and performance during the exam. These findings were in harmony with previous studies (e.g., Edriss and

Matthew, 2016; Lai, 2023). On the contrary, other studies concluded that standardized tests promoted peer tutoring and created a healthy educational environment (Baird et al., 2011; Sulastri and Puspawati, 2019). Another challenge was that the EmSAT exam was neither integrated nor aligned with the English curriculum, making it problematic to practice the exam content. This result was consistent with the findings of previous research (e.g., Mehrens and Lehmann, 1991; Gunes, 2019). Moreover, students' low e-maturity level was another obstacle preventing them from effectively interacting with the exam, especially with the writing section. The findings of the study also demonstrated some challenges as identified by educational leaders, including the lack of teacher training regarding the exam components and administration. Teachers were disregarded from exam preparation and administration, although they are considered the most influential party in increasing student achievement. This contradicts the findings reached by Imsa-ard (2020), in which teachers had a positive attitude towards computerized exams. Additionally, the findings confirmed that the exam was not a guarantee of admission to all universities in the UAE as it had been planned.

5 Conclusion and Recommendations

5.1 Summary and Key Findings

This research examined the viewpoints of educators and leaders in education regarding the difficulties that were encountered throughout the EmSAT examination. By conducting a thorough analysis of the participant's viewpoint on the subject under investigation, this qualitative study achieved its aims and responded to its primary research inquiries through the application of phenomenological interpretive research. To acquire the necessary data and address the research inquiries, two sets of interview questions were employed. Insufficient teacher preparation, lack of resources, and the potential for technological failures were among the numerous obstacles identified in the study's results regarding the administration of the EmSAT. In addition, the results indicated that anxiety, fear, and poor performance resulted from students' insufficient exam time and inadequate e-maturity to respond to all questions. Moreover, in order to surmount these obstacles, the results suggest crucial strategies including enhancing the efficacy of the English curriculum, integrating the EmSAT exam competencies into the curriculum, and providing comprehensive teacher training.

5.2 Limitations

The study has a number of limitations, including the small number of participants, which caused a challenge related to the generalizability of the findings. The study is also limited to one context (a private school in RAK), which does not make it representative of other schools in other emirates in the UAE. Another limitation is related to data collection since the researcher has only implemented semi-structured interviews without adopting another tool to ensure data triangulation which would enhance the validity and reliability of the findings.

5.3 Recommendations

One recommendation is for the assessment unit at the Ministry of Education to consider the challenges faced by students, teachers and educational leaders and work effectively to overcome them. Another recommendation is for school administrations to provide much support and training for teachers and students on the most effective strategies to deal with the EmSAT exam to ensure increasing student achievement and performance. A final recommendation is for English teachers to adopt their lesson planning and activity preparation in line with the exam specifications and requirements.

5.4 Implications for Further Research

Further research is needed to increase the number of participants and involve different contexts to identify the possibility of obtaining consistent results from the present study. A key aspect of future research is to use quantitative research methods to generate numeric data that could be used to validate the findings of the present paper.

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The Relationship Between the Frequency and the Range of Morphemes Used in Students' Essays and Essay Scores in an American School in Dubai

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Abstract. Purpose - The purpose of this research paper was to determine whether there is a relationship between the frequency and the range of morphemes used in students' essays and their actual essay scores.
Methodology - To address the research questions, the mixed methods design was conducted to view the findings from different angles.
Findings - The results suggest that there is a strong relationship between the range of morphemes used in students' essays and essay scores.
Implications - These findings can have meaningful implications for English teachers and linguists in the UAE, specifically, about the significance of considering the morphology used in students' essays.
Originality - This paper adds to the growing body of literature by adding information on the frequency and the range of morphemes used in students' writing and essay scores in the UAE's education sector. This may contribute to more significant information within the field of linguistics.

Keywords: Morphology · Literacy · Frequency · Essay Scores

1 Introduction

Writing is a fundamental aspect of English Language Acquisition (ELA) learning for teachers as well as students, as some experts argue it is crucial to facilitate the acquisition of the target language (Ferris 2011 in Ene & Kosobucki 2016). The fundamental building blocks of language are grammatical morphemes, which include articles, suffixes, and prefixes. These morphemes encode a variety of concepts; hence, it is crucial for ELA learners to acquire them (Murakami 2014). Therefore, to inculcate literacy skills among students, they need to receive an adequate amount of support in nurturing lexical, syntax, and discourse skills that are necessary for comprehending written text (Hemphill & Tivan 2008). However, despite its importance, acquiring grammatical morphemes seems to be remarkably challenging for second-language learners (Ellis 2008). Considering this point, it could be argued that this is one of the reasons students' essays are mainly graded by the rubric given instead of stressing the range of morphemes used in the essays.

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Therefore, this research attempts to delve into the morphological analysis, specifically whether the variety of morphemes has an impact on students' essay scores. Essentially, the aim of this investigation is to determine whether there is a relationship between the frequency and the range of morphemes used in students' essays and their actual essay scores. The research questions are:

1 What is the frequency used in students' essays across proficiency levels?
2 What is the range of morphemes used in students' essays?
3 Is there a relationship between the range of morphemes used in students' essays and essay scores?

According to previous research, it has been established that there is a significant correlation between morphology and reading proficiency, such as vocabulary words in a text, and reading comprehension (Northey 2013). However, my small-scale research study for this paper is significant because very few studies have been conducted on the topic of how morphological analysis may contribute towards writing quality in the context of Dubai, United Arab Emirates (UAE). The research will morphologically analyse students' essays; thus, it is advantageous for English teachers to better understand whether there is a relationship between the variety of morphemes used in students' essays and essay scores.

2 Literature Review

To begin with, morphemes are the minimal units of meaning or grammatical function (Wolter & Pike 2015). Hence, the study of word formation and internal structure, including components like root words and affixes, is known as morphology (Nippold 2016). For instance, the root word "talk", if we add the suffix "plural s", it will be "talks". Another example is "happy" which is considered the root word, by adding the prefix "un" it will be "unhappy". Free morphemes have a distinct meaning and can stand alone (e.g. eat, date). However, bound morphemes make it impossible for it to function as a standalone word. It includes both suffixes and prefixes (e.g. -s, re-, un) (Carlisle 2003). Furthermore, free morphemes come in two varieties: lexical and functional. Lexical morphemes have a meaning and can stand alone as a word. It includes verbs, nouns, and adjectives; for example, girl, boy, and smart. The functional morphemes include articles, conjunction, and pronouns. Derivational and inflectional morphemes are the two types of bound morphemes. The first type is derivational morphemes which alter the part of speech. It brings about a change in the existing word and introduces a new word in a language. For example, (care) and (careless). The part of speech of a word is not altered by inflectional morphemes such as boys (plural s), Jim's purse ('s) (Brady 2021). These definitions are adopted as the authors provided a thorough explanation of the definition of the morphemes and their types clearly.

The theory that supports this paper is "Structuralism" (Levi-Strauss 1973; Jakobson 1976), which emphasised the morpheme concept and categorised syntax as a derivative of morphotactics (i.e., combining morphemes). Put simply, structuralism views language as a set of descriptive and analytical procedures. Analysis of the language can be structured as (a) semantics, (b) syntactic (c) morphological (d) phonological (Siddiqi & Harley

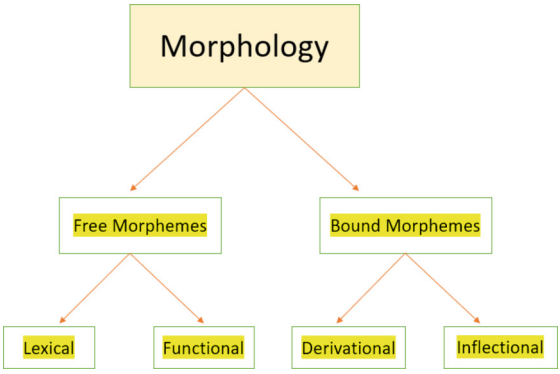

Fig. 1. Morphology and its types (Harley, 2014)

2016). Although this theory is well-established within the field of linguistics, it has been criticised by some linguists who argue that merely using morphemes to replace the notion of words has its limitations. However, for the purpose of this paper, structuralism is used as a theoretical foundation (Fig. 1).

The importance of morphology integration into literacy lessons as an intervention strategy is generally acknowledged across research (Gilbert 2020). In primary grades, morphological instruction includes teaching students affixes, and root words as a technique for utilising these word parts to develop meanings for new terms (Manyak, Baumann & Manyak 2018). Numerous studies have demonstrated the importance of morphological analysis in recognising words, vocabulary comprehension, and spelling when writing (Ash & Baumann 2017). In elementary schools, approximately 60% of the words that students come across in texts are words that consist of derivational morphemes, meaning base words and affixes (Fejzo, Desrochers & Deacon 2018). This has shown that teaching affixes such that students learn how to use them accurately with familiar lexical items, can increase their understanding of unfamiliar words that use affixes, and they may even deduce the meanings of these words (Schultz 2021). Ultimately, the main aim of teaching morphology is to improve students' capacity to determine word meanings, because the study of word components aids in writing skills (Apel & Werfel 2014).

There is a body of research which demonstrates that morphological knowledge plays a role in both text production and spelling, especially for students who are struggling with writing (McCutchen et al. 2014). The representation of relevant morphemes in essay writing is more difficult for students who have written language issues compared to their peers (Rubin & Laboratories 1988); for example, poor spellers have difficulty identifying the distinctions between root morphemes and word affixes. In contrast to the research on spelling accuracy, additional research has shown that reading-problematic pupils struggle to apply morphological rules to novel words (Brittian 1970 et al. in Rubin & Laboratories 1988). As a result, students tend to employ derivational morphemes in writing later than inflectional morphemes (Northey, McCutchen & Sanders 2016). A general but possibly incorrect viewpoint is that derivational morphemes are either too challenging for students or are not crucial for students' literacy development all the way up until middle school

level (Carlisle 2003). These assumptions give rise to the practice of neglecting either derivational or inflectional morphology instruction in primary and middle school (ibid). Despite the fact that morphological acquisition is viewed as it is related to grammatical development, learning, or acquiring morphology goes beyond grammatical and structural rules (syntax) (Marinova-Todd, Siegel & Mazabel 2013). Essay writing appears to be related and more pronounced to the capacity to analyse written texts using morphological components (Perfetti 1999). Ultimately, the literature review has covered three major themes about morphology which are (a) morphological instruction across proficiency levels, (b) morphological awareness, and (c) morphological skill in essay writing. This paper contributes to the existing body of literature by adding information on the frequency and the range of morphemes used in students' writing and essay scores within the context of the UAE.

3 Methodology

To address the research questions, the mixed methods design was conducted to view the findings from different angles instead of relying on a single approach (Denscombe 2017). A stratified random sampling was carried out where the researcher ensured that various groups are included. First of all, I divided the students into groups or strata according to their levels (high, average, and low). Then, each stratum was sampled randomly. I chose this technique as it is a practical combination of randomization and categorization that makes it possible to conduct both quantitative and qualitative research (Cohen, Manion & Morrison 2017). I classified the marks according to the students' levels.

High Achievers	Average	Low Achievers
From 9-10 out of:10	From 6-8 out of:10	From 4-5 out of:10

The participants in this study were female students from different nationalities, aged between 17 to 18 years old, studying at an American school in Dubai. I analysed 9 essays written by these participants and categorised them according to the level of their writing proficiency, as determined by their teacher. From the quantitative perspective, numeric data was collected by representing the frequency of students' essays across proficiency levels. As for the qualitative design, the range of morphemes used in students' essays had been identified, and color-coding was used to identify the range of morphemes used in students' essays. To ensure validity for quantitative design, normality was tested before proceeding with the Pearson analysis to ensure that the data were normally distributed. Furthermore, I ensured all standard steps were taken to ensure this study met the expectations of ethical considerations, as determined by the British University in Dubai (Table 1).

Table 1. Research design

Research Questions	Approach	Instrument	Participants	Data Analysis
What is the frequency used in students' essays across proficiency levels?	Quantitative	Quantitative document analysis	9 students (essays)	SPSS (Pearson Correlation)
What is the range of morphems used in students' essays?	Qualitative	Qualitative document analysis	9 students (essays)	Color-Coding
Is there a relationship between the range of morphems used in students' essays and essay across?	Both (Quantitative + Qualitative)	Quantitative + Qualitative document analysis	9 students (essays)	SPSS + Color-Coding

4 Findings

This section contains an overview of the study's findings. This part is essential in order to describe the data that was examined and provide an explanation for the research questions. As previously stated, the research question for the quantitative design was "What is the frequency used in students' essays across proficiency levels?".
The frequency of the high achievers:-

Frequency	Student 1	Student 2	Student 3
Lexical	188	351	192
Functional	335	718	263
Derivational	14	25	19
Inflectional	35	74	40

The frequency of the average students:-

Frequency	Student 1	Student 2	Student 3
Lexical	179	168	217
Functional	282	246	315
Derivational	14	7	6
Inflectional	35	35	51

The frequency of the low achievers:-

Frequency	Student 1	Student 2	Student 3
Lexical	19	135	77
Functional	17	303	102
Derivational	0	3	6
Inflectional	5	14	19

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Grade	.240	9	.144	.851	9	.076
Total	.277	9	.046	.876	9	.143

a. Lilliefors Significance Correction

The data were normally distributed, as assessed by Shapiro-Wilk's test ($P > .05$).

Correlations

		Total	Grade
Total	Pearson Correlation		.706*
	Sig. (2-tailed)		.034
	N		9
Grade	Pearson Correlation		
	Sig. (2-tailed)		
	N		

*. Correlation is significant at the 0.05 level (2-tailed).

There was a statistically significant, strong correlation between the range of morphemes used in the essays and essay scores in female students aged 17 to 18 years, $r = .706$, $P < .05$.

As for the research question of the qualitative design "what is the range of morphemes used in students' essays?" color-coding was implemented wherein 9 essays were analysed morphologically. Consequently, some of the key conclusions drawn from these essays are as follows:

4.1 Comparison of Morphological Skills Used in Students' Writing

High achievers:-

The range of morphemes	Student 1	Student 2	Student 3
Lexical	Many examples such as "children, Quran, family friend, find etc"	Many examples such as "life , grade , high, school, place etc".	Many examples such as "person , broad , shabby, almond, help etc"
Functional	Pronouns, Conjunctions, prepositions, Determiners, Quantifiers, Articles, Auxiliary verbs, Modals, Qualifiers, Question words	Pronouns, Conjunctions, prepositions, Determiners, Quantifiers, Articles, Auxiliary verbs, Modals, Qualifiers.	Pronouns, Conjunctions, prepositions, Determiners, Quantifiers, Articles, Auxiliary verbs, Modals, Qualifiers, Question words
Derivational	ing, ly, ness, al, ed, ful. Such as happiness , deeply, peaceful etc. "	ing, ly, tion, er, ed. Such as "constantly careless , reflection, shaped, stranger etc."	ing, ly, ed, ful. Such as shaped , soothing , thoughtful etc. "
Inflectional	ed, ing, 's , -es, -er, -s such as plays , comes , friends etc."	ed, ing, -s, -es , -er such as "compared , younger , lights , shared etc".	ed, ing, -es, -est, -s, 's such as lightest , writing , clothes , smelled, friends , aunt's etc."

Average students:-

The range of morphemes	Student 1	Student 2	Student 3
Lexical	Many examples such as "dark , brown , hair, angry, summer , camp etc"	Many examples such as "person, best, friend, spent, necessity, awesome etc"	Many examples such as "play , hit , blue, sharp, name etc"
Functional	Pronouns, Conjunctions, prepositions, Determiners, Quantifiers, Articles, Auxiliary verbs, Modals, Qualifiers.	Pronouns, Conjunctions, prepositions, Determiners, Quantifiers, Articles, Auxiliary verbs, Modals, Qualifiers, Question words	Pronouns, Conjunctions, prepositions, Determiners, Quantifiers, Articles, Auxiliary verbs, Modals, Qualifiers.
Derivational	ing, ly, ment, -ive, tion, er, or, ed. Such as "encouragement, supportive, instructor, teacher, Sadly, appreciation etc."	ing, ly, er, ful. Such as truly, painter, cheerful, amazing etc. "	ing, ed, ic. Such as "burning, artistic , spiced etc."
Inflectional	ed, ing, -s, -es such as "created, living, lessons, memories etc".	ed, ing, -ist, -s such as finest, realized topics etc."	er, ing, -s, -es such as "Days , slower , stories , running etc".

Low achievers:-

The range of morphemes	Student 1	Student 2	Student 3
Lexical	Many examples such as ".mum, contact , family, sister etc"	Many examples such as "hard, person , time , happy , power etc"	Many examples such as "play , hit , blue, sharp, name etc"
Functional	Pronouns, Conjunctions, prepositions.	Pronouns, Conjunctions, prepositions, Determiners, Quantifiers, Articles, Auxiliary verbs, Modals, Qualifiers.	Pronouns, Conjunctions, prepositions, Determiners, Quantifiers, Articles, Auxiliary verbs, Modals, Qualifiers.
Derivational	NONE	Ful, ed "beautiful, shaped"	ing, ment, er, ed, ness. Such as "understanding, listener, entertainment, tenderness".
Inflectional	's , such as "mum's"	ed, ing, -s, -est such as "reasons , highest, talking etc".	est, -s, -es such as ", activities , areas, greatest etc".

Morphemes can be joined in a variety of ways to convey certain meanings or to fulfil specific grammatical functions. The essays reveal that the vast majority of students used lexical and functional morphemes compared to other morphemes. For example, "she had those round eyes that I can never seem to forget when she crosses my mind". However, the number of inflectional and derivational morphemes used in the essays varied across proficiency levels. For instance, the high achievers used a variety of derivational, inflectional morphemes such as "she has pale skin with light brown hair, light brown eyes, and beautiful freckles, I honestly find her one of the most beautiful people I have ever met". Despite the fact students used a lot of lexical and functional morphemes, it

can be seen evidently that students used a variety of derivational and inflectional in the same sentence "three derivational morphemes and two inflectional morphemes". Students' lexical knowledge and high-calibre writing are significantly influenced by their grasp of morphology. As for the average students, the researcher noticed that students used a variety of morphemes but not as much as the high achievers' ones, for example, "Yasmin has big gorgeous curly hair and she always looks stunning". This sentence is derived from an average student essay, it can be inferred that the sentence contained a good number of lexical morphemes and only one derivational morpheme "ly", and one inflectional morpheme "s". Regarding the low achievers, the students provided little derivational and inflectional morphemes. They mainly focused on lexical and functional which was easier for them than the use of derivational and/or inflectional morphemes. For example, "My mom is my best friend in my life, and my first human that she came to in my head". It is evident that the low achievers did not provide any of the inflectional or derivational morphemes in the sentence which affected the overall score. Due to a lack of vocabulary, they were able to write a range of lexical and functional morphemes but were unable to add affixes to the base word.

4.2 Using Morphology at the Text Level

Using a variety of morphemes improves the quality of students' writing and consequently, will lead to a better score. Students utilize inflectional morphemes more frequently than they do with derivational morphemes. Therefore, the production of derivational morphemes develops later than their use of inflectional morphemes in writing. For example, one of the weak students stated "she was my favorite mum's sister in mum's family mum's sister maryam she lives in Kuwait" she was able to use inflectional morphemes frequently but was unable to produce any derivational morphemes. As for syntactic structure, the researcher noticed that the weak writers relied mainly on the basic organisational markers such as, because, also, when etc., which hinders the flow of their writing. For instance, "This two they come first thing in my head because and the first one and my first and favorite human she was my mom and the second person", this student has overly produced connector words "because, and" and tends to use less variety of the word choice and syntax. The high achievers, in contrast, utilised a wider range of organizational markers and syntactic structure efficiently. For example, "since the last time I saw him I can't picture him physically, but I remember his personality. He was so dynamic and talkative compared to me who was reserved". Additionally, morphological skills enabled the high achiever students to generate complex sentences and multi-sentence as stated: "he is just the scrawny boy that I picked a fight with when I was younger". It smoothes the syntax and gives more nuance to the meaning. As for the average students, they were good at generating complex sentences too. For instance, "Even though she lives ten thousand kilometers away, she feels like she's right next to me". Lastly, the low achievers, most of them write little to no complex sentences within the essay adequately. Finally, to answer the third research question "Is there a relationship between the range of morphemes used in students' essays and essay scores?". According to the findings stated above, there is indeed a relationship between the range of morphemes used in students' essays and their actual essay scores. This phenomenon will be discussed further in the subsequent section.

5 Discussion and Conclusion

The research questions of this study were: 1- What is the frequency used in students' essays across proficiency levels? 2- What is the range of morphemes used in students' essays? 3- Is there a relationship between the range of morphemes used in students' essays and essay scores? A mixed method study was conducted due to several reasons, one of the reasons is that with the use of a mixed approach, a phenomenon may be understood completely and thoroughly (Cohen, Manion & Morrison 2017); and it may help to answer the research questions more meaningfully. Overall, the data analysis revealed that morphological skill contributes significantly to students' writing development. Hereby, there is a strong relationship between the range of morphemes used in students' essays and essay scores. As a result, the higher the variety of morphemes used in students' essays, the better the scores. Also, the researcher compared the morphology used in students' essays across proficiency levels and found that a variety of morphemes was utilised by high achievers, which most likely enabled them to attain high scores. Thus, using various combinations of morphemes assists in enhancing the writing quality as well as conveying certain meanings or fulfilling specific grammatical functions.

Despite the fact that much linguistic study has concentrated on the discipline of phonology, various studies on language and literacy development have stressed the importance of morphology, another area of linguistics that goes beyond phonology. Researchers with this perspective stressed how crucial it is to cultivate morphological skills in order to enhance the learning process of reading and writing mutually (Carlisle 2003; Perfetti 1999). Thereby, there is strong evidence that morphological knowledge helps in developing students' writing (Goodwin & Ahn 2013; Northey, McCutchen & Sanders 2016). The development of high-quality writing is substantially correlated with morphological competence and literacy. This finding is in line with a growing body of research in the fields of education and psychology that emphasizes the significance of morphology which indicates that morphological skill should be included as an essential component of literacy instruction (Gilbert 2020).

As discussed earlier, there are four main types of morphology which are: functional, lexical, derivational, and inflectional. These types play a significant role in academic writing wherein practice is the key to naturally acquiring these kinds of morphology. According to research, explicit instruction of derivational and inflectional morphemes is necessary to support the continuous development of morphology and syntactic (Marinova-Todd, Siegel & Mazabel 2013). Therefore, recognising the words, comprehending the texts, spelling, and vocabulary would be reinforced among English language learners as well as monolinguals. Apel & Werfel (2014) argued that there is a mutual relationship between morphology and written language which facilitates the acquisition of morphological competence. This paper contains a number of limitations that should be noted. To start with, the sample size was relatively small due to the shortage of time by the researcher. Also, this study does not represent the population. Therefore, it would be better to have more students' essays from different levels of the k-12 sector to represent the entire population. In addition, it is better to consider male students since the researcher focused on female students only.

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The Implementation of Critical Thinking Skills in American Curriculum Schools in Sharjah: A Study on Science Teachers' Approach and Academic Standards

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Abstract. The purpose of this study is to examine the extent to which the science teachers apply critical thinking in their classrooms in some of American schools in Sharjah. In the modern days, the attention towards critical thinking skills is massive. For so many years it's been acknowledged as a central objective in the field of education. The academic standards in various subjects including math, science, and social studies give significance to several connections between critical thinking and the content of the core curriculum, guiding the students in a more superior way. This research study was aspired to delve into the approach of in-service science teachers regarding the implementation and utilization of critical thinking attributes in science classes that apply the NGSS science academic content standards in some American curriculum schools in Sharjah (UAE). In this quantitative study, twenty science teachers responded and volunteered from various schools in Sharjah. A large diversity of standards was attended by science teachers in place of needing critical thinking skills in the face of the fact that a lot of others were contemplated to be inadequate. The scheme concerned with standards perceived high in comparison to critical thinking in science. However, the standards of the science content conceded the minimal amount.

Keywords: Critical thinking · in-service teachers' approach · Science standards NGSS

1 Introduction

One of the most fundamental objectives in education is considered to be critical thinking (Blunt, 2010). It is an essential skill that is needed in any workplace being able to aid an individual with his/her mental and spiritual inquiries through the assessment of information in hands, as well as assimilating all the evidence to become theoretical and through argument analysis Furthermore, added to designating students with problem-solving where they make use of teamwork for data arguing, writing reports and immerse in intellectual tasks. These approaches are said to be teachable and trainable CT skills, exclusively in science classes as science portrays an extensive role in the development

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of the students' intellectual and cognitive intelligence which will eventually create lead to the academic progression of learners (Lai, 2011). There is a massive agreement that is highly required to associate students through the teamwork in practices that are authentic in the educational science classes (National Research Council, 2012).

Critical thinking is a cognitive mechanism where learners are skillfully and passionately engaged and drawn towards various concepts such as application, analysis, synthesizing and evaluation of examined, discovered or experienced evidence, as well as supporting their discovery with reasons and elaborations (Paul and Elder, 2007). From a contrasting perspective specified by (Dewey, 1998), critical thinking is said to be a "way of reflective thinking focused on deciding what to believe and what to do". Dewey is considered as the father of the CT or reflective thinking as being termed by him. He believed that reasons are crucial factors having the intent and objective to support the implications that our beliefs relate to, including logical, religious, scientific as well as moral or individual.

The conduction of this research study has a relevant motive behind it as it clarifies and creates realization regarding the importance for the use of critical thinking skills in the academic content standards in combination with the positive effect they imprint on the students' futures, although teachers' beliefs and views about CT have been examined and investigated numerous times, only a narrow number of studies have inspected the knowledge of educators regarding the magnitude of critical thinking skills in the United Arab Emirates. The rational and intellectual skills' evidence has been infrequent and thus the data used for investigation has not been advantageous. Corresponding to the insufficiency of experience in CT, a lot of conflict has been encountered by teachers in engaging students in teamwork that associates critical thinking (Tempelaar, 2006), as well as a huge number of them, do not make use of practices conferred in their textbooks conveniently (NRC 2012). Consequently, considering the students' feeble potential in critical thinking skills, they are struggling with grasping real-life problems and having to solve tough questions. It is necessary for teachers to yield students with a curriculum that involves creating and evaluating CT skills in order to strengthen their learning by obligating higher-order thinking and thus increase the students' proficiency to critical thinking. In such circumstances, expected response characteristics will be knowledgeable to students and thus guide them to studious thinking as well as reflecting a critical thinking way (Deal and Hedge, 2013). This research study aiming to accomplish the needed documents that will enhance the analysis of the following question:

To what extent the in-service science teachers in American curriculum schools in Sharjah emphasize CTA in their implementation?

2 Literature Review

Critical thinking reverses the proficiency of which each individual has to face through convoluted decisions in various life prospects which may take a form of human's personal, educational and social lives (Bagheri, 2015). Critical thinking can be analyzed as a way to approach methods and resolve difficulties taking various factors into consideration such as decision making, contrary thinking, establishing logical, conclusive and rational arguments or statements that include validating, verifying, evaluating and

selecting the most accurate and relevant satisfactory response for a definite task from a diversity of alternative solutions with moderate eradication (Karabay, 2015). Concurrently, CT is one of the essential skills for education as it aids individuals in collaborating with a variety of information actively, with the aspiration to recognize the advantages and disadvantages and then to asses them in order to reach to the conclusion of the truth value, to apply knowledge and deposition towards the generation of new perceptions (Marilena and Hurjui, 2015).

According to Paul, critical thinking is said to be "the art of thinking about thinking in an intellectually disciplined manner" (Paul, 2005). Paul certified that this type of thinking has three important factors related to it. These factors include appraising and evaluating which show a higher standard of critical thinking. The final factor deals with developing and enhancing.

The relationship between the accomplishment of students and the use of CT techniques has sought massive attention. CT symbolizes a crucial component in the learning and academic advancement of students. As well as working effectively and precisely in their upcoming academic standard and be willing to oppose in the marketplace worldwide then these students will accommodate and portray a vital aspect in the success in the following generations (Alliance for Excellent Education, 2011). There are various aspects that can alter the scheme and advancement of CT skills implementation. The first aspect is associated with the animosity between the tutor's essentiality to illustrate these skills corresponding to the teacher's request for the success of learners on the test of an unsound achievement (Greenstein 2012). The second aspect has a wide connection to critical features that will give aid and support to the application of these skills which take the energy and right amount of time for the application to occur into consideration (Rosefsky and Opfer, 2012). The third aspect is connected to the teachers being capable of promoting these certain skills for the students, while the final aspect is in correlation to the extensive pressure that the teachers are enduring due to high expectation level of academic prosperity that they're required to work up to as conducted by a large number of stakeholders for the purpose of maintaining their positions at their jobs.

Next Generation Science Standards (NGSS) are K–12 science content standards aimed at setting expectations for what students should know and be able to do at each level of study. According to the National Academies Press (2012), One of the three dimensions of NGSS is science and engineering practices which build upon analyzing and interpreting data, developing and using models, engaging in argument from evidence, carrying out investigations, and designing solutions which is totally aligned to the CTA that we are up against in our research, we have selected schools that follow these standards and are controlled by an inspection team of Sharjah Ministry of Education (MOE).

Ministry of Education launched a strategic plan for 2017–2021 to develop an innovative education system for building a knowledgeable and globally competitive society, and encouraging a society that is driven by science, technology, and innovation is also one of its values in education and though, improves the level of students to prepare them to a better future. In order to achieve these goals.

In 2013, the significance of problem-solving and CT is validated by the NGSS Lead States as a crucial factor in the development of the students' learning effect brought in science. Due to that reason, these abilities and skills should be taught to the students

from the initial primary stage year with the purpose of acquiring the ability to perform and manifest competence in functioning and appointing research, evaluating, defining and portraying data, conceiving several interpretations and draft various illustrations, analyzing followed by communication of facts and evidences (NGSS Lead States, 2013, p.3). A large number of researchers established the effective results through carrying out critical thinking in various subjects such as geography (Korkmaz and Karakus, 2009), reading (Keller, 2008), technology (Scott, 2010). According to the academic standards of the state and the educational content, for the purpose of the enforcement and development of the learning method results in the classrooms, teachers have to integrate critical thinking skills into the instructions of learning. This can be qualified by using the academic content measures for various subjects. Critical thinking teaching is a main target in education nowadays, because it provides students with the necessary skills to justification social issues in a rapidly changing world. Some people consider the skills of critical thinking hard to be applied and even complicated however it is crucial to the learning process.

This study falls under the umbrella of different educational theories, Cognitive apprenticeship theory proposed in the late 1980s, social Constructivism theory that emphasizes the role of social interactions and the construction of knowledge through collaboration and dialogue, and Bloom's taxonomy theory that classifies cognitive processes into different levels from lower-order thinking skills and progresses to higher-order thinking skills.

3 Methodology

The study in this research is a quantitative study, an online questionnaire was conducted via electronic devices in the form of Likert Scale; the objective of applying this questionnaire is to find a connection between the science content standards from k-12 and the critical thinking skills from the science teachers' points of view, thoughts and ideas. That questionnaire provides a numerical description of different people's strategies, patterns or ideas using learning and checking cases of such a community. There has been a detailed analysis of the value of designing this study questionnaire followed by leading it to an online system (Sue & Ritter 2012). Moreover, the given questionnaire will be able to introduce analysis with a straightforward justification by using claims that draw on its strength points along with weakness points, information gathering and greater efficiency (Creswell, 2014). The in-service k-12 science teachers have been chosen to participate in this study and only twenty volunteered from various schools in Sharjah and they have been classified according to their demographic data. This demographic information could have the names, designation and also in this study I included the gender, years of teaching experience, the grade stages that are taught plus their academic qualifications and whether they had any CT courses before or not. Worth to mention, that the chosen teachers are all using NGSS American standards in their schools that already identified as American schools because they apply the American curriculum. The findings of this online questionnaire were gathered within seven days period of time. According to Forawi 2016, this method has been validated using equivalent approaches as well as being applied by all respondents in this study.

3.1 Participants

Twenty science teachers who work in different schools in Sharjah participated as a proper exemplification to establish the implementation and alignment of CT instructions and methods used in this research. The in-service science teachers took part in the courses for their methods in science periods in all three levels of primary, intermediate and secondary during the first semester of the current school year to make sure that the adequate numbers of the science standards have been covered at k-12 grades.

3.2 Instrument

The questionnaire of this study includes two segments, it begins with the demographic data about the participants, and then, it goes to the different ways that participants respond to CTA. The critical thinking attributes or CTA is the name of the instrument that many researchers use and work together in order to build it up and improve it; these attributes include ten major and crucial statements as shown in the appendices. This tool also is able to assess the validity of the arguments and the accuracy of the rationale with the aim of leading to assumptions and explanations of the findings. Moreover, the main premise of this CTA instrument is that it reflects the concept and interpretation of CT which can be considered as a way to examine and evaluate thoughts.

4 Data Analysis and Findings

The following pie charts represent the demographic information about the twenty k-12 science teachers who participated in the study. It shows that most of the participants have more than ten years of experience, and about half of them had critical thinking courses before, the majority of them are teaching science high school while the minority are teaching middle and elementary school (see Fig. 1).

In more details, the Bar graph in Fig. 2 is showing the mean scores of applying each of the early mentioned critical thinking skills in science classes in American curriculum schools that use the next generation science standards (NGSS) and the percentage of each as well. The results of this research showed that almost all the participants are using the CTA in their science classes but they give more focus to the fifth and sixth attributes in order which are related to creating the parameters and scales for evaluation, as well as enhance the levels of questions. The highest mean (4.3) for the sixth attribute that has the highest application rate within science classes. Participants confirmed that they work hard to answer and address the important questions (4.2) in the fifth attribute. The independent thinking and building cognitive capability as well as using the vocabulary of critical thinking both were fairly equal in their mean scores (4). While the least mean scores were (3.5) for both the third and seventh attributes that tend to avoid the early decisions and the analytical skills that are not easy to achieve, while the rest of the required CT skills were proportionally attainable and acceptable.

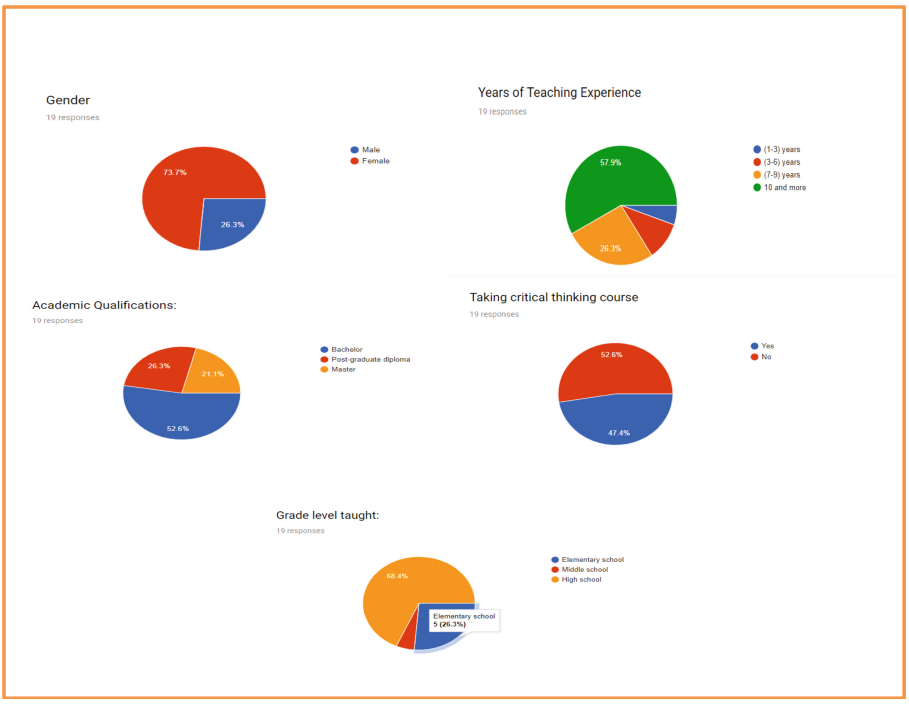

Fig. 1. Demographic information

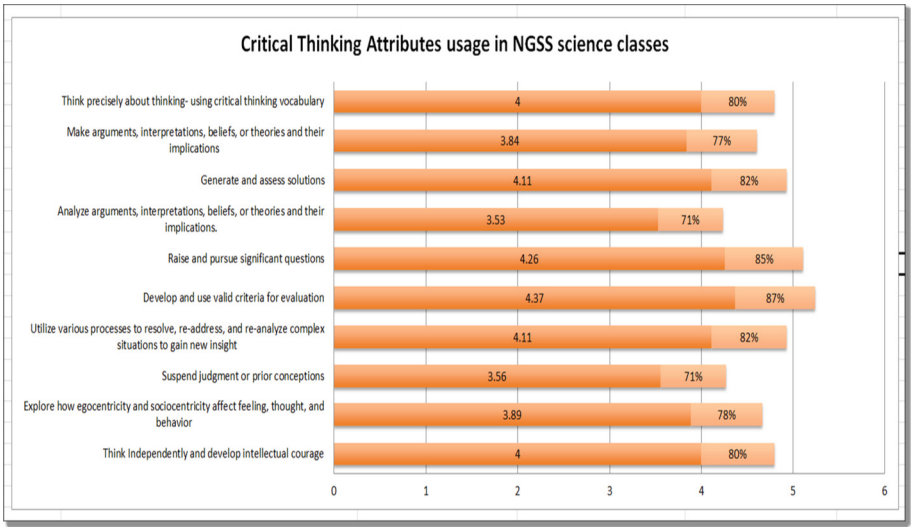

Fig. 2. Applying CTA in NGSS science classes

5 Discussion, Conclusion and Recommendations

The study found that science teachers in Sharjah recognized the importance of critical thinking and attempted to apply it in their lessons. Also, the highest percentage of the fifth and sixth CT attributes can be justified as teachers are subject matter expertise who have a deep understanding of skills and knowledge that need to be assessed, and this allows them to refine and enhance the evaluation criteria based on their professional judgement.

As noticed also in the results of the study that the analytical skills practice by teachers should be improved. Furthermore, the results of this study assured the science in-service teachers' awareness of the importance of the CTA and their attempts to apply it within their science lessons in the light of the relation between critical thinking and the standards required in all American schools that use NGSS in the emirate of Sharjah. Forawi & Mitchell (2012), believed that the skills of critical thinking of learners are considered to be present in a social and cultural-oriented system where teaching is responsive and driven, important to realize that this will give a chance to students to expand and enhance their metacognitive knowledge. The new NGSS document (2013) also embraces this concept in which, standards alone will not be considered as a functional framework. Accordingly, innovative new teaching techniques are required to achieve the expected results. It was discovered that one of the most efficient strategies in CT is the inquiry-based teaching method of science that was recognized as a tool for a successful introduction of the new NGSS system (2013) and so it has to be improved. To be able to develop CT in schools, it is necessary for these skills to have a strong basis. This can be achieved by engaging teachers by giving them unique and advantageous CT courses to help teachers to acquire the skills in more analyzing as well as professional way. When these courses are accomplished, the teachers will be more confident as they will get more experience and will be capable of implementing the critical thinking skills of the students in a positive way.

As a matter of fact, it is worth to mention that, to bring out a better result in terms of having clear instructions on CT skills, one approach should be to study standards precisely, closely, and show readiness always to help the teachers to improve their teaching techniques mainly the ones that have critical thinking skills when needed. Critical thinking skills should be integrated into the vocabulary of academic standards in all classrooms, targeted at all teachers all over the world and those in charge of curriculum development.

Implementing CT skills in education prepare students to become lifelong learners and active participants in an increasingly complex and interconnected world. However, a limitation of this study was the inability to evaluate teachers' critical thinking abilities, which could hinder the transfer of these skills to students if teachers are not aware of them or how to apply them effectively. It is crucial to provide teachers with training on effective implementation of CTA using various teaching styles, best practice, role modeling and professional development courses because these guidelines will enhance the efficiency and ensure lasting outcomes. Future studies can explore the implementation of CTA in American schools following NGSS and compare the rate of improvement over time, assessment methods, and curriculum design and alignment.

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A Case Study Exploring ESL Instructors' Perspectives of Blended Learning in UAE Higher Education

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Abstract. Recently, universities and colleges across the United Arab Emirates have been actively incorporating new learning technologies to facilitate blended learning pedagogy mandated by the Ministry of Higher Education during the COVID-19 crisis. Despite its popularity, blended learning is still a relatively new approach to learning across higher education in the UAE. This small-scale qualitative study seeks to gain insights into instructors' perspectives of blended learning in an ESL program at a federal college in the UAE. Semi-structured interviews were used to identify the benefits and challenges perceived by instructors teaching in this context. The results revealed several key benefits, including increased flexibility, improved accessibility, and timely and continuous learning. However, instructors also reported increased academic workload, technical issues, and a lack of professional development as barriers. The findings offer recommendations, implications, and possible future directions for stakeholders and academics to inform future directives.

Keywords: blended learning · higher education · COVID-19 · qualitative

1 Introduction

In January 2020, the world was struck with a pandemic that led to the closing of schools all over the globe. According to the United Nations (2021), the pandemic created the most significant disturbance in the history of education, affecting over 94% of the world's student population in more than 190 countries. Like many countries, the national education system in the UAE was disturbed by the lockdown. However, as campuses closed their physical operations, it was expected that the delivery of the curriculum would continue. Nevertheless, a rapid transition from face-to-face teaching to entirely online and remote delivery was precipitated, where students learned from home and faculty taught from home. From faculty perspectives, the preparation, planning, and newly acquired skills have been exceptional. However, as higher education gradually progresses to fully reopening campuses, there is a need to ensure a consistent, seamless, and efficient blend of on-campus and remote learning where learning outside the classroom supports the limited contact time spent in the classroom. In this research site, English classes that

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were entirely delivered through face-to-face instruction shifted to blended learning. During this transition, faculty faced several challenges such as insufficient resources, lack of IT skills, and inadequate training. Despite the challenges, the recent educational crises resulted in academics being forced to depend on technology as the main teaching resource regardless of their prior technology-related views and practices.

Initial research exploring the potential uses of blended learning has mainly focused on comparing blended learning to traditional instruction (Bazelais & Doleck 2018; Mali & Lim 2021). In addition, much of the research in the field of blended learning has been based on students' perceptions, mainly using quantitative measures such as surveys and questionnaires (Napier, Dekhane & Smith 2011; Clark & Post 2021; Saboowala & Manghirmalani Mishra 2021). While the overall student-based studies are important for understanding the potential value of blended learning, not enough studies have detailed instructors' perspectives, views, and attitudes toward blended learning. Understanding how instructors actually experience blended learning environments is essential to inform future developments in learning design in the UAE higher education sector. Thus, there is a need for more qualitative research from the UAE where blended learning has recently been introduced and is still in its infancy.

1.1 Research Aim and Questions

This small-scale qualitative study seeks to gain insights into instructors' perspectives of blended learning in an ESL program at a federal college in the UAE.

To fulfill this purpose, the following research questions guided the study:

RQ1: What benefits did instructors perceive while implementing blended learning in ESL classrooms?

RQ2: What are the possible barriers instructors perceived while implementing blended learning in ESL classrooms?

2 Related Work

The term blended learning is not a recent development in education; as it has been around for more than a decade. As blended learning environments continue to evolve, various definitions have been found in the literature (Müller & Mildenberger, 2021). The most prominent definition arises from Graham's (2013) work, who defined blended learning as the combination of traditional face-to-face instruction and computer-mediated instruction. Sharma and Barrett (2007) posit blended learning as an appropriate balance of traditional teaching and web-enhanced learning. The problem with this definition is that it is broad, and it covers almost all learning systems. The third perspective to blended learning is the most common point of view in the literature. For Garrison and Kanuka (2004), blended learning is the thoughtful integration of the best features of classroom-based face-to-face instruction with the best features of online learning. This definition is important because it recognizes that such combinations must be pedagogically sound. In the literature, some scholars refer to blended learning as 'hybrid learning', 'flipped' or 'inverted' learning (Rasheed, Kamsin & Abdullah 2020). In this paper, the term 'blended

learning' is used in its broadest sense to refer to the integration of classroom face-to-face instruction with some online and distance teaching, making it possible to blend the best features from both teaching methods.

Blended learning has been found to improve students' academic performance (Graham 2013), enable students' autonomy (Bruggeman et al., 2021), improve self-efficacy (Graham 2013), and increase students' intrinsic motivation to learn. Other advantages include increased access to courses while providing academic institutions greater access to the student population. These benefits are also echoed by Smith and Hill (2019), who report that blended learning demonstrated potential for personalized learning, enhanced learner outcomes, and promoted self-directed learning. Other benefits cited in the literature (Bruggeman et al., 2021; Banihashem et al., 2023) include pedagogical benefits, increased efficiency, and improved learning outcomes.

Despite the numerous strengths of blended learning, several weaknesses have been documented in the literature. Past studies (Osguthrope & Graham 2003; Owston 2013) have indicated that time constraints and re-design of the course are barriers to effectively implementing a blended learning model. Lomer and Palmer (2023) agree that stimulating students' engagement, lack of materials and technical problems are critical challenges in online contexts. Furthermore, Boelens, De Wever, and Voet (2017) cited stimulating students' interaction as a key challenge in online contexts. Similarly, Youde (2020) argues that among the shortcomings of blended learning, online peer-to-peer interaction is difficult with instructors. Another major criticism associated with blended learning is faculty's technical skills and literacy. Researchers suggest that in order to deliver a blended program, teaching academics are not only required to have content and pedagogical knowledge, but are also expected to possess technological skills. Therefore, continuous professional development is important, as faculty need to develop new technological and pedagogical skills to successfully deliver a blended learning model. Researchers conclude that failing to provide sufficient opportunities for professional development may lead faculty to fail to fully embrace an effective blended format and eventually, they will replicate their conventional teaching approaches (Garrison & Vaughan 2013). A review of the literature revealed that despite the widespread use of blended learning after the outbreak of COVID-19, research on instructors' views, attitudes, and perspectives of blended learning remains scarce, especially in the Middle Eastern context. This limited focus risks a somewhat narrow and impaired understanding of how blended learning is used in tertiary education in the region. To address this knowledge gap, this qualitative study focuses on the benefits, challenges, and barriers instructors perceive of blended learning pedagogy during the pandemic.

3 Research Methodology

This small-scale qualitative study is based on a constructivist approach that views reality as a shared social experience to gain in-depth insights into the lived experiences of instructors' blended learning experiences. Therefore, a case study design (Yin 2009) fits the purpose of the study. The study was carried out at a tertiary college in the UAE during the academic year 2020–2021. A convenience sample of eight instructors (female N = 3; male N = 5) with an average of 12–15 years of experience volunteered to take part

in this study. In this English course, students studied reading, writing, speaking, and listening over a course of 12 weeks. The program consists of a combination of online and on-campus classes, with a final on-campus online exam. In this blended model, the time students spend in the classroom will introduce them to new content skills, assign projects, and set out guidelines for the work to be completed at home.

Data were collected using semi-structured interviews following an interview guide to ensure consistency. Interviews were chosen as the primary data collection tool due to their ability to generate rich insights aligned with the research questions (Merriam 2009). Participants were interviewed individually for about 40 – 50 min. Each interview was audiotaped and transcribed verbatim. Sample of interview questions include: *In your opinion, what makes a successful blended/hybrid learning program?* To sustain credibility, member checks were used to validate the accuracy of the data. Braun and Clarke's (2006) thematic analyses were followed to determine patterns and sub-themes generated from the data. The thematic analysis allowed to reveal patterns across the data, which helped to understand different aspects of the phenomenon that participants experienced. First, data from the transcripts were reviewed and categorized to identify common themes and recurrent patterns. The sub-themes were grouped into three categories.

3.1 Ethical Considerations

All procedures performed in this study involving human subjects were in accordance with the ethical standards of the field. Ethical considerations suggested by Patton (2015) were practiced throughout the entire study. Informed consent was obtained from all of the participants prior to data collection. Furthermore, no names were used when reporting data from the interviews to protect participants' identities. The researcher also kept a journal to record rationales, notes, and personal reflexivity insights throughout the data collection and analysis of the research.

4 Findings and Discussion

The findings are presented based on the research questions. Three main categories emerged from the interviews. Table 1 outlines the subthemes discussed in the findings.

4.1 RQ1: What Benefits Did Instructors Perceive While Implementing Blended Learning in ESL Classrooms?

Theme 1. Accessibility, flexibility, and convenience

In line with previous studies (Graham 2013; Smith & Hill 2019), data analysis revealed that almost all of the participants found blended learning to offer increased accessibility and flexible and convenient teaching. Some participants also mentioned that attendance tracking was more efficient online. In addition, blended learning was reported to 'reduce lecture time', 'support meaningful learning', and facilitate students' self-directed learning. Comments include "*Students were accessing materials from their homes, cars and anywhere*". "*It is very convenient for students. They are able to do tasks on their own time*".

Table 1. Summary of the sub-themes that emerged from the semi-structured interviews

Benefits	Challenges
Improved accessibility, flexibility, and convenience	Increased academic workload
Timely and continuous learning	Technical issues
Pedagogical benefits	Lack of professional development
Enhanced students autonomy and self-efficacy	Insufficient resources
Personalized learning	Lack of IT skills
Promoted self-directed learning	Content redesign
Foster peer-to-peer interaction	Trust in the internet
Reduce lecture time	Stimulating students interaction
Promote active learning	Lack of effective communication
	Culture shift
	Pedagogical challenges

Theme 2. Timely and Continues Learning

A general analysis of the data revealed that the notion of ongoing learning outside the classroom is stressed, and it appears that there is a consensus that blended learning may foster active learning. Participants also stated that the biggest advantage of blended learning is that it enhances students' autonomy. One participant explained, "*Students are no longer passive learners. They are making quizzes and PowerPoints and helping their peers access materials*". However, one participant disagreed, "*We struggle with students who are coming fresh from high school with zero autonomy…it is their first time to study from a distance.* The participant further commented *"We have a new culture to deal with*". Another participant agreed that *"They are 100% responsible for their education*". These views are reinforced by Graham (2013) who acknowledged the benefits and the challenges of blended learning. More importantly, at least two participants reported that blended learning could empower instructors and learners by transforming teaching and learning methods from highly teacher-dominated to student-centered. Moreover, some participants had different opinions. One participant mentioned, "*Even if students are in class, they are still working online. We can't do group work. I don't think it is working!*" These findings are supported by previous research (Bruggeman et al., 2021; Thabet, Hill & Gaad, 2021) who recognized these issues in blended learning contexts.

Theme 3. Pedagogical benefits

Instructors confirmed that one of the pedagogical benefits of blended learning is increased efficiency. Nevertheless, one participant disagreed and expressed that "*Students were often passive online, and there were a lot of moments of silence.*" Another participant confirmed, "*Language learning does not happen in isolation*". Some participants emphasized the importance of providing workshops, webinars, and enough materials for students to help them learn how to research and look for information independently. Moreover, some participants noted that blended learning facilitated self-directed learning

and fostered peer-to-peer interaction. In contrast, a few participants had a different opinion. Several instructors mentioned that students' lack of 'independent study habits' was a problem. One participant noted, "*Students assumed fewer classes meant less work*." On the other hand, few participants mentioned that blended learning could provide students with valuable skills that the markets recommend. Thus, such technology creates opportunities for students to develop their creative skills, cognitive skills, critical thinking skills, and other higher-order thinking skills.

4.2 RQ2: What Are the Possible Barriers Instructors Perceived While Implementing Blended Learning in ESL Classrooms?

Theme 1. Increased academic workload

The majority of the participants mentioned that the academic workload increased with blended learning "*We have to edit, adapt, and create new materials to use in our online lectures*". This indicates pedagogical challenges, which are principally associated with the absence of standardized content. Another participant expressed frustration and thought, "*The demand on the teacher is too much*". Teaching faculty went on to state that "*We have to be creative and spend a lot of time preparing supplementary online materials*". One participant mentioned, "*I find myself doing two jobs. One at the campus and one at home*". It appears that with work from home (WFH), instructors reported longer and unlimited working hours as much of their time was spent on content-creating and providing students with feedback in online Zoom meetings. Based on the data, technological problems associated with Wi-Fi and the unreliability of the internet are the primary challenges of blended learning.

Theme 2. Technical issues

Based on the data, technological problems associated with Wi-Fi and connectivity are the primary challenges of blended learning. All of the participants confirmed that internet connectivity is one of the key challenges that face the effective implementation of a blended learning model. Some participants also mentioned that the technical difficulties are primarily linked to the unreliability of internet connections and the lack of required electronic devices for many students. Other issues underlined by participants were privacy, safety, and copyright materials. Prior studies (Clark & Post 2021; Mali & Lim 2021) confirmed these challenges in online environments.

Theme 3. Lack of professional development

Many of the participants agreed that the lack of professional development is one of the critical issues that should be addressed, as it could create an obstacle in fully adopting the blended learning system. Faculty stated that they needed time and support to implement change. Participants' comments include: "*I realized that I am a good teacher in the classroom, but online I am different*." Another participant suggested: "*It could have been helpful to have several PDs on how to use the new tools before moving online.*"

5 Conclusions, Limitations, and Future Work

This small-scale qualitative case study reported the views, attitudes, and perspectives of eight instructors teaching in an ESL program at a federal college in the UAE. Data from semi-structured interviews show that faculty may deliver blended learning classes more

efficiently with appropriate resources and training. The findings from the study show that instructors welcome the use of blended learning due to flexibility and convenience. However, it appears that instructors' views on learning autonomy and self-directed learning are inconsistent, as the majority of them did not feel that blended learning has improved students' learning outcomes. There are a number of potential limitations to this study. Foremost, the relatively small sample size may limit the generalizability of the findings. Second, the findings focus only on instructors' experiences in a single language program; therefore, caution should be observed in extending the study findings to other populations, settings and contexts. This study extends previous research by investigating instructors' perceptions of blended learning environments in a college in the UAE. By highlighting instructors' early experiences of blended learning, this paper contributes to the literature by improving our understanding of the term 'blended learning' environments. Furthermore, this qualitative study adds to the literature as it focuses on the benefits, challenges, and barriers instructors perceive of blended learning pedagogy during the pandemic. This study provides general implications for policy, practice, and higher education programs. The pandemic has sparked a revolution in UAE higher education, extending the policy to practice. Future studies should conduct a large-scale empirical study to measure the effectiveness of blended learning environments across higher education. In addition, the results from this study may provide stakeholders with data regarding the effectiveness and usefulness of the blended/hybrid academic delivery model, which could inform the design of programs across higher education in the UAE.

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UAE Parents' Awareness of the Importance of Programming to Primary Students, and Their Perspectives Towards It: A Quantitative Study

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Abstract. Purpose: Highlight programming's importance and explore parental views on its inclusion in UAE primary schools.
Methodology: Employing a quantitative approach, the study surveyed 499 UAE parents with primary school children. Their perspectives on programming and their children's attitudes towards it were gauged.
Findings: UAE's primary school programming education needs reform, necessitating enhanced parental and student awareness.
Implications: Educational policymakers should prioritize programming as a core subject, backed by this study. It adds to the literature on programming's value, highlighting parental awareness's impact on student attitudes.
Originality/Value: This research contributes practical and academic insights, guiding potential expansion. Educational leaders, especially in primary schools, can use these findings to improve programming education.

Keywords: programming · coding · block-based coding · TAM

1 Introduction

1.1 Background

This study highlights the importance of early programming education for primary students, fostering digital understanding and future skills. However, in UAE schools, challenges persist. Some parents view programming as a supplementary skill, potentially neglecting it for subjects like math and physics. UAE's educational policies should integrate programming widely in the primary curriculum, educating parents about its benefits to combat passive technology consumption.

1.2 Study Purpose and Questions

This study's primary goal is exploring parental awareness and viewpoints on programming education. It addresses these research questions:

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- How do parents view primary student programming education?
- Do parents recognize programming's importance?
- Can primary students grasp taught programming concepts easily?
- To what degree do parents cooperate in implementing proposed solutions to enhance programming teaching?

2 Literature View

2.1 Theoretical Framework

2.1.1 TAM (Davis, 1989)

Davis's Technology Acceptance Model (TAM) is highly relevant to our study's goal. TAM centers on two key factors influencing one's openness to adopting new technology: perceived usefulness and ease of use. These factors impact consumers' attitudes towards new tech and subsequently, their intention to use it (Cheng 2019). Parents who find coding unimportant and challenging might not support their kids in learning it. Conversely, if parents recognize coding's value and simplicity, they're more likely to encourage their kids. Some parents might not promote programming due to misconceptions about its complexity. Other TAM components include attitudes toward usage, reflecting the user's inclination to employ the technology. The blend of perceived usefulness and actual usage predicts the utilization attitude (Fig. 1).

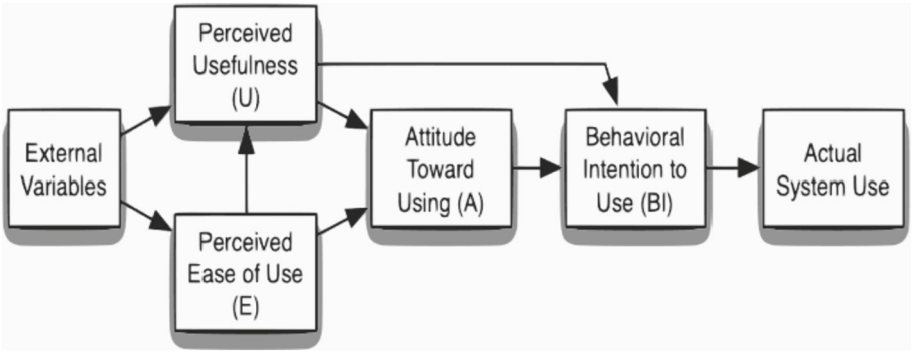

Fig. 1. Technology Acceptance Model (Davis, 1989)

2.1.2 Papert's Constructionism Theory (1972, 1980)

In his constructionism theory, extensively documented in technology literature, Papert (1972) suggests kids program computers, not vice versa. He introduced computational thinking, highlighting its empowerment potential. By granting children computer access, a user-friendly programming language, and peripherals for real-time actions, we offer them unparalleled ability for inventive, engaging projects.

These theoretical approaches go well together to serve the goal of this study, which is to consider programming as a critical skill for students' academic and future success.

2.2 The Importance of Programming

2.2.1 Programming Impacts on Students' Academic Development

Programming expedites cognitive development (Brackmann et al. 2017; Zhang & Nouri 2019), comparable to reading and writing as observed by Manches & Plowman (2017). It cultivates skills in science, math (Turan & Aydoğdu 2020; Scherer, Siddiq & Sanchez 2018), and STEM (Gunbatar & Karalar 2018; Master et al. 2017; Kucuk & Sisman 2017). Additionally, it unveils computer functions (Arfé et al. 2019; Manita, Durão & Aguiar 2021; Relkin, de Ruiter & Bers 2021 ; Román-González, Pérez-González & Jiménez-Fernández 2017). Psycharis & Kallia (2017) indicated coding enhances cognitive skills applicable to disciplines like Math, Engineering, and Science. Learning coding fosters critical thinking, social skills, problem-solving, and self-management (Popat & Starkey 2019; Schanzer, Fisler & Krishnamurti 2018; Scherer, Siddiq & Sanchez 2018). Psycharis and Kallia (2017) confirmed this via a quasi-experiment, noting heightened reasoning and math self-efficacy through the programming course.

2.2.2 Programming Impacts on Students' Future Achievement

According to the US Bureau of Labour Statistics (2022), information technology jobs will grow by 13 percent over the next decade, far faster than the average for all occupations. Similarly, Sheehan et al. (2019) maintain that the number of jobs in the information technology industry will increase by 12.5% over the next decade; correspondingly, the inclusion of computational thinking in school curricula should increase. Although perceptions of future jobs and competencies required for Industry 4.0-induced changes differ, there is widespread agreement that job profiles related to programming, mechatronics, robotics, data analysis, Internet of Things, design and maintenance of smart systems, process analysis, and bionics are the new job profiles required in smart factory systems (Jerman, Pejić & Aleksić 2020; Benešová & Tupa 2017; Tytler et al. 2019).

2.3 Programming Status in Educational Policies

Numerous countries promote coding in schools. The UK, US, Finland, Australia, Greece, and France have mandated programming from primary school (Rich et al. 2019). Obama's "Computer Science for All" initiative (2016) aimed to equip US students for the digital economy (Price & Price-Mohr 2018; Tran 2018). Trump's administration allocated $200M yearly, aided by Amazon, Facebook, and Google (Dickey 2017). England integrates coding into its National Curriculum (Williamson et al. 2019). Australia embraced coding with a $9M centre for teacher training (Williamson et al. 2019). Japan, Korea, and the UAE emphasize coding too.

Regarding the UAE, the Ministry of Education (2015) underscored coding's importance within the UAE Vision 2021, which prioritizes science, technology, and innovation as key drivers of growth and development. Ongoing efforts aim to adapt to sector advancements, aligning educational outcomes with global standards. Yet, there's uncertainty on how coding skills are taught, particularly in primary schools. The demand for a precise policy and strategic framework for their educational implementation and delivery is pronounced.

3 Methodology

3.1 Research Design

This study utilises a quantitative approach to report on parents' perspectives of the programming being taught to primary students at UAE schools.

3.2 Questionnaire Method Selection

The present research utilizes a Likert-type questionnaire using a five-point agreement scale (ranging from strongly agree to strongly disagree). A customized survey was given to parents having children in UAE primary schools. Google Forms was chosen for generating online questionnaires due to its simplicity for coding. In the questionnaire, "strongly agree" reflects full agreement, while "strongly disagree" signifies complete disagreement.

3.3 Sample Selection

The questionnaire was given to parents, not students, to avoid exposing young children to Likert-scale questions (Zeman et al. 2006). Children's emotional development is intertwined with other aspects, raising doubts about their understanding of such scales. The sample size choice is complex due to the unknown UAE parent population size. For unknown populations, the infinite population sample size formula is used, factoring in confidence level (95%), Z score (1.96), proportion (50% = 0.5), and margin of error (5% = 0.05). The formula: $S = Z2 \times P \times (1 - P)/M2$ Resulting in: $S = 3.8416 \times 0.25/0.0025$ $S = 384.16$ Thus, 384.16 participants represent UAE's unknown parent population.

3.4 Quantitative Data Analysis

The statistical information from the questionnaire was processed using SPSS version 23. The study involved 499 participants (70% mothers and 30% fathers) aged between 25 and 45. To enhance validity, responses indicating strong agreement or agreement were considered. A portion of these participants also offered valuable insights and suggestions through open-ended questions, which were integrated into the study's outcomes.

4 Data Analysis and Results

4.1 Quantitative Results

Gathered quantitative datasets underwent analysis through SPSS. The responses were tallied to determine the count and percentage of similar responses. The initial four questions aimed to gather demographic information, succeeded by nine Likert-scale questions. Using a five-point scale, these nine items were divided into five categories, each

requiring a corresponding response (ranging from strongly agree, agree, neutral, disagree, to strongly disagree). The participant pool consisted of 499 parents (445 mothers and 54 fathers), with a gender distribution of 89% females and 11% males (Table 1).

Table 1. Demographics of parents

Participant	Frequency	Percentage
Male	54	10.8
Female	445	89.2
Ethnicity		
Emirati	115	23.0
Egyptian	205	41.1
Palestinian	35	7.0
Jordanian	54	10.8
Lebanese	4	.8
Lebanon	11	2.2
Moroccan	9	1.8
Omani	1	.2
Pakistani	3	.6
Saudi	2	.4
Somali	1	.2
Sudanese	15	3.0
Syrian	33	6.6
US	1	.2
Yemeni	2	.4
Canadian	1	.2
Algerian	3	.6
Indian	1	.2
Iraqi	1	.2
British	2	.4

(*continued*)

Table 1. (*continued*)

Participant	Frequency	Percentage
Child's school curriculum		
Ministerial	155	31.1
British	222	44.5
American	122	24.4

The outcomes of the initial inquiry indicate that a majority of respondents recognize programming's significance. Nevertheless, 7.6% expressed uncertainty, 2.4% disagreed, and 0.4% strongly disagreed (Table 2).

Table 2. Programming Impact

	Frequency	Percent
Strongly Agree	277	55.5
Agree	170	34.1
Neutral	38	7.6
Disagree	12	2.4
Strongly Disagree	2	.4

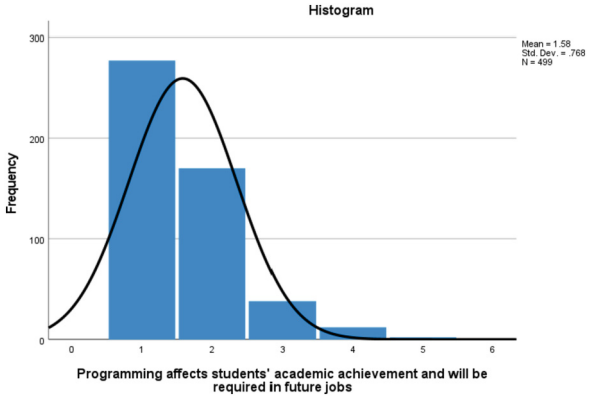

Fig. 2. Programming Impact

The following query is: Are parents aware of programming's utility? The level of agreement reaches 89.9%, while 7.2% remain neutral and 3% disagree with instructing young students in programming (Fig. 2, Table 3).

Table 3. Programming Necessity

	Frequency	Percent
Strongly Agree	248	49.7
Agree	200	40.1
Neutral	36	7.2
Disagree	15	3.0
Strongly Disagree	0	0

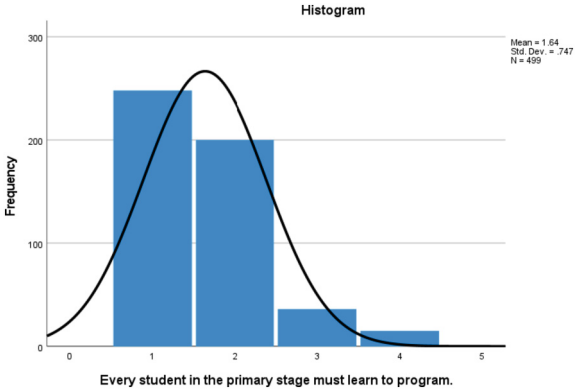

Fig. 3. Programming Necessity

Question three queried participants about programming's clarity in their kids' school. Scores ranged from 1 (strongly disagreed) to 5 (strongly agreed), reversed for clarity assessment. A "positive" response was if "strongly disagreed" or "disagreed" in the reversed question. Roughly 50% found the purpose unclear, 29.3% were neutral, and 19.2% felt clarity regarding programming's goal in their children's school (Fig. 3, Table 4).

Table 4. Programming Goal (Reverse)

	Frequency	Percent
Strongly Agree	11	2.2
Agree	85	17.0
Neutral	146	29.2
Disagree	170	34.0
Strongly Disagree	87	17.4

The fourth inquiry aims to confirm the appropriateness of the programming curriculum. The diagram below illustrates the correlation between the school curriculum and children's ability to grasp it (Fig. 4).

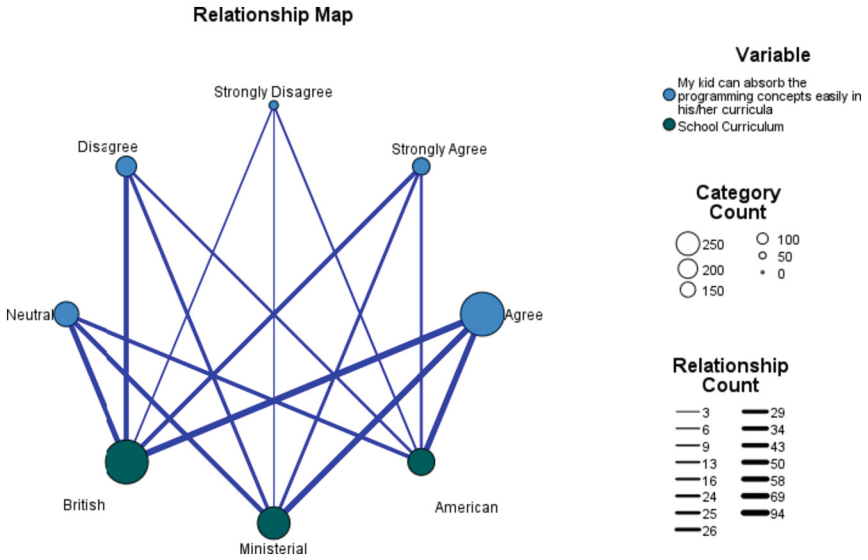

Fig. 4. Relationship Map

Unexpectedly, a considerable number of parents indicated that their children could readily grasp programming topics in school. Satisfaction and dissatisfaction ratios were similar across all schools. Ministerial schools had the highest satisfaction at 60%. British schools scored 55.4% and American schools followed at 58.1%. Importantly, a clear programming goal correlated with students' understanding. Clarity on coding's purpose led to better comprehension in schools (Table 5).

Table 5. Correlation.1

		Students' ability to understand	The school's obvious goal
Students' ability to understand	Pearson Correlation	1	.185**
	Sig. (2-tailed)		<001
	N	499	499
The school's obvious goal	Pearson Correlation	.185**	1

(*continued*)

Table 5. (*continued*)

		Students' ability to understand	The school's obvious goal
	Sig. (2-tailed)	<001	
	N	499	499

Questions five and six validate the recommendation's viability. Can parents support kids with external guidance or need workshops? 65% can assist, 16.6% cannot guide in programming (Table 6).

Table 6. Programming Guidance

	Frequency	Percent
Strongly Agree	93	18.6
Agree	236	47.3
Neutral	87	17.4
Disagree	67	13.4
Strongly Disagree	16	3.2

While many parents claim they can guide their children, 90.4% agree training is needed for programming assistance. 6.8% are uncertain, and 2.8% disagree (Table 7).

Table 7. The need for programming workshop

	Frequency	Percent
Strongly Agree	254	50.9
Agree	197	39.5
Neutral	34	6.8
Disagree	12	2.4
Strongly Disagree	2	.4

The last questions address the second recommendation: dedicating more time and resources to programming and making it mandatory to cover all concepts. High agreement was seen in both questions (93.4% and 85.8%) (Fig. 5, Table 8).

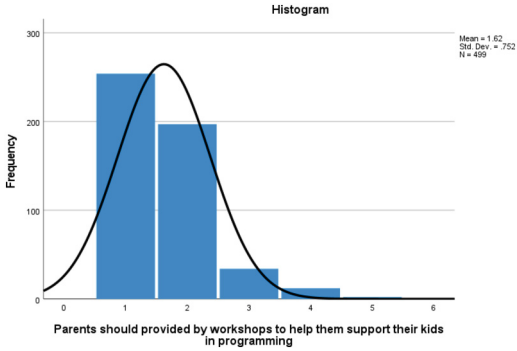

Fig. 5. The need for programming workshop

Table 8. Time and Resources

	Frequency	Percent
Strongly Agree	274	54.9
Agree	192	38.5
Neutral	20	4.0
Disagree	11	2.2
Strongly Disagree	2	.4

Table 9. New Programming Subject

	Frequency	Percent
Strongly Agree	231	46.3
Agree	197	39.5
Neutral	43	8.6
Disagree	22	4.4
Strongly Disagree	6	1.2

Items in the questionnaire were split into "programming value perception" and "recommended education enhancements". SPSS's "compute variables" function combined related items in each category into single variables. "Perception" summed parents' grasp of programming's value. Similarly, "recommendations" reflected their support for researcher-suggested solutions. Table 11 illustrates the positive link between understanding programming's importance and backing proposed solutions (Table 9, Table 10).

The researcher included an elective open-ended question at the questionnaire's conclusion, inviting participants to share any thoughts or suggestions. Several participants

Table 10. Correlation.2

		Parents' Perception	Recommendations Acceptability
Students' ability to understand	Pearson Correlation	1	.506**
	Sig. (2-tailed)		<001
	N	499	499
The school's obvious goal	Pearson Correlation	.506**	1
	Sig. (2-tailed)	<001	
	N	499	499

shared their insights and recommendations, which have been taken into account in the study's findings.

5 Discussion of the Results

The paper underscores programming's skill-enhancing importance and explores parents' awareness and views on programming education, proposing solutions for improved implementation in UAE primary schools. Questionnaire outcomes, discussed within the study's scope, revealed most parents recognizing programming's value, though a few were uncertain. Some parents displayed confusion, with one associating programming with TV shows like Netflix. This highlights a misunderstanding of programming. Responses to the third question indicated unclear school programming goals, possibly affecting student motivation. While most parents believed primary school children could comprehend the curriculum, their overall confusion casts doubt on this. Some parents felt capable of aiding their kids in programming, but many acknowledged the need for training. As for dedicating more resources and time to programming education and introducing it as a distinct subject, there was widespread agreement and minimal disagreement among parents.

6 Conclusion

6.1 Major Findings

This study highlights coding's importance for primary students and aims to gauge parental awareness and students' grasp of programming concepts. The intention is to prompt officials and decision-makers to enhance this learning process. Most parents affirmed their children's enjoyment and understanding of programming curriculum. Some parents, however, confuse programming with technology. A majority recognized the need for training. Agreement was unanimous for dedicating more resources and time to programming education and making it a separate subject. In conclusion, this study

echoes Papert's constructionism theory, emphasizing students programming computers. Learning coding empowers students to control technology, aligning with developed nations' focus on programming education. Comparatively, UAE's policies lack in this area, urging educational policy adjustments and parental awareness to support students effectively.

7 Implications for Action

Based on these findings, this study suggests several actions to enhance programming learning:

- Boost parental understanding of programming's importance and benefits for students through workshops.
- Develop a curriculum suited to their comprehension level, facilitating gradual progression.
- Integrate programming with other subjects for holistic learning.
- On a larger scale, the Ministry of Education should consider establishing a separate core subject solely for programming, distinct from ICT, covering all principles and skills.

8 Limitations and Future Recommendations

While this study contributes significantly, there are limitations affecting its validity and generalizability. Firstly, some participants misunderstood programming, influencing their responses. Addressing this, future research should clarify the concept beforehand and inquire about participants' educational background. Additionally, teacher experience and effectiveness were overlooked, which can impact learning. Future research should assess teachers' coding teaching skills. Moreover, exploring coding's integration with subjects like math and science could be explored in subsequent studies.

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Developing a Draft Curriculum Framework for Learners with Severe and Multiple Disabilities in UAE Schools Through Analysis of Relevant Literature

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Abstract. This study is one of the first to investigate Learner with Severe and Multiple Disabilities curriculum frameworks in UAE schools. It will improve inclusive education in formal settings, prepare stakeholders in the region to work with students with disabilities in schools, and accept the UNESCO vision to perform more research in this sector. It aims to develop a draft of the curriculum framework for Learners with Severe and Multiple Disabilities in schools in the UAE.

To achieve the objectives of the study, the systamtic literature review method was used for data collection. Interestingly, the findings of the study revealed that designing a curriculum framework for Learners with Severe and Multiple Disabilities requires taking into consideration several aspects such as the curriculum itself, whether it is a general or functional curriculum. Other aspects include special teaching techniques, cooperation between stakeholders and the team, curriculum accessibility, efficiency of the assessment process, and the incorporation of technology.

Keywords: Learners with Severe and Multiple Disabilities · inclusion · curriculum framework · inclusive education

1 Introduction

The education system has witnessed in the last few years an active worldwide movement to advocate for learners with disabilities rights. The CRPD and UNESCO emphasized the importance of providing equal education and equal opportunity to learners with disabilities. The UNESCO seeks to achieve goal number 4 from the Sustainable Development Goals (SDGs) that guarantees inclusive education for all (UNESCO 2018).

The IDEA (2017) sought to achieve inclusive education by addressing the curricula and learners with disabilities. While Every Student Act (n.d.) demanded that schools provide an accessible environment for learners to be able to learn from general curricula.

The prevalence of Severe and Multiple Disabilities in society is about 1–2 per 1000, as indicated by the Executive Office of the Council of Ministers of Labor and the Council

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of Ministers of Social Affairs in the Arab Gulf Cooperation Council (2017). However, there is a limited number of studies about the inclusion of LSMD in Arab countries. Furthermore, UNESCO (2020) stated that in Arab countries, the quality of education for learners, including learners with disabilities, is uneven and variable. Additionally, there are still LSMD who are denied their right to an inclusive education (Agran et al. 2020), despite several studies and appeals highlighting the value of inclusive education and its benefits for all students, including those with Severe and Multiple Disabilities (Alquraini & Gut 2012).

Thus, there are persisting questions about achieving a balance in the education of this category within the academic framework and functional curriculum, in addition to concerns about the accessibility of this group to the general education curriculum. As a result, this study will contribute to enhancing the quality of inclusive education in formal settings, preparing stakeholders in the region to engage and work adequately with learners with disabilities in schools, and adopting the UNESCO vision to do more research in this field.

This paper aims to develop a draft of the curriculum framework for Learners with Severe and Multiple Disabilities in schools in the UAE by critically analyzing the relevant literature.

The author divides the paper's aim into four objectives: identify the main characteristics of LSMD, understand the importance of including it in the regular classroom, research the latest LSMD curricula, and understand the critical educational components shaping the curriculum framework. And attempts to answer the following questions:

1. What are the main characteristics of LSMD?
2. Why it is important to develop an initial curriculum framework for LSMD in schools in the UAE?
3. What are the curriculum options available to LSMD?
4. What are the critical educational components to build the target curriculum framework?

2 Methodology

The significance of research design comes from structuring the study to respond to the research question considering the available data and warrants (Jansen n.d.). Therefore, the current study adopted the systematic literature review as a data collection tool to answer the research questions and coded this literature for reaching the findings and conclusion (Hallinger 2013; Onwuegbuzie & Leech 2015). According to Munn et al. (2018), the goal of this type of research is to concentrate on a particular topic, identify gaps and patterns in the available information, and guide future studies in the field. It concentrates on a certain set of issues and independent documents (Xiao & Watson 2019).

The author designed the literature review process and protocol by planning, reading, screening and analysing, authoring, and amending. (Machi & McEvoy 2016; Durach, Kembro & Wieland 2017). A study was carried out using various academic databases and journals (SAGE Journals, ProQuest, BUiD library). Priority was given to updated references for the last ten years matching the keywords. The author carefully assessed

the studies which were relevant to the aim, research questions, and inclusion\exclusion criteria such as year of publication, keywords and sufficient relevant details (Hammick, Dornan & Steinert 2010; Mthimunye & Daniels 2019). The study accepts the qualitative and quantitative research in the synthesis of data to provide a comprehensive picture related to LSMD (Hallinger 2013; Machi & McEvoy 2016).

The author adopts Suri (2019) ethical consideration which are: choosing an epistemological orientation, choosing a suitable goal, finding related literature, analyzing, interpreting, and synthesizing reports, and connecting ideas. The first exploration produced 41 articles. The subsequent stage resulted in 22 articles being obtained based on the final inclusion and exclusion decision.

Following the completion of the literature analysis, the author adopted thematic analysis and generated three themes for the current study that were formed using the data that had been retrieved through the collection of relevant information. Then, Finish by interpreting the findings and coming to conclusions considering the data offered in the papers you read (Hammick, Dornan & Steinert 2010).

3 Literature Review

Learners with Severe and Multiple Disabilities

The literature debates the utilization of several terms to refer to LSMD such as Sever Disabilities, and Profound and Multiple Learning Difficulties. However, there was no concise definition since they are a heterogeneous group. For instance, the Executive Office of the Council of Ministers of Labor and the Council of Ministers of Social Affairs in the Arab Gulf Cooperation Council (2017) defined a person with profound disabilities as someone who has severe levels of cognitive, communicative, social, or physical disability. The National classification of Disabilities in the United Arab Emirates (2018) defined the Multiple Disability as a person who has a disability that can be categorized under one of these categories (sensory disabilities, physical disabilities, neurodevelopmental disorders, psycho-emotional disorders) accompanied by one or more other cognitive, communicative, social or motor disturbances, excluded hearing and visual impairment together and those who have two types (sub-categories) of neurodevelopmental disorders.

South Lanarkshire Council (2015) confirmed that LSMD have faced real challenges in different developmental areas and skills such as communication, cognitive complex health needs, and physical disabilities. LSMD lacks self-care and self-direction and exhibited a deficiency in life skills (Al-Otaibi & Alshalawe 2016). Therefore, they derived from these characteristics the incessant demand to provide immense support for these learners. Further, LSMD have problems with their health and mental well-being which affects their engagement level and communication (Lehr 2020).

In conclusion, the term ‘Severe and Multiple Disabilities’ refers to someone suffering from one or more physical, cognitive, or developmental disabilities with severe deficiencies in one or more of the developmental areas, excluding hearing and visual impairment.

Peer-reviewed research by Alquraini and Gut (2012), Ballard and Dymond (2017) reported that although there are significant challenges in the inclusive education of

LSMD, the continuous advocation for their right to enroll in schools is necessary. Their inclusion has benefits at the level of the LSMD, society, and stakeholders.

The attendance of LSMD in a regular classroom alleviated their social interaction skills, motor skills, communication skills and academic performance (Al-Otaibi & Alshalawe 2016; Agran et al. 2020).

Models of Curricula for LSMD

Ballard and Dymond (2017) reported that the type of curriculum for LSMD consisted of three elements are the balanced curriculum, meaning that the curriculum is evenly distributed between standards-based curriculum and other curricula attending to the specific needs and academic and pragmatic skills of LSMD for all ages, the social skills, and the academic exposure.

South Lanarkshire Council (2015) focused on the Curriculum for Excellence, which places the learner at the center and claims to provide a comprehensive education experience by encompassing the eight curriculum domains.

In Finland, the EHA2 Curriculum was established by considering the normal psychological development of children in the four essential developmental areas (Kontu & Pirttimaa 2010). Ballard and Dymond (2017) raised an important point regarding meeting the curriculum requirements for LSMD. They suggested curriculum overlapping and a multilevel curriculum as a good example.

In the United Arab Emirates Ministry of Education Special Education Dept. (2010) developed several special education programs to serve learners with disabilities focusing on inclusive education environments, rather than targeting the curriculum itself. These programs were classified based on learning, from the least to the most constraining environments. And recently the policy in some states has been updated to lest the vocational curriculum as an option for LSMD (KHDA 2017).

In principle, Al-Otaibi and Alshalawe (2016) stated that the curriculum should be a comprehensive curriculum incorporating school, daily life, social, vocational, and recreational skills.

Educational Considerations to Formulate the Curriculum Framework

The mission of the United Arab Emirates Ministry of Education Special Education Dept. (2010) is to deliver full comprehensive support to learners with special needs in the educational sector through several considerations, such as the Individual Education Program (IEP) or Advanced Learning Plan (ALP). Similarly, IDEA (2017) stressed the importance of delivering IEP to LSMD in the general curriculum. The South Lanarkshire Council (2015) provides a similar service under the name Personalized Approach and Additional Support Plan (ASP). It recommended implementing both the process and task-based methods in the ASPs, although the process-based method could provide better clarity in goals formation and monitoring. This is significant for the follow-up phase of the learner's progress.

On the other side, activating the role of stakeholders is important to ensure adequate access for learners to the curriculum in the classroom (United Arab Emirates Ministry of Education Special Education Dept. 2010; Ballard & Dymond 2017). Alquraini and Gut (2012) identified the roles of stakeholders, which are prioritizing the unique needs of LSMD, recognizing the goals of LSMD, and maintaining productive communication

between school team members and learners. Accordingly, the duties of stakeholders are mainly centered around the needs of LSMD.

The competence of the teachers to handle and teach learners with disabilities is one of the most important pillars during the preparation of the curriculum. Therefore, Alquraini and Gut (2012) and South Lanarkshire Council (2015) reported that teachers should thoroughly understand the characteristics of LSMD.

The teaching method is an integral part of applying the curriculum. The teaching practices in the South Lanarkshire Council (2015) followed a learner-centered approach by focusing on active participation and communication, as well as creating a responsive learning environment and incorporating suitable learning activities in small groups.

However, Alquraini and Gut (2012) highlighted in their study a new method for teaching practices founded by Copeland and Cosbey to help LSMD which are a) Cooperative Learning, b) Inquiry Learning and c) Universal design. Additionally, they discussed Embedded Instruction and Response Prompting techniques. In conclusion, a unique and flexible teaching approach is urgently needed for the education of LSMD.

Few studies talked about the role of implementing Assistive Technology (AT) as a supportive tool for LSMD. Alquraini and Gut (2012) in line with IDEA (2017) emphasized implementing AT as an important educational tool for LSMD.

Assessment practices should be closely supervised during assessment and progress monitoring. The Council highlighted that the assessment process is a formative assessment and should be carried out more intensely at the beginning of the school year (South Lanarkshire Council 2015). Consequently, three-step assessment criteria development. All team members repeatedly observe, the first and most important stage in the assessment. The second phase, organised assessment, involves observing and documenting in a flexible assessment setting. One-on-one assessments in quiet environments are best. Progress monitoring tracks LSMD's curriculum growth. Qualitative data collecting follows this stage.

According to UNESCO (2018), there should be more emphasis on providing instructional tips and training for parents. Parents have an important underestimated role that should be accounted for when contemplating any curriculum. The role of parents is to engage efficiently in an inclusive environment. Parents are the first teachers to their children, so targeting them and involving them is essential (United Arab Emirates Ministry of Education Special Education Dept. 2010; Alquraini & Gut 2012).

Alquraini and Gut (2012) concurred with Ballard and Dymond (2017) to divide the factors of curriculum accessibility for LSMD into 4 factors are: 1) positive learning community 2) adult support which consists of attaining support to facilitate the delivery of the curriculum from specific 3) modification and accommodation which are essential requirements to get access to the curriculum for LSMD collectively by all team members. Alquraini and Gut (2012), associated a strong relationship between the appropriate modification and the academic benefit that LSMD receive from the curriculum. Interestingly, United Arab Emirates Ministry of Education (2020) applied the Emirates Code for a qualified and approved environment. 4) location of education delivery for LSMD, is still undefined. Ballard and Dymond (2017) listed different options based on studies such as a regular classroom, special education classroom, and non-classroom environments. However, the consensus for the best location was one where the accessibility of literacy

skills can be reached through everyday life skills. The United Arab Emirates Ministry of Education (2020) is still working on preparing the operational policy, regulations, and executive procedures to determine the most appropriate place for providing education programs for learners with disabilities in general.

4 Discussion and Finding

The literature demonstrates that LSMD has a distinct and complex range of characteristics (Alquraini & Gut 2012; South Lanarkshire Council 2015). These characteristics underscore the significance of the present study, which aims to develop a curriculum that ensures their entitlement to an education that aligns with their specific requirements. Indeed, Literature showed that there were benefits of integrating LSMD in schools. Alquraini AND Gut (2012) for example mentioned that this inclusion improved the academic performance and social-communication skills of LSMD. While Ballard and Dymond (2017) stated that inclusion has benefits at the level of the LSMD, peer, and society.

Interestingly. LSMD have access to a variety of curriculum options that can be implemented while they are in school. In order to accomplish the vision of inclusive education, the majority of these curricula emphasise integrating the academic aspect with the skills and needs of the learners (Kontu & Pirttimaa 2010; South Lanarkshire Council 2015; Ballard & Dymond 2017). In the United Arab Emirates Ministry of Education (2020) took significant steps to enhance their inclusive policy by incorporating various programs, services, and curriculum modalities.

To develop a curricular framework, the literature highlights many key aspects, which are outlined below:

1- Adopting the IEP model or any other similar model is a necessity (Alquraini & Gut 2012; Individuals with Disabilities Education Act 2017; MOE 2021).

2-Teaching methods such as cooperative learning, inquiry learning, and universal design could be new useful strategies (South Lanarkshire Council 2015; Dymond & Carter 2020).

4- Proposing the use of assistive technology to access the curriculum (Alquraini & Gut 2012). Additionally, the different roles of adequate modification and accommodation, the role of peers, a positive learning environment, and a collaboration between teams (Ballard & Dymond 2017).

5- Conducting an adequate assessment (South Lanarkshire Council 2015).

6- Incorporating health and mental wellbeing in the curriculum framework (Lehr 2020).

Figure 1 provides a comprehensive overview of the key findings pertaining to the various components of the curricular framework.

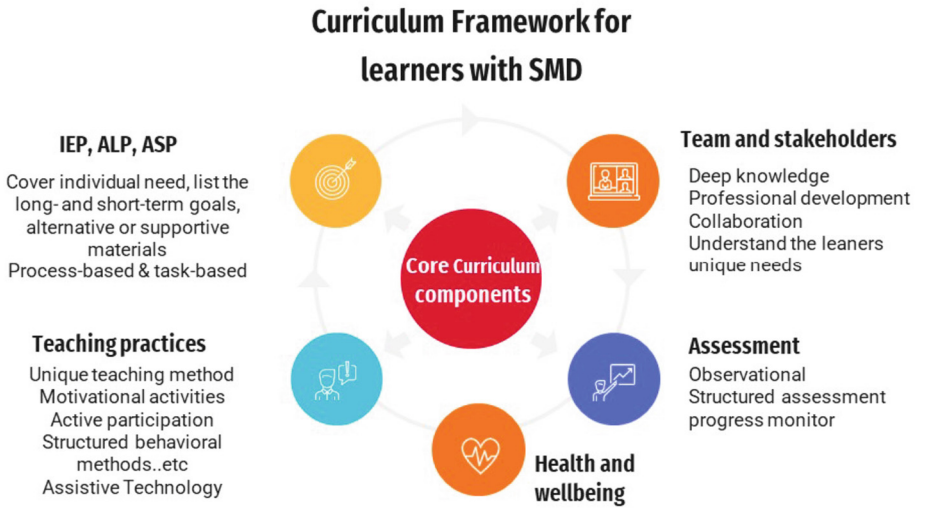

Fig. 1. The draft of the curriculum framework for learners with SMD

5 Recommendation

The findings in this study clearly illustrate how to develop a curriculum framework for LSMD and specifically underline the educational components that should be attached to this group. Regarding schools in the UAE, it is recommended to do a pilot trial in a small number of schools and examine the outcomes. Future studies should look at each educational element in detail to allow researchers to investigate how well each element contributes to the development of the curriculum framework.

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The Emerging Nature of ICT Policies in Education: A Comparative Analysis of School ICT Policies

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Abstract. Purpose- The role of ICT in education is not new but the manner in which technology in education is perceived, valued and implemented is in constant flux.
Methodology- This paper uses a comparative approach to examine ICT school policies, pre and post pandemic, to explore key issues of focus and relevance.
Findings- As a result of the Covid-19 pandemic, technology became ubiquitous in education and it is now imperative that we consider the extent to which it is appropriate for use, sustainable and supported. ICT has the potential to transform the learning environment but it must be understood, implemented and managed responsibly.
Implications- The paper looks at the role of leadership and key stakeholder engagement in this process, from a teacher and student perspective.
Originality/value- Drawing on a detailed literature review and in-depth document policy analysis, this paper considers the framework for implementation and identifies key components required for the design and development of a relevant ICT school policy.

Keywords: ICT · School Policy · Educational Technology

1 Introduction

Information and communication technology (ICT), a major component of modern life in the digital age and a knowledge-based society, is equally relevant in the field of education. ICT was widespread prior to the pandemic but was tailored and bespoke in its usage, with clear evidence of structural approaches and policies in place that focused on school internet access, and teacher training (Liu, Toki & Pange 2014).

There has been a lot of emphasis on advocating the use of ICT in education; in many nations, there have been various strategies and systems targeted at teachers and educators (Szyszka, Tomczyk & Kochanowicz 2022). Analysis of these developments must take into account context and capacity to determine the extent to which implementation is relevant and sustainable. This paper evaluates two institutional ICT policies within the British context. The two schools are Ysgol Treffynnon reviewed in October 2015 (pre-pandemic) and St. Helena Community College reviewed in November 2021 (latter

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stages of the pandemic). Both policies have specific aims; including facilitating learning and providing opportunities for learners. This paper provides, in context, an analysis of the strengths and weaknesses of the two policies regarding stakeholders, teachers, and students' involvement.

2 Literature Review

ICT, appropriately implemented, can enhance the educational approach and reinforce the significance of education to the progressively digital workplace (Tinio 2003). In public educational organizations, ICT-centred programmes and educational techniques are being used to encourage practical experimental learning. Schools, and instructors are incorporating ICT in classrooms and other learning environments, encouraging learners to participate in individualised, group-based, online, and collaborative learning and develop new strategies for instruction and evaluation (Kozma 2008).

2.1 Educational Administration and Stakeholders

The administration of ICT works to guarantee that educational goals are achieved by making the best use of available infrastructure (Jacob, Jegede & Musa 2020). There is a requirement, however, to work with teachers in order to ensure successful implementation and this involves revising policies to take advantage of the latest technologies. To evaluate the applicability, relevance, and clarity of the ICT policy, regular stakeholder input is required.

Policymaking and system designing, recruitment and expansion, curriculum improvement and educational programmes, student staff management, and curriculum progress, are among the fundamental duties of the educational administration (Ilgaz & Gülbahar, 2015). Being excluded from the policy-making procedure can cause stakeholders to lose interest in the process of developing policies or putting them into action (Castro Sánchez & Alemán, 2011).

It is imperative to expand the application of ICT in education through both team-based education and administrative assistance. However, teachers' enthusiasm to digitise their teaching, often relies on leadership and active support for the use of new media in the classroom. Multivariate regression analysis revealed that positive managerial support was a critical component in promoting the application of ICT in education (Szyszka, Tomczyk & Kochanowicz 2022). Therefore, educational administrators must offer their educators noticeable support to help stimulate the implementation of ICT in classrooms.

For ICT to be successfully implemented in the classroom, the school's organizational formation must be altered to promote technology application across subject, department, and school borders (Al Mofarreh 2016). It is crucial to create framework conditions that enable teachers to integrate technology into their daily school assignments and ensure leadership awareness. These involve peer learning, a collective preparation period, and collaborative work. This is essential since teachers need to track students' progress and assess their performance (Al Mofarreh 2016). Policies should include a clear description of evaluation and assessment procedures as this is a continuous process (Al Mofarreh 2016).

COVID-19's abrupt shift to online instruction established the ultimate circumstances for governments to acknowledge the advantages of Emergency Remote Teaching (ERT) and consider ways to enhance ICT policies. The outdated rules for traditional educational environments do not provide a suitable set of knowledge and abilities for the digital learning world (Choi, Chung & Ko 2021). As a result, coaching for digital proficiency must not merely emphasise overall technological understanding but include hands-on instruction for coping with online schooling and learning tools.

To sustain improvement in teaching, the integration procedure should be facilitated along with the improvement of ICT organisation and plans for professional development of educators. Schools often embark on the preparation procedure for ICT by creating and establishing schools' ICT structure, attempting to match curricular needs to the infrastructure, and then launching professional development plans (Al Mofarreh 2016). Schools are therefore encouraged to incorporate technology into all areas and levels of learning. Once this is done, students can use technology to achieve higher levels of perception in particular learning environments (Fu 2013).

2.2 Teachers

ICT can offer a platform for educators to implement and create various methods to improve learning environments (Ngao, Sang & Kihwele 2022). ICT can help transform a teaching environment from teacher-centred to student-centred. Since learners in ICT classrooms are enthusiastically engaged in the learning process, the teacher empowers them to make decisions and becomes the facilitator in class. As a result, ICT broadens educational scopes and options for students and teachers (Fu 2013).

Teachers' digital competencies also need to take into account flexible approaches toward applying technology, as evidenced by unforeseen events like compliance and awareness of exterior environments, such as the COVID-19 outbreak (Choi, Chung & Ko 2021). ERT shows how teachers' responsibilities in digital environments have changed over time; today's teachers are held accountable for students' development in many areas.

Qualified teachers have access to a wide variety of teaching and learning resources offering new prospects and demands for both educators and pupils to transform the data into useful knowledge to preserve, comprehend and share in a supportive learning atmosphere (Jacob, Jegede & Musa 2020). Through its application for lesson planning, guided approach, and teaching and learning assessment, ICT in schools can reduce teacher work load. Instead of merely dispensing information, teachers will take on new roles as learning facilitators, collaborators, coaches, mentors, knowledge navigators, and co-learners (Jacob, Jegede & Musa 2020). Teachers need more creativity in adapting and customizing their teaching materials. A teacher should use ICT more creatively and productively to design more engaging and demanding activities and more efficient teaching. Ilgaz and Gulbahar (2015) argued that providing schools with technology would not enhance the value of instruction if teachers lacked the skills to utilise them efficiently.

ICT integration takes place when teachers are aware of how ICT is used and how it is taught in the classroom (Al Mofarreh 2016). Because increasing digital literacy guarantees the constant application of ICT in education, teacher educators must revise

their digital abilities. As a result of the technological transformation, there are now numerous ICT-associated systems, software, and appliances that need to be learned to improve teachers' learning and comfort in employing them in the classroom. Teachers who have been in the educational field before the surge of technology tend to prefer more traditional teaching methods and are less prone to apply technology inside their classrooms. Additionally, teachers and other stakeholders may have personal characteristics that either hinder or facilitate ICT incorporation. Older professionals may struggle due to age (Al Mofarreh 2016). If the right resources are appropriately used, learning can be both simple, fun, and engaging. Thus, ICT coaching must include self-instructed techniques that enable teachers to fully comprehend the advantages of ICT in alignment with their teaching styles. This might involve making use of the available technology, such as online development courses.

2.3 Students

ICT incorporation enables students to retrieve massive amounts of content accessible online. By carefully choosing the right resources, it is less likely that students will have access to fake materials that could compromise their ability to learn (Ngao, Sang & Kihwele 2022). Furthermore, ICT provides students with the tools they need to face social, academic, and professional needs as the world shifts into the digital era (Al Mofarreh 2016). Such an environment requires new skills and knowledge necessary for individual and career development.

Learners must acquire certain fundamental technical competencies to take advantage of online learning (Ilgaz & Gülbahar 2015). Students use ICT to uncover learning topics, unravel questions, and offer explanations to challenges encountered during the learning process. ICT facilitates knowledge achievement and concept understanding in learning areas by engaging students (Fu, 2013). It offers additional innovative explanations for various styles of learning inquiries but students must possess the necessary ICT participation abilities to accomplish this (Al Mofarreh 2016). ICT can improve students' independence, skills, and creativity. It is changing the traditional teacher-centric approach. Extended exposure to an ICT environment can enhance students' critical thinking skills.

Technology is viewed as key to potential student learning outcomes as well as preparing students for a progressively more digital world. Liao et al. (2017), for instance, show that applying technology to assist student learning progresses will groom them for the digital world.

3 Methodology

This paper adopts a comparative analysis approach, underpinned by document analysis. This study explores the use of ICT policies in two schools within the British context: Treffynnon and St. Helena Community College. The researchers intentionally selected a policy reviewed before the pandemic and one reviewed during the pandemic. This study examines three aspects: Leadership team involvement, teachers' involvement, and students' involvement.

4 Findings

Ysgol Treffynnon's ICT policy was adopted on October 1st, 2014, and reviewed on October 1st, 2015. St. Helena produced and reviewed its ICT policy in November 2021. Both institutions offer chances to their pupils to learn how to utilise ICT safely and constructively in the classrooms.

Ysgol Treffynnon's the overall aim is for ICT to deepen learning for all learners and guarantee that teachers are competent and confident to apply ICT effectively in their classrooms, and aid students to develop their ICT skills. Since ICT is a core subject and the school's target is to facilitate technology use, the school provides four venues across the premises and a supplementary suite in the ICT department. Moreover, there is a small suite for private study, and "Free" slots available upon booking.

St. Helena's ICT policy aim is for all consumers of ICT to understand and consent to the attempt to develop ICT skills, clarify its outlook, ensure uniformity in application, and apply it securely. ICT coordinators aim to create lifelong learners. At St. Helena, the policy states that it has only one limitation which is bandwidth problems. They aim to help all staff use suitable and practical sources as tools for learning.

The schools are aware of the significance of ICT to evaluate, share, and present information wisely and positively. Both have been supplied with computers, tablets, printers, scanners, digital cameras and videos, and smartboards that all have access to the internet.

4.1 Leadership Team Involvement

School administration in both institutions play a pivotal role in providing adequate technological tools to staff and students. They also provide necessary workshops to enable integration of technology into the learning process.

Ysgol Treffynnon's ICT leadership team reviews the policy holistically every three years. Technology is used effectively at the school to enable access to both staff and students. The school's administration network allows staff to retrieve electronically students' data, timetable, and attendance. The policy design includes a section for security and health and safety measurement while students use any means of technology at school. It provides a secure and reliable online atmosphere through purified internet entry. The school acknowledges the significance of spreading awareness of online safety. Learners are held responsible when using ICT and the leadership team monitors its application in the institution.

Stakeholders provide a safe online environment through purified internet admission. Furthermore, the policy states that the leadership team provides an annual budget for maintenance, equipment, and any network services. The ICT department is responsible for erasing data on any discarded equipment. To ensure the comprehensive removal of data, the school is registered with the Environment Agency as a Generator of Hazardous Waste.

St. Helena's ICT policy is designed to notify, and guide current and new staff members and parents. The board of directors is active in developing opportunities to access ICT. The leadership team is involved in providing powerful resources to help facilitate

learning and track students' performance. Subject coordinators embed ICT in the curriculum. It is a subject that is taught at all levels. Furthermore, the leadership team ensures that ICT is at the front of all schemes and that ICT is granted primacy in the budgeting procedure. They provide modernized supplies and keep all staff up to date with new development. Moreover, they supervise the curriculum related to technology and solve any problems that they face. The ICT Data manager takes full responsibility for directing the application of ICT among all stakeholders. The leadership team ensures health and safety while using ICT by taking all necessary measurements remotely or on campus. Apart from providing training sessions, the leadership team encourages staff members to self-develop their skills in technology. They also provide them with experts when they need any support. The stakeholders provide a School Information Management System (SIMS) that efficiently monitors students, class sections, and grades. Reports can be made based on several factors, such as attendance, progress, and target grades. The leadership team acknowledges the advantages of using ICT for children with special educational needs.

4.2 Teachers Involvement

In Ysgol Treffynnon, staff are involved in the new developments of ICT. Teachers attend programmes to update on new advances. They annually take part in the school improvement plan, related to technology. All staff members are aware of logging flaws and applications of the Internet/email. All teachers have access to trustworthy hardware and software so they can use ICT efficiently. Teachers integrate ICT into their lessons to enhance learning. All teachers can log in through the school's Curriculum system to their data fields, combined data, and applications. Teachers record and report students' assessment results digitally. Teachers are asked to build their teaching supplies to cater to students' learning difficulties. Since ICT is embedded in the curriculum and students take it as a course, ICT teachers in stage three meet annually to evaluate students' assessment results in technology. Once every three years, teachers review the policy to make necessary adjustments.

At St. Helena, all staff members are trained to develop their ICT skills. Trainees and current teachers can study through the school's partnership with TES and earn an International Postgraduate Certificate in Education. Teaching assistants can access distance learning courses through overseas providers. Moreover, the use of ICT makes further opportunities for Continuing Professional Development (CPD) accessible. Furthermore, educators are kept up to date with the latest developments in technology. Teachers are required to read and consent to the IT policy and sign the IT User Agreement before being granted entry. They have access to their password-protected workplace. Every teacher is responsible for maintaining the security of the assigned ICT resources. The school's password-protected network provides access to shared data and personal data areas for all staff users.

4.3 Students Involvement

In Ysgol Treffynnon, students with special needs also benefit from using technology to support them since ICT addresses their individual needs, improves their language skills,

and increases their access to the curriculum. The ICT policy addresses and involves students with determination by catering to their needs and abilities. Students are responsible digital citizens who are expected to use technology wisely to serve their learning. All learners have access to trustworthy hardware and software, so they can use ICT competently and for employing teaching and learning tools.

At St. Helena, students have access to a wider curriculum using Distance Learning opportunities. Netbooks are available to students, enabling autonomous research or assistance for lessons that call for ICT access outside of the ICT labs. All students, of different races or gender, have the chance to improve their ICT skills. Learners who have computers at home are motivated to utilize them for educational purposes. Students are accountable to certify that they use ICT in a secure and liable manner for the constructive advantage of their knowledge and overall growth.

5 Discussion of the Results

Based on the evidence above, not all classrooms are equipped with a digital projector and interactive whiteboard in Ysgol Treffynnon. The school plans to install them in every classroom in the coming years. On the other hand, in St. Helena, the institution is fully equipped with technological tools. Although St. Helena provides its staff members and students with all the necessary facilities, it charges them a nominal fee per hourly use in some of its computer labs. Both policies are well designed; however, St. Helena includes appendixes to clarify precisely how technology is utilized. In one of its appendixes (Generic Skills to be embedded within strands), the policy states possible developmental areas, indicating institutional awareness of its weaknesses. Ysgol Treffynnon's ICT policy also includes two appendices, stating teacher involvement in technology. They both provide training for all staff members and follow up on the matter.

6 Conclusion

This study analysed and compared correlated research evidence on ICT usage in education in both institutions. Both policies are well-designed and clearly explain the use of ICT in both institutions. According to the facts, it was found that both schools Ysgol Treffynnon and St. Helena have made great improvements in the practice of ICT application in education. Technology is embedded in their curriculum. However, they do not state the limitations they face in their classrooms. For instance, what are specific methods that teachers employ concerning classroom management to teach with technology? The policies do not mention the attitude of the students while using technology. How do teachers cope with the mishandling of technology inside the classrooms? How can they monitor students' application of technology inside the classroom? Teachers' planning might be hindered if students' application of technology is not monitored.

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The Perceptions of Science Teachers in Improving and Developing Science Learning of Students with Learning Difficulties in the Middle Stage of Private Schools in Dubai

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Abstract. Purpose- This research investigates science teachers' perceptions and practices in enhancing the science learning of students with learning disabilities (LD), guided by social cognitive theory and Fox's Personal Learning Theories.
Methodology- The study utilized a questionnaire responded to by 156 science teachers from various private schools in Dubai.
Findings- Findings indicate a positive perception among teachers towards developing science learning for students with LD, employing well-established strategies.
Implications- the study emphasizes the need for guidance and coordination among stakeholders to maximize the impact of these positive perceptions.
Originality/value- providing essential information for enhancing science teacher performance and creating an optimal classroom environment.

1 Introduction

1.1 Overview

Learning scientific best practices yields real-life benefits for all students, including those with learning difficulties. Acquiring these skills enables students to apply them in various contexts (NRC 2012). Furthermore, in the field of science, prioritizing an accessible and meaningful learning experience for all remains an ongoing educational goal (NRC 1996).

1.2 Statement of Problem

Teachers with high self-efficacy levels contribute to a positive experience for all students, including those with LD, fostering kindness and reducing the fear of future failure (Villanueva, Mary Grace Taylor et al. 2012). However, studies indicate that general education instructors may not be adequately prepared to support this student group in mainstream classes. Teachers' attitudes significantly shape their understanding of students, emphasizing the importance of familiarity with science fundamentals and the ability to motivate learners. Nevertheless, lacking experience in teaching students with LD may hinder the effective use of teaching techniques (Mastropieri, Scruggs & Magnusen 1999; Bencze,

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Bowen & Alsop 2006; Kim 2013; Park, Lee & Heo 2015). Limited research exists on science teachers' attitudes and readiness to instruct students with LD (Kang & Martin 2018).

1.3 The Purpose and Research Questions

The intent of this research study is to investigate science teachers' perceptions and practices in developing the science learning of students with LD and to answer the research question below:

What are science teachers' perceptions regarding developing science learning among students with LD in Dubai middle schools?

1.4 Rationale for the Study

Teachers' beliefs about learners' abilities significantly influence learning outcomes, as evidenced by various studies (Darling-Hammond 2000; Stronge et al. 2007). Earlier research indicates that a shortage of highly qualified teachers for students with learning disabilities hampers the progress of this student group (Allinder 1995; Scruggs & Mastropieri 1996; Orynbassarova 2017). Moreover, this shortage limits opportunities for students with LD to pursue science or mathematics in their academic and career paths (Sharma & Chunawala 2013; Burgstahler & Chang 2014).

1.5 Significance of the Study

There has recently grown a global trend that aims to improve Science, Technology, Engineering and Math (STEM) education to produce a new generation that holds the professional skills to gain work in the STEM field (Therrien, Hughes & Hand 2011; Green 2014). Since STEM education relies on problem - solving skills related to real life experiences that the students will face in their work experience later on, students in general, (Chen 2013) and students with LD in particular, find it difficult to develop these kind of skills (Street et al. 2012).

2 Literature Review

2.1 Overview

The intent of this research study is: to investigate science teachers' perceptions regarding developing science learning among students with LD in middle stage of private schools in Dubai; to examine the practices that science teachers use to enhance students with LD in science learning; and to investigate the effect of demographic differences on science teachers' perceptions regarding developing science learning for this group of students in the middle stage of private schools in Dubai.

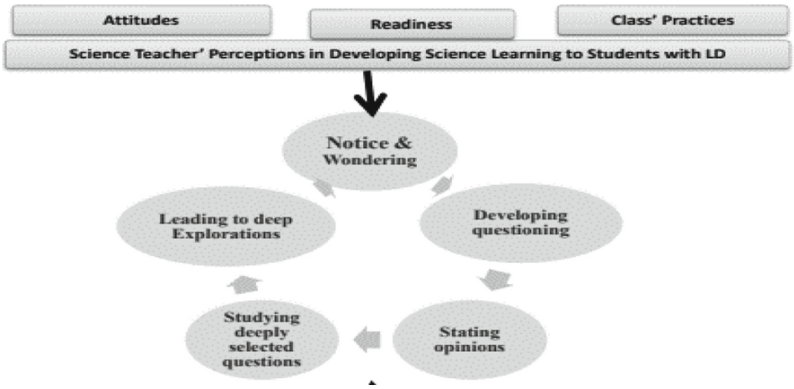

Fig. 1. The Conceptual Framework of the Study

2.2 The Conceptual Framework

With regards to this study, the conceptual framework establishes a link between the science teachers' perceptions, including their attitudes, readiness, and the best practices followed to develop the science learning of students with LD, as shown in Fig. 1 below:

2.3 Theoretical Framework

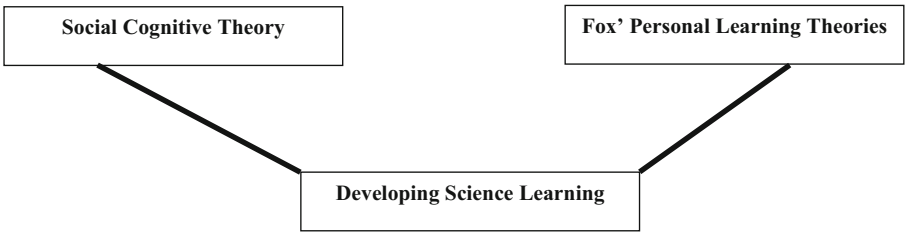

Fig. 2. The Theoretical Framework of The Study

The relevant theories that support this study are shown in the Fig. 2 below: Social Cognitive Theory and Fox Personal Learning Theories.

2.4 Literature Review

The main aspects in this literature review are developing science learning, and learning difficulties through the perceptions of science teachers. In this section, the researcher describes the main concepts in this research study including science learning as the main concept of the study. The other aspects of this study are science teachers' attitudes and readiness, and class practices used to enhance students with LD in developing science learning.

2.4.1 Science Learning

Education faces the challenging task of cultivating future generations capable of shaping the world effectively (Suryanti & Lede 2018). Learners need higher thinking abilities to become effective leaders in the learning economy (UAE Ministry of Education 2015). An essential education function is introducing children to the culture of science, encompassing reasoning patterns, observation skills, and standards of proof, driven by a growing appreciation of children's thinking and learning (NRC 2007). Recognizing students' greater learning potential emphasizes the need for richer and more challenging learning environments led by skilled teachers, with a particular focus on science in early education (Worth 2010). To create a healthy learning environment, Flook (2021) proposes four strategies for schools: fostering positive relationships, developing students' self-management skills through engaging teaching strategies, cultivating social, emotional, and intellectual competency, and establishing comprehensive school support systems, including after-school activities and community collaborations.

2.4.2 Science Teachers; Preparation, Attitudes and Readiness to Teach Students with LD

Science teachers and those in training often feel unqualified to teach in inclusive classroom settings, despite the policy being in place since the late 1990s (McNamara 2007). Lack of teacher involvement in decision-making may lead to low motivation to implement inclusive policies (Greer, B. & Greer 1995; Jitendra et al. 2002). Instructors' attitudes toward inclusion are crucial for success (De Boer, Pijl & Minnaert 2011; Spektor-Levy & Yifrach 2019; Teo 2021). Teo (2021) categorizes science teachers into those supporting inclusion for students with LD and those opposing it. Some teachers express reluctance or preference for teaching students without LD, while others are willing to teach students with LD, providing necessary adjustments and adaptations (Dev & Kumar 2015). Adaptations and modified approaches are vital for inclusive science classrooms (PACER 2018).

2.4.3 Recommended Strategies and Practices in Science Classes for Students with LD

In this regard, investigations that have been conducted. Watt et al. (2013) demonstrate that the goals of Individualized Education Programs (IEPs) must be established by modifying the content of general education programs, and those instructional activities must be carried out using differentiated instructions within the scope of science learning to students with LD. Curriculum modification, according to Hall, Vue, Koga & Silva (2004) is making adjustments to curriculum components like content, teaching methods, and acquisitions to meet the needs of students. For example, whereas the purpose of a science and technology course is to explain the meanings of ideas, this goal might be changed for students with intellectual disabilities to "demonstrate the named concept" or "match concepts and meanings" if the students have reading and writing skills difficulties (King-Sears 2001). For students who lack reading and writing skills, textbook-based instruction and verbal lectures pose significant barriers Mastropieri, Scruggs, Norland, et al. (2006).

3 Methodology

In this study, data were collected from science teachers in various private schools in Dubai using a questionnaire designed specifically for this research. The questionnaire comprises three sections: a demographic section, three clusters exploring science teachers' perceptions of inclusive education, teaching strategies, and learning barriers for students with LD. The final section includes a qualitative question. The questionnaire underwent revision by an educational expert and was pilot-tested to address the research question: "What are science teachers' perceptions regarding developing science learning among students with LD in Dubai private middle schools?" Confidentiality standards of the British University in Dubai (BUiD) were adhered to, and participants were provided with a detailed description of research protocols, confidentiality measures, the study's primary goal, and its objectives before granting informed consent. This approach ensures research accessibility and comprehensive security (Creswell 2014).

4 Data Analysis and Results

The main results of analyzing the data from science teachers' questionnaires revealed that most science teachers are prepared for and have attitudes towards inclusive education, use effective teaching strategies to help students with LD be included, and agree on the academic barriers that constrain this group of students. The total number of science teachers from various private schools in Dubai who agreed to participate in the questionnaire was 156.

Science Teachers' Questionnaire Validity Test

As it is shown in Table 1, an important step involved weighting the overall significance of the correlation matrix through Bartlett's Test of Sphericity, which provides a measure of statistical probability that the correlation matrix has significant correlations among some of the components. The results were significant: x^2 ($n = 156$) = 2995.721 ($p < 0.001$), which indicates its suitability for factor analysis.

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA), which indicates the appropriateness of the data for factor analysis, was 0.931. In this regard, data with MSA values above 0.8 are considered appropriate for factor analysis.

Table 1. Results of Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of the Science Teacher' Questionnaire

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		. 931
Bartlett's Test of Sphericity	Approx. Chi-Square	2995.721
	df	378
	Sig.	.000

The exploratory factor analysis (EFA) employed principal component analysis and varimax rotation, setting a minimum factor loading criterion of 0.50. Communalities, indicating variance explanation, were evaluated, with all exceeding 0.50, except for item 5 in cluster B, leading to its removal. The EFA initially yielded three factors, explaining 59.785% of the variance. However, three items failed to load significantly, prompting their removal: item #5 and item #2 in cluster B, and item 6 in cluster D.

Subsequent EFA, excluding these items, affirmed the theoretically defined three-dimensional structure. The Kaiser–Meyer–Olkin MSA was 0.929, and the dimensions explained 58.902% of the variance. The Bartlett's Test of Sphericity was significant, and all communalities exceeded 0.500. Factor loadings, detailed in Table 3, aligned with the research's theoretical framework. Item revision and statement rephrasing were undertaken to enhance alignment with each questionnaire cluster (Table 2).

Table 2. KMO and Bartlett's Test after EFA

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		. 929
Bartlett's Test of Sphericity	Approx. Chi-Square	2890.854
	df	351
	Sig.	.000

Science Teachers' Questionnaire Reliability Test

The reliability of the science teachers' questionnaire was assessed using Cronbach's Alpha coefficient, with specific focus on clusters B, C, and D. For cluster B, which comprises 16 items related to learning strategies, the alpha value was 0.933, indicating high internal consistency. The item statistics, including mean and standard deviation, further supported the reliability of individual items within this cluster.

Similarly, cluster C, examining teachers' perceptions toward inclusive education with five items, demonstrated high internal consistency, with an alpha value of 0.901. The item statistics, encompassing mean and standard deviation, reinforced the reliability of each item within this cluster.

Cluster D, investigating barriers affecting students with LD in learning science with six items, exhibited an alpha value of 0.847, indicating strong internal consistency. The item statistics, including mean and standard deviation, along with the inter-item correlation matrix, affirmed the reliability of individual items within this cluster. Overall, these results highlight the questionnaire's reliability in assessing different aspects of science teachers' perspectives and practices.

Table 3. Reliability Statistics of Science Teachers' Questionnaire Clusters

Cluster	Cronbach Alpha	Cronbach Alpha Based on Standardized Items	N of Items
B: Teacher' Strategies used with Students with LD	.932	.933	16
C: Teacher Perception towards Inclusive Education	.901	.902	5
D: The Barriers that Affect students with LD Learning of Science	.849	.847	6

Descriptive Statistics Analysis of Science Teachers' Questionnaire

The analysis of 156 science teachers' responses focused on cluster B, examining teaching strategies for students with learning disabilities. While most scores were similar, item #15, suggesting greater success for such students in inclusive classes, received the highest score ($M = 4.333$, $SD = 1.0181$). In contrast, item #16, assessing positive attitudes toward inclusive education based on teaching experience, scored the lowest ($M = 3.865$, $SD = 0.9843$). This implies that teaching experience may not significantly contribute to positive attitudes about inclusive education among science teachers (Table 4).

Table 4. The Descriptive Analysis of Cluster B s related to the Teaching Strategies used by Science Teachers

Cluster B: Teaching Strategies used by Science Teachers	N	Mean	Std. Deviation
1. Coordination between science teachers and support teachers can enrich inclusive education policy application	156	4.147	.9890
2. Reading scientific texts constrains students with LD to learn science	156	4.231	.9076
3. Scientific terminology constrains students with LD to learn science	156	4.096	.9557
4. I prefer to have a support teacher during science lessons	156	4.103	1.0787

(*continued*)

Table 4. (*continued*)

Cluster B: Teaching Strategies used by Science Teachers	N	Mean	Std. Deviation
5. I integrate technology to facilitate learning for students with LD	156	4.429	.9511
6. The class size affects the quality of inclusive education provided	156	4.282	1.0522
7. I use Enquiry -based learning strategy in most science lessons	156	4.237	.8733
8. Use of higher- order thinking skills	156	4.122	.9252
9. I use Guided Science Inquiry instruction with students with LD	156	4.083	.9295
10. Inclusive education builds better people for a better society	156	4.218	.9456
11. I use differentiated work to meet the needs of students with LD	156	4.224	.9268
12. I am open to changing my teaching strategies and the learning environment in order to address the needs of students with LD	156	4.128	1.0014
13. I use note-taking techniques to improve student's science learning	156	4.256	.9630
14. I follow small group strategy (4–5 students) in planning the lesson activities and running them in class	156	4.026	.9964
15. Students with learning difficulties will be more successful in inclusive classes	156	4.333	1.0181
16. An experienced teacher has a positive attitude towards inclusive education	156	3.865	.9843

In Cluster C, focusing on science teachers' views on inclusive education, mean scores range from 4.231 to 3.718. The highest mean ($M = 4.231$, $SD = 0.9005$) is associated with item #21, gauging teachers' readiness to adjust teaching practices for students with LD. Conversely, the lowest mean ($M = 3.718$, $SD = 1.0210$) is found in item #17, assessing teachers' knowledge of specific teaching methods for students with LD (Table 5).

Table 5. The Descriptive Analysis of Cluster C examining Science Teachers' Perceptions towards Inclusive Education

Cluster C: Science Teachers' Perceptions towards Inclusive Education	Mean	Std. Deviation
17. I have adequate knowledge of specific teaching methods appropriate for students with LD	3.718	1.0210
18. I have adequate experience to teach students with LD	3.942	.8962
19. My subject coordinator's feedback is that I do very good work with students with LD	3.942	.8962
20. I use appropriate teaching methods and instructional support with students with LD to help them meet the expectation level of each lesson	4.115	.9085
21. I make changes in regular teaching practices to accommodate the needs of students with LD	4.231	.9005
22. Language barrier	4.115	.9085

In Cluster D, addressing learning barriers for students with LD in science, the 156 science teachers highlight item #23 as the most significant barrier (M = 4.231, SD = 0.9005), focusing on missing previous knowledge and experience. Conversely, item #27, addressing social and behavioral difficulties, is considered the least significant barrier (M = 3.846, SD = 1.605) (Table 6).

Table 6. The Descriptive Analysis of Cluster D that is related to the Learning Barriers that reduce Science Learning

Cluster D: Learning Barriers that reduce Science Learning	Mean	Std. Deviation
23. Missing previous knowledge and experience	4.231	.9005
24. Lack of concentration	4.006	1.0984
25. Low skills level in mathematics and reasoning	3.981	.9933
26. Scientific terminology	3.891	1.0196
27. Social and behavioral difficulties	3.846	1.0605

- **Analyzing the Open-Ended Question of the Science Teacher's Questionnaire**

In Cluster E, focusing on the need for courses or professional development to teach students with LD, the majority of science teachers (144) express a preference for such educational opportunities. This inclination indicates the teachers' readiness to enhance their skills in working with students with LD (Table 7).

Science teachers stress the importance of a degree course or professional development for addressing learning difficulties. They substantiate this need by highlighting the

Table 7. The Frequency of Science Teachers' Responses of Cluster E: Course Degree or Professional Development related to Special Education Needs

Type of Response	Yes	No
# of Response	144	10

significance of understanding coping strategies, implementing effective methodologies, improving student performance, and facilitating accommodations. Conversely, those who responded negatively attribute their stance to their existing experience, academic qualifications, or, in some cases, choose not to provide further comments.

5 Discussion

This section analyzes the research results in the context of the theoretical framework and relevant studies from the literature review. The study aimed to explore science teachers' perceptions and practices in enhancing science learning for students with LD in private schools in Dubai. Both quantitative and qualitative data were collected to address the research question:

What are science teachers' perceptions regarding developing science learning among students with LD in Dubai private schools?

The data indicates that science teachers generally hold positive perceptions about including students with LD in their science classes, as seen in their responses to item #5 in Cluster C and item #2 of the questionnaire. However, a significant number of teachers lack the necessary training and resources to translate these positive perceptions into practice, especially evident in their responses to item #2 and the qualitative question in section E, emphasizing the need for professional development or a diploma related to learning difficulties in education. This underscores a lack of adequate training for science teachers in handling this student group.

Breault (2006) states that teachers must be held accountable, have a variety of methods available, work together with parents, teachers of special education, and other support staff, view every learner as a potential resource for improving instruction, and have patience and flexibility. Research has shown that only a limited number of science teachers have obtained training in teaching students with LD, and Fox theories have been developed to address the relationship between a teacher's personal teaching theory, learning theory, and instructional approaches. This study investigates the science teachers' perceptions of developing the science learning of students with LD. The transfer theory, shaping theory, traveling theory, and growing theory are all well-suited to this research study. Social cognitive theory (SCT) is another theoretical framework that connects to the science teachers' perceptions of developing science learning of students with LD.

SCT involves the interchange of actions or behaviors between an individual and environmental factor, encompassing elements like behavior ability and observational learning. A science teacher with positive perceptions and the ability to convey scientific knowledge becomes a model for students. The data indicates positive perceptions among

science teachers regarding science learning development, although variations exist in certain questionnaire items. For instance, item #6, addressing the impact of class size on inclusive education quality, aligns with studies suggesting benefits for students with severe learning requirements in smaller classes. However, there is disagreement on the optimal student-to-teacher ratio for various age groups.

Item # 16, related to the experienced teacher and their positive attitude towards inclusive education, showed the same results as Mouchritsa et al. (2022). However, the positive attitude of teachers is not related to the experience, it is linked to the teacher' belief and readiness. The acceptance of diversity and the elimination of exclusion at all levels, adaptation of curriculum and teaching methods, teacher cooperation, and support from the school unit's principal are necessary for inclusion practices to function properly. An item in the science teacher' questionnaire that shows a notable difference is item # 19, linked to the teacher' qualification to educate students with LD. This indicates either the feedback was not efficient and helpful, or the coordinator does not have sufficient knowledge to guide the science teacher to teach students with LD.

Whitworth et al. (2017) found that science coordinators need more effective professional development to be able to work more effectively with students with LD. Garcia (2021) suggested four essential practices to help science teachers in their inclusive setting: individualizing instructions, reorganizing assignments, simplifying information, and providing options in assessments. Teachers' attitudes and opinions play a significant role in the adoption of new instructional strategies and methodologies.

Implications

This research study, which investigates the perceptions of science teachers in developing the science learning of students with LD can provide the stakeholders in the education sector with needed information to improve the science teachers' performance and support them in creating a better classroom setting.

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The Environmental and Economic Impacts of the Use of Recycled Asphalt During the Preventive Maintenance of Roadways in the UAE

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Abstract. This article studies the environmental and economic benefits expected from using recycled asphalt pavement in roadway maintenance by comparing the life cost analysis of conventional and recycled pavement. When comparing recycled and conventional asphalt, it turns out that the recycled asphalt cost is 28,060,400 Dhs compared to conventional asphalt's cost of 40,207,900 Dhs. Consequently, utilizing recycled asphalts will save around 12,147,500 Dhs, which is about 70% of the expense divided between the two pavements. This is because the duration of each maintenance process is different recycled asphalt requires 9 steps, which is the same as 33 days, compared to 12 steps for conventional asphalt, which requires 85 days. Calculating the waste from Dibba-Masafi Road is 23,104 m with the conventional pavement shows that managing this construction area's waste is a challenge within its given rising volume of waste. However, by using recycled asphalt 3040 m of waste will be consumed which is a good amount to start a change in the roadway maintenance processes. Moreover, the assets that should be included in the roadway components, the norms and requirements set forth by the relevant authorities, and the minimal construction cost determined by quantity surveying are taken into account which resulted in the findings of this research demonstrating recycled asphalt as a long-term fix.

Keywords: Recycled asphalt · Pavement Condition Index · roadway performance · asphalt · maintenance

1 Introduction

The World Highways Organization set a target to have 70% of recycled materials used in the infrastructure industry by 2020. This occurred in Europe where around 1000 million tons of recycled materials are used in the pavement that are producing valuable sustainable scenarios at a lower rate of waste landfills. It should be noted that the number of materials that contribute to roadway pavement production such as stone, sand, gravel, and other aggregates of gravel is limited as a natural resource and vital in different other industries as well, such as building construction which means it shall be reserved and consumed with caution to ensure efficiency and sustainability (Balaguera et al., 2018).

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[1] Therefore, this research serves a significant role in addressing the sustainability approach in different categories all at once by exploring new potential techniques for the roadway pavement industry. Studying the current situation of the pilot project: Dibba -Masafi roadway in UAE. Roadway construction materials are an important economic factor for recycled asphalt over other content of the construction. Asphalt pavement comprises aggregates and bitumen products. The primary aggregates that are used during the development of roadways are either natural materials from the rocks or slag aggregates. Due to the large amount of material that is needed during roadway construction, there is a central section that is formed by the transport of aggregate resources. Studies have demonstrated that to reduce this impact, it is necessary to lower the distance that is covered during the transportation of roadway construction materials. (Zaumanis, Mallick, and Frank, 2015) [2].

2 Methodology

The author attempts to obtain research assessments and outcomes through mixed methods. as shown in Fig. 1.

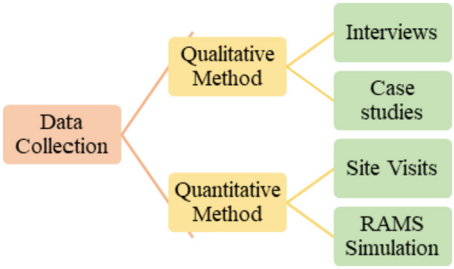

Fig. 1. Data collection methods

Besides that, the approaches of qualitative and quantitative are used to utilize the impact of the implementation of recycled pavement in terms of preventive maintenance. Further, the qualitative method is also taken into consideration for obtaining and analysing non-numerical data to understand viewpoints or experiences. It can be applied to gain a thorough understanding of a topic or to generate new research proposals. It is carried out to discover people's opinions on various topics. When analysing data, this kind of strategy is constantly concerned with keeping the rich meaning. (Bhandari, 2022) [3].

On the other hand, the quantitative method depends on creating numerical data that can be transformed into useful statistics. It formulates facts and uncovers patterns in the study using measured data. Because quantitative data is based on numbers, it requires some sort of mathematical analysis because it is based on numbers. The methods include elementary maths like calculating means and medians and more sophisticated statistical analysis like figuring out the statistical significance of your results. (Humphrey, 2022) [4].

The following is an explanation of each approach:

A. **Interviews**

The interviews contribute with 10 experts with the scope of infrastructure. All the answers for the 10 interviewees were merged and summarised as follows:

- **How do you define RAP?**
  RAP is a term that states a reclaimed or recycled asphalt pavement when utilizing the existing pavement material in new pavement construction. It essentially revolves around removed and reprocessed asphalt and aggregate pavement materials.
- **Why are most of the organization that deals with roadways in UAE oriented to recycled asphalt?**
  The UAE adopted vision, policies, and strategies to be the world's leading nation. On the other hand, most organizations carry out new tools and techniques to ensure happiness and welfare. The roadway organizations are concerned with having a better and smoother daily journey for drivers. Nowadays, infrastructure is considered one of the global trends which need attention and concern to be better.
- **How can recycled asphalt be a maintenance solution?**
  Recycled highway materials are used in pavement construction to reduce waste, protect the environment, and create an affordable resource for building roadways. It is the most practical and cost-effective way to use millings from asphalt pavement.
- **What are the parameters that influence pavement quality?**
  The most important parameter that influences the pavement quality is traffic volume which contains both heavy and light vehicles. Besides that, there are other factors that control pavement quality which are:

  – Materials selection and quality (materials characterization).
  – Structural and asphalt mix design in terms of:
  – Wheel load
  – Axle configuration
  – Type of Bitumen used
  – Contact pressure
  – Vehicle speed
  – Subgrade type
  – Roadway level of service.

- **How can you follow and monitor the traffic volume in the federal roadway network?**
  The federal roadway network can be monitored by doing a traffic count study on weekdays at peak time and by integration and prediction of traffic volumes of ongoing and future development.
- **What is roadway maintenance? What are the maintenance types?**
  Road maintenance is the process of preserving and keeping the road structure practicable and as normal as possible. The maintenance can be categorized from two perspectives. The first is from an actions perspective, the types include Asphalt overlay, Patching, Reshaping, slab replacement, smoothing, and reconstruction; while

the second perspective is from the time of application, the types including Preventative/Routine maintenance which should be done periodically and Emergency maintenance which is special repairs when the damage happened in certain locations.

- **What is the difference between Conventional pavement and recycled pavement?** Conventional pavement is pavement constructed using 100% new virgin asphalt mixture and can be used for any type of road from local roads to freeways, and any level of traffic from low traffic to heavy traffic.

  Recycled pavement is pavement where the RAP material is used partially with additional virgin aggregate and/or additional bitumen; in other terms, it utilizes a certain percentage of its material from recycled sources.
- **What is the limitation of implementing recycled asphalt?** The limitations of implementation due to recycling are mentioned below:

  – Particle shape, size, and density of Mixture performance
  – Volume stability
  – Quality of products
  – Climate change

B. **Case Studies Approach**

Case studies are considered a roadmap that guides the author in aligning and integrating the objectives and finding answers to the research questions, as shown in Table 1.

C. **Site Visits Approach**

All of the site visits were performed according to the health and safety regulations with the provision of an expert engineer in the project. The first visit was to identify the failures within Dibba -Masafi roadway, as shown in Fig. 2.

The noticed failures within the roadway were addressed through a field survey sheet. Since they are repeated failures, the author identified them through random segments. The first segment was between (519–521), (528–530) and (531–533) poles with a distance of 60 ms. The most apparent failures were identified as shown in Table 2 which recognizes cracks as the most common failure parameters that influence the roadway level of service.

D. **Road Analysis Management System (RAMS)**

The author evaluates the current pavement of the research case study in three random segments to diagnose the damages. Also, inspection and observation of the roadway surface state demonstrate the need for maintenance to increase the quality and comfort of the driving environment as it applies to the condition of the pavement. This can be done by assessing the degradation stage of each section that needs to be repaired on the federal highway. The following Table 3 is a group of pavement conditions extracted from the RAMS.

Table 1. Case studies summary

No	Case study Purpose	Case study Description	Case study Methodology	Added value	Reference
1	Life Cycle Assessment (LCA)	Using LCA	Using different materials including recycled asphalt in road construction	To make useful alternatives that can elaborate the environmental indicators	(Balaguera, et al., 2018) [1]
2		A critical review and future directions	Confirms that an LCA study for a road can also be used to for other applications	The evaluation of the environmental impacts that would arise during the lifecycle of the road	(Jiang & Wu, 2019) [5]
3	Construction Waste Sent to Landfill	Impact of Construction Waste Disposal Charging Scheme on work practices at construction sites, in Hong Kong	Using actual data and information to understand the impact of construction on waste	Construction and demolition (C&D) waste and the construction waste disposal charging scheme (CWDCS)	(Ann, et al., 2013) [6]
4		Implementing onsite construction waste recycling, in Hong Kong	House solutions and policies that would address the waste development	Reduce cost and recycle waste at the same time	(Bao, et al., 2020) [7]
5	Life Cycle Cost Analysis (LCCA)	Evaluation of Life-Cycle Cost Analysis Practices Used by the Michigan Department of Transportation	Reviews how the governmental transportation department of state uses LCCA in estimating the costs	To estimate the costs correlated to roads and pavements in terms of their service life and what the lowest-cost pavement alternatives	(Chan, et al., 2008) [8]

(*continued*)

Table 1. (*continued*)

No	Case study Purpose	Case study Description	Case study Methodology	Added value	Reference
6		Reliability analysis and life cycle cost optimization: a case study from Indian industry	Using LCCA because it has better advantages, outcomes, and applications	To analyze the reliability of a component or a system taking into consideration its given designed performance life	(Waghmode & Patil, 2016) [7]

Fig. 2. Identifying and exploring the failures with E89 roadway

Table 2. Failures appearance in the research case study

Roadway Segments	Failure Appearance		Rutting	Patching	Cracks		
	Ravelling	Loosing Materials			Potholes	Longitudinal	Alligator
519–521	√	√	√		√	√	√
528–530	√	√	√	√	√	√	√
531–533	√	√	√		√	√	

3 Results and Discussion

The main three evaluation parameters are the life cycle assessment, waste sent to the land field, and life cycle cost assessment. This will be able to show the effectivity of using recycled asphalt rather than the use of conventional asphalt where a comparison between both of them will be held in this chapter to show how effective and sustainable using these materials is in the road maintenance industry.

Table 3. Dibba-Masafi failure parameters, source: MoEI, RAMS,2021

Roadway Parameters	OV	2013	2014	2018
Total Cracks (%)	**5**	1.33	2.04	5.96
IRI (mm/km)	**2**	1.85	1.86	1.93
Rutting (mm)	**1.5**	2.87	2.97	4.33
Deflection (mm/100)	**55**	42	50	56

A. Life Cycle Analysis

The time needed to execute any project including roadway maintenance will have a high impact on financial and social aspects as it impacts users and traffic flow in the selected area. Therefore, it is important to consider the time needed to complete the project as a major factor in selecting the best maintenance procedure for the roadway, in addition to the manpower needed and logistic facilities required during the project duration. All these factors contribute to the decision-making of the most sustainable roadway maintenance procedure, as these factors influence social and economic sustainability. Any project activity needs to be implemented according to the work order which has been modified through the contract. In this section, the author compares conventional asphalt and recycled asphalt in terms of implementation duration time. The following activities are for implementing conventional asphalt within this project that complies with 12 activities. The maximum duration is for the second activity which is traffic diversion & NoC, this is because the rest of the activity is a compulsory need for traffic diversion and organizing the traffic volume movement, which is approved by the local authorities, as shown in Fig. 3.On the other hand, the following activities are for implementing recycled asphalt within the research study that complies with 9 activities as shown in Fig. 4.

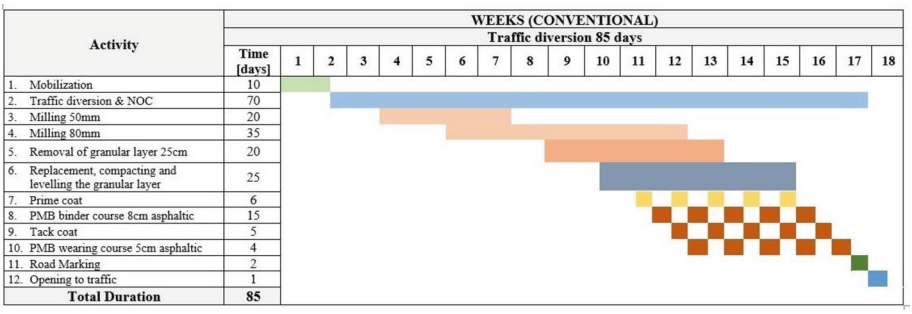

Fig. 3. Conventional pavement life cycle, source: MoEI, 2022

B. Life Cycle Cost Analysis

Using recycled asphalt as a preventive maintenance process from an economical perspective supports the idea of saving in cost. The following Table 4 illustrates the impact

Activity	WEEKS (RECYCLING) Traffic diversion 33 days Time [days]	1	2	3	4	5	6	7
1. Mobilization	10							
2. Traffic diversion & NOC	32							
3. Milling 60mm	20							
4. Recycling 250mm w / cement stabilized	20							
5. Compacting and levelling of recycled layer	20							
6. Prime coat	3							
7. PMB wearing course 60mm asphaltic	7							
8. Road Marking	2							
9. Opening to traffic	1							
Total Duration	**33**							

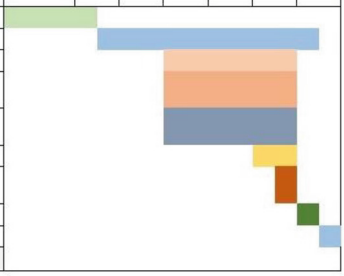

Fig. 4. Recycled pavement life cycle, source: MoEI, 202

of using recycled asphalt as a solution in improving the roadway level of service and performance which is less costly and more sustainable in terms of cost and time. As a result, the saving percentage of using recycled pavement in the execution stage is 70% as saving with 12,147,500 Dhs.

Table 4. Activities and cost comparison between conventional and recycled asphalt, source: MoEI, 2022

Activities/Cost of Conventional Asphalt		Activities/Cost of Cold in place Recycled Asphalt	
1. Mobilization	–	1. Mobilization	–
2. Traffic diversion & NOC	467,500	2. Traffic diversion & NOC	176,000
3. Milling 50 mm	9,120,000	3. Milling 60 mm	9,120,000
4. Milling 80 mm	17,024,000	4. Recycling 250 mm w/cement stabilized	15,200,000
5. Removal of granular layer 25 cm	6,080,000	5. Compacting and levelling of recycled layer	1,216,000
6. Replacement, compacting and levelling of the granular layer	1,520,000	6. Prime coat	182,400
7. Prime coat	182,400	7. PMB wearing course 60 mm asphaltic	2,128,000
8. PMB binder course 8 cm asphaltic	3,040,000	8. Road Marking	38,000
9. Tack coat	608,000	9. Opening to traffic	–
10. PMB wearing course 5 cm asphaltic	2,128,000		
11. Road Marking	38,000		

(*continued*)

Table 4. (*continued*)

Activities/Cost of Conventional Asphalt		Activities/Cost of Cold in place Recycled Asphalt	
12. Opening to traffic	–		
Total Cost in Dirhams			
40,207,900		**28,060,400**	

C. **Waste Land Fill**

Asphalt waste makes up most of the waste produced by the construction industry, and occupies precious public space by being dumped in landfills. By using recycled asphalt to replace conventional asphalt that has already been utilized in roads, these high amounts of asphalt waste may be decreased.

The conventional asphalt waste volume is calculated through width, length, and depth in meters and total waste volume in meters cubic with 23,104 m^3, as shown in Table 5.

Table 5. Conventional asphalt waste volume, source, MoEI, 2022

Total waste volume	
Width (m)	8
Length(m)	7600
Depth(m)	0.38
TOTAL (m^3)	**23,104**

On the other hand, recycled asphalt structure contains two layers the 8 cm base course and 25 cm granular base to be recycled, whereas the 5 cm wearing course of asphalt is to be replaced as shown in figure (66) with a total waste volume of 3,040 m^3, as shown in Table 6.

Table 6. Recycled asphalt rehabilitation solution waste, source: MoEI,2022

Total waste volu	me
Width (m)	8
Length(m)	7600
Depth(m)	0.05
TOTAL (m^3)	**3,040**

Shifting to recycled asphalt saves landfill by 87%. This is by comparing the total waste volume of conventional asphalt and recycled asphalt.

4 Conclusions

This paper has conducted the importance of the new approach using recycled asphalt in roadways. This approach supports sustainability, and in this study two pillars: economics and environment were highlighted and achieved. The recycled asphalt showed evidence of a reduction in cost and duration. On the other hand, from economic perspective this approach sequence with green phenomena by saving land fill and reuse the construction waste as landscape in neighborhoods or in new construction roadways.

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Addressing the Overheating Crisis and Its Socio-Economic Implications: A Case Study in London's High-Risk Areas

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Abstract. Purpose- The number of excess deaths in England and Wales during the second heatwave period in 2022 was the greatest it has been since 2018. Greater London is particularly at risk for indoor overheating due to the predicted increase in hot summers from 50–60% by 2050, which can have serious negative effects on the socio-economic state of the city. The purpose of this study is to assess and predict the risk of overheating in a residential apartment building in a high-risk London heatwave location.
Methodology-This study uses computer simulation and on-site measurements to create a virtual model for IES VE dynamic thermal modelling and perform overheating assessment simulations in a London apartment complex using the CIBSE TM59 methodology.
Findings- The percentage hours with exceeding temperature surpassed 50% above the standard threshold in the 2020s scenario, which increased two folds for the 2050s and 2080s. Moreover, the bedrooms' operational temperatures are found to be terribly above the safety standard.
Implications- The findings implicate examining the economic viability and effectiveness of various solutions in the future to prevent residential building overheating in London. Further investigation can be done by conducting in-depth experiments on the susceptibility of various floors to overheating.
Originality/value- The paper offers novel insights into the overheating risk assessment in London, particularly focusing on households in high-risk areas. The study contributes to the conversation on sustainability practices and their socio-economic implications by highlighting the urgent need for retrofitting frameworks to promote sustainable building design and practices.

Keywords: Overheating · Built environment · Socio-economic · CIBSE TM59 · Building retrofitting

1 Introduction

After the dreadful heat wave of 2018, the second heatwave period (10–25 July) in 2022 witnessed the highest number of excess deaths in the England and Wales region, with 2,227 excess deaths (10.4% above average) (UK Health Security Agency & Office

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for National Statistics 2022). As global temperatures rise, the risk of experiencing a hot summer is expected to increase, rising to 50–60% by 2050 (Met Office 2022). Additionally, it is predicted by the UK government that by 2070, summer temperatures will increase by 1.3 °C to 5.1 °C and winter temperatures will increase by 0.6 °C to 3.8 °C in a high emission scenario. Since the external environment is a key driver of indoor conditions, extremely hot summers would translate to a higher overheating risk in UK homes, potentially having negative effects on the occupants' health and well-being (Petrou et al. 2019). In addition to the terrible death tolls, persistent overheating can have cumulative negative effects on a variety of socio-economic factors, including the physical and emotional health of inhabitants, discomfort, reduced productivity, and financial concerns (Mourkos et al. 2020; Murage et al. 2020; Mavrogianni et al. 2022). The socioeconomic implications of all these factors are hence unfavourable.

After the dreadful heat wave of 2018, the second heatwave period (10–25 July) in 2022 witnessed the highest number of excess deaths in the England and Wales region, with 2,227 excess deaths (10.4% above average) (UK Health Security Agency & Office for National Statistics 2022). As global temperatures rise, the risk of experiencing a hot summer is expected to increase, rising to 50–60% by 2050 (Met Office 2022). Additionally, it is predicted by the UK government that by 2070, summer temperatures will increase by 1.3 °C to 5.1 °C and winter temperatures will increase by 0.6 °C to 3.8 °C in a high emission scenario. Since the external environment is a key driver of indoor conditions, extremely hot summers would translate to a higher overheating risk in UK homes, potentially having negative effects on the occupants' health and well-being (Petrou et al. 2019). In addition to the terrible death tolls, persistent overheating can have cumulative negative effects on a variety of socio-economic factors, including the physical and emotional health of inhabitants, discomfort, reduced productivity, and financial concerns (Mourkos et al. 2020; Murage et al. 2020; Mavrogianni et al. 2022). The socioeconomic implications of all these factors are hence unfavourable.

Statistics conducted by the UK government show that Greater London and the South-East of England are particularly vulnerable to indoor overheating in residential buildings (Botti et al. 2022). Over half of London was shown to be at high risk of overheating in the Approved Documents of the Building Regulations in England, with the remaining half at moderate risk, which is extremely worrisome (HM Government 2010). In addition to the London houses, the risk of overheating is particularly superior in highly urbanized and densely occupied apartment blocks due to compactness, airtight insulation, and limited ventilation (Aliya, Saleh & Al-Khatri 2021). Besides, overheating risks are mostly associated with urban centres, building attributes, and occupant behaviour, notably in homes built after the 1980s with less heat loss and insufficient ventilation (Botti et al. 2022). For example, in an apartment building, the top floor and south/west facing apartments may receive more sunlight than the ground floor apartments. Thus, the harmful effects of home overheating are amplified in a densely populated area like London, where there are 145–210 or more residences per hectare (Centre for London 2016) and call for major refurbishments.

Since 2008, the UK has pledged to mitigate the effects of global warming and overheating risks by lowering CO_2 emissions by 80% below baseline levels of 1990 by 2050 (Petrou et al. 2019). Similarly, the Climate Change Committee's most recent assessment

of heat-related risks in UK buildings provides several mitigating measures, such as integrated passive and/or mechanical cooling (Climate Change Committee 2022). However, just 3% of UK houses currently have air conditioning, therefore without proper cooling methods implemented through new construction and retrofitting, non-mechanical cooling in residential dwellings will not be sufficient by 2050 (Hughes & Natarajan 2019). Therefore, it is crucial to raise awareness of the issue and take the necessary steps to ensure that people can comfortably reside in such dwellings even during the warmest parts of the year in the UK.

Thus, the motivation of this study is to assess and predict the risk of overheating in a residential apartment building situated in a high-risk area of London during the heatwave-prone months. The above discussion prompted the development of two significant research questions:

1. Are naturally ventilated London homes considered safe for the occupants during the summer months?
2. What future overheating risks await these homes in the absence of refurbishments or mitigation strategies?

This study, therefore, intends to answer the above-mentioned research questions by conducting overheating risk assessments on a case study building in London following the CIBSE TM59: 2017 Design Methodology for dwellings.

2 Theoretical Underpinning

2.1 Overheating Causes and Drivers

The risks and factors of overheating in UK homes have been studied extensively for the past two decades since the UK government announced its heatwave strategy during the 2003 heatwave (Hughes & Natarajan 2019). The most significant contributors to indoor overheating were found to be the structure and location of the building. The risk for overheating in cold and temperate regions, such as the United Kingdom, is mostly influenced by the ambient air and solar radiation, as well as the relative humidity and wind speed (Taylor et al. 2023). Moreover, the microclimate around the building is considerably responsible for the warming that occurs inside due to the lack of surrounding vegetation and the presence of heat-radiating surface materials like concrete (NHBC Foundation 2012). Additionally, exterior factors such as heat transfer, ventilation losses, and radiative heat gain then interact with the features of the building to affect indoor overheating (Taylor et al. 2023).

Some of the main causes of overheating in the summer addressed in multiple recent studies are larger glazing areas (south/west/east facing), no/poor external shade, limited/restricted window operations for privacy and security reason, and greater insulation and air tightness (Mitchell & Natarajan 2019; Petrou et al. 2019; Aliya, Saleh & Al-Khatri 2021; Botti et al. 2022; Taylor et al. 2023). Besides old builds, a growing body of research suggests that newer buildings, even meeting high energy efficiency criteria, can also become too hot in the summer (Salem, Bahadori-Jahromi & Mylona 2019). This is because homes in the UK are typically designed for cold climates with high thermal mass for storing heat with little thought given to reducing the risk of overheating in the summer (Taylor et al. 2023).

2.2 Overheating Criteria

Overheating in homes, whether naturally or artificially ventilated, may now be assessed with a relatively new design methodology called CIBSE TM59 (Mourkos et al. 2020). This methodology was created in 2017 to evaluate the risk of domestic overheating after the Zero Carbon Hub (Zero Carbon Hub 2015) issued an evidence evaluation highlighting the lack of guidelines for residential overheating (CIBSE 2017). The TM59 is a standardized approach for evaluating and predicting the risk of overheating in residential buildings using Dynamic Thermal Simulations (DTS), suitable for predominantly but not limited to naturally ventilated houses and flats (Table 1).

Table 1. TM59 criteria (a) and (b) for naturally ventilated homes

	Rooms analysed	Criteria	
a	Living room, kitchen, bedrooms	H_e ($\Delta T \geq 1$ °C) $\leq 3\%$	(1)
		The percentage of occupied hours that are greater than or equal to 1 °C from May to September inclusive should not be more than 3% of the occupied hours of 09:00–22:00 for the living room and kitchen and 24 h for bedrooms	
b	Bedrooms	($T_{op} > 26$ °C) $\leq 1\%$	(2)
		The operative temperature should not be more than the 26 °C threshold for more than 1% of the assumed sleeping hours of 22:00–07:00 annually (33 h/year)	
Source: CIBSE 2013, 2017 where H_e is the hour of exceedance during $\Delta T \geq 1$ °C			
ΔT is mentioned in the TM52 criterion 1 as $\Delta T = T_{op} - T_{max}$ (CIBSE 2013)			(3)
T_{op} is the operative temperature of the room analysed			
T_{max} is the maximum acceptance temperature and can be expressed as $T_{max} = 0.33T_{rm} + 21.8$			(4)
T_{rm} is the subjective operating mean temperature (°C) and can be estimated by $T_{rm} = (1-\alpha)\, T_{0d-1} + \alpha T_{rm-1}$			(5)
where α is a constant usually taken as 0.8, while T_{0d-1} and T_{rm-1} are the daily and running mean temperatures, respectively, of the day before the day of interest (T_{0d}) (Mitchell & Natarajan 2019; Petrou et al. 2019; Mourkos et al. 2020)			

The TM59 guideline combines the CIBSE TM52 criterion 1 for limiting thermal comfort and avoiding overheating risk in European buildings and CIBSE Guide A for limiting bedroom temperatures as criteria (a) and (b) respectively (CIBSE 2017). The guide further provides a variety of input data for DTS, including internal gain profiles, occupancy, equipment, and lighting profiles which are described in the methodology

section. In short, the goal of the TM59 method is to supply a normative framework for analysing overheating that can "assist design decisions" across industries (Mourkos et al. 2020).

3 Methodology

This study examines a London apartment building as a case study using a computer simulation approach with IES VE modelling software (IES 2023a) to analyse the risk of summer overheating in the first-, mid-, and top-floor units and predict future risks. The apartment was simulated using on-site measurements for IES VE dynamic thermal modelling to ensure compliance with TM59 criteria. Additionally, a multitude of inputs such as weather and construction data, thermal gains, occupancy profiles, and window operations were incorporated into the software to run the overheating assessment simulations.

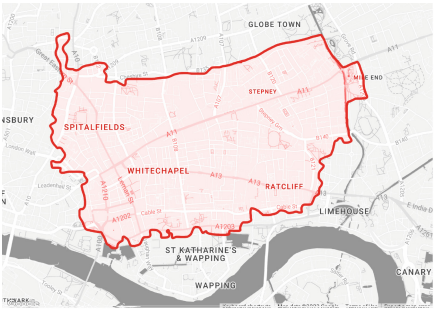

Fig. 1. London E1 postcode zone (Source: Google Maps)

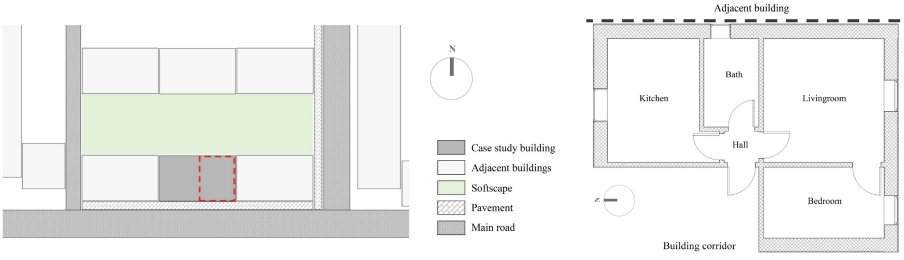

Fig. 2. (a) Site boundary condition, and (b) Double bedroom flat floor plan (Source: Author)

3.1 Building, Location, and Weather Data

The case study building is a five-story apartment in Central London's E1 postcode region, which falls under the city's high overheating risk locations according to Building Regulations 2010: Approved Document O (Fig. 1) (HM Government 2010). The building is

an old-built with its main façade facing south and shares adjacency with multiple adjacent buildings. Figure 2a illustrates the building's boundary conditions, which should be considered while evaluating TM59 because nearby microclimate factors like pavement and highways have a significant influence on heat-island effects. Also, Fig. 2b shows a typical floor plan of the flats, which features a south-facing living room and bedroom separated by a north-facing kitchen.

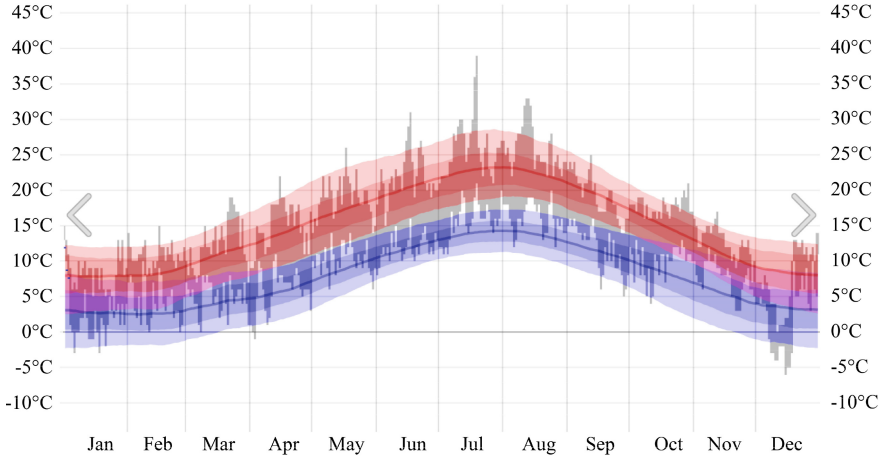

Fig. 3. Annual temperature profile of London 2022 (Source: Met Office 2022)

By TM59 guidance, the latest CIBSE 2016 DSY1 weather file for the 2020s, high emissions, 50% percentile scenario was obtained from CIBSE TM49 (CIBSE 2014) and the London Weather Centre (LWC) (Fig. 3) was chosen as the weather station based on the case study location (Virk & Eames 2016; CIBSE 2017; Met Office 2022). The current study considered the summer months from May 1st through September 30th, 2020, a period of 30 years reflective of probable future climatic conditions. Additionally, using future DSY1 files for the 2050s and 2080s, this study examined the risk of overheating in the absence of refurbishments to the case study building.

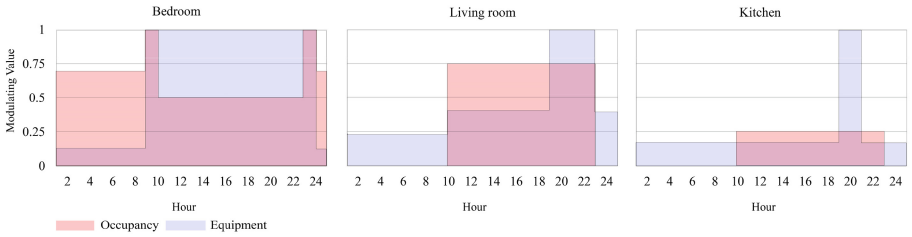

Fig. 4. Occupancy and Equipment profiles for a 1-bedroom (double bed) flat (Source: CIBSE 2017)

3.2 Thermal and Construction Data

The Standard Assessment Procedure (SAP) (BRE 2014) report was used to obtain the construction details while on-site measurements were used for the dynamic model. In addition, the CIBSE Guide A was used to determine the precise thermal parameters of the building materials such as U-values, density, heat capacity, etc. (CIBSE 2015). Figure 4 shows the recommended occupancy and equipment daily profiles for the bedroom, living room, and kitchen, which were used for the Apache simulation in IESVE software. Next, window operation profiles were developed in the IESVE Macroflo application based on the TM59 recommendation, which suggests opening windows only when a room is occupied and when the indoor dry bulb temperature is above 22 °C for naturally ventilated homes. Following that, these profiles were then linked to the corresponding room's occupancy profiles.

3.3 Computer Simulation

The overheating risk assessment was performed by the IESVE simulation engine, which has undergone comprehensive validation using industry-standard methods (EERE 2023; IES 2023b). First, a virtual thermal model of the case study building, and its surrounding environment (adjacent buildings, pavement, motorway) were modelled in the software. Next, a complex custom workflow was used to develop the thermal model for DTS, including setting up the TM59 weather file, categorizing rooms as independent thermal zones, and assigning relevant data. Since CIBSE emphasises precision in simulation setup, assigning data for overheating evaluation is a vital stage. So, there were three major steps in this process:

1. Assigning appropriate thermal templates.
2. Assigning proper construction data obtained from CIBSE Guide A.
3. Creating and assigning window operations by room and criteria.

4 Results

Following the methods described above, the three case study flats were simulated for the overheating assessment using DSY1 2020s, 2050s and 2080s scenarios for the predicted risk assessments. A summary of the TM59 findings is shown in Fig. 5, where it is evident that all of the living rooms on the three floors fail criteria a, and bedrooms fail both (a) and (b). Likewise, the kitchens on all levels pass the overheating assessment due to their north orientation and have been excluded from the discussion.

The results for criterion (a) reveal that the living rooms are most susceptible to overheating, which will only rise exponentially in the 2050 and 2080 scenarios. The percentage of hours in the first-floor living room that surpasses the 3% threshold (formula 1) is 6% in the current 2020s scenario, but rises to 9.3% and 13.6% in the 2050s and 2080s, respectively (Fig. 5). The mid-floor living room shows the highest proportion of hours that are exceeded, which is 7.3% in the present year and nearly doubles in the 2080s scenario. The top-floor living room exceedance, on the other hand, is less than

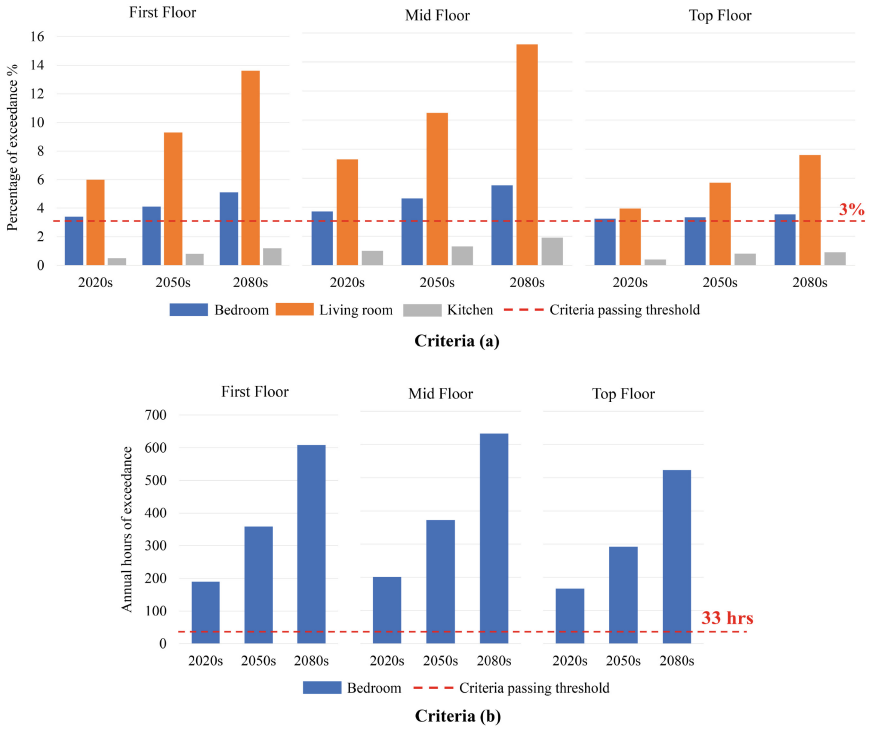

Fig. 5. Summary of results for overheating risk – TM59 criteria (a) and (b) (Source: Author)

the other assessed floors but is nevertheless greater than 3% over the years, hence failing criteria a. Furthermore, the bedrooms exhibit a similar trend of rising overheating risks for first and midfloor levels, where they are slightly above the threshold percentage in the 2020s scenario, at 3.4% and 3.7%, respectively. The bedrooms in the 2080s scenario exhibit the most exceedance for these floors, which are 5.1% and 5.5%, respectively. In comparison, the bedroom on the top floor performed better than those on the lower floors and slightly crossed the cutoff in all scenarios, which varied between 3.2 and 3.5%.

Furthermore, Fig. 5 shows the bedrooms on all three levels fail criterion (b), where the operative temperatures between the hours when a bedroom is inhabited (22:00–07:00) should not exceed 26 °C for more than 33h/year (formula 2). Their performance in the current 2020s scenario shows a minimum of 166 h per year of exceeding, which is higher for the mid floor being 201h/year. Additionally, a significant increase in exceeding hours can be observed in the future 2080s scenario, with 633 h annually in the mid, 608 h in the first, and 523 h in the top floors surpassing 26 °C operative temperature.

The above review of the results of the overheating assessment shows the extreme situations of the London apartments during the summer months, which become increasingly unsafe in the long term and thus answers the second research question of this study. Therefore, this study's findings indicate that the risk of overheating in London homes is a persistent issue that is only likely to get worse over the next sixty years, making it

extremely dangerous and unsafe for the occupants. The current paper thus addresses the earlier mentioned research questions through this discussion.

5 Conclusion

This study presents a simulation-based method to assess and predict the overheating risk in a high-risk London apartment complex during the heatwave-prone months. This was accomplished by utilizing the CIBSE TM59 methodology to perform dynamic simulation in the IESVE software. The simulation results reveal that the living rooms and bedrooms on the assessed floors of the building are susceptible to overheating, with an exponential increase in risk in the 2050s- and 2080s-year scenarios. The predicted condition of overheating is quite worrying when considering the greatest 5-year average summer mortality rate in England and the case study assessment results. Hence, emphasis has been given to the significance of addressing overheating risks in buildings, especially in high-risk areas, as constant overheating can have adverse effects on the socio-economic state of the dwellers. Moreover, this study aims to raise awareness and offers useful insights for retrofitting methods to reduce the risk of overheating in residential buildings for building designers, legislators, and other stakeholders. Research in the future can further examine the economic viability and effectiveness of various solutions to prevent residential building overheating in London. Further investigation into the problem can be made through the conduct of more in-depth studies of the susceptibility of various floors to overheating.

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Investigating the Food Waste Status in the Hospitality Sector of the Emirate of Dubai-UAE

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Abstract. Saving natural resources to sustain a better future for the generations requires focusing mainly on the three pillars of a sustainable society; the social, economic and environmental. In 2015, the world was united to set international goals to reduce the recent, global problems affecting these pillars; the seventeen Sustainable Development Goals (SDGs). Goal number 12 focuses on making consumption and production reasonable to lower the use of natural resources and decrease the waste generated consequently. The food loss and waste problem has been the focus of individuals and governments in the last few years as it affects the sustainable vision of the countries. Tackling this issue needs the united efforts of the private and public sectors and is considered under goal SDG 12.3. Food loss is defined as the decrease in food amounts before consumption, mostly in developing countries. While food waste focuses on food thrown out after consumption, left intentionally or thrown away, and mostly in developed countries. The UAE has one of the highest per capita amounts of food waste yearly, around 224 kg. Thus, efforts to tackle the problem have to start, this is in alignment with achieving international targets like SDG 12.3 and national ones such as "Zero Hunger" by 2051. Huge efforts and initiatives in the country are established, mainly focusing on recovering food waste through banks, composting and animal feeds. However, source reduction is considered the top priority in solving the food waste problem. This paper suggests topics to fill the theoretical gap, which was confirmed to be lacking in the country, in finding the causes and drivers of food waste in the hospitality sector of Dubai.

Keywords: Food waste in UAE · Hospitality food · food waste impacts · causes of food waste

1 Introduction

Sustainability is important to maintain the life of the generations at a decent level by pursuing the communities' economic, environmental, and social needs without wasting resources. Seventeen Sustainable Development Goals (SDGs) were suggested by the United Nations in 2015 to do that. Part of these goals were focused on rational consumption and production of resources by lowering waste, which food is part of it, while others concentrated on ending hunger worldwide.

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Food waste and loss are hitting alarming numbers in deteriorating resources, and money through the supply chain from production to consumption. According to Filimonau & De Coteau (2019), food waste (FW) is classified as food thrown after consumption, usually in homes and hospitality sectors and mainly found in developed countries; as higher consumption reflects a sophisticated economic position. The sub-goal number 12.3 focuses on halving FW per capita at the consumption level and food losses in other phases by 2030.

Many countries are following the Paris Agreement and suggesting targets to limit this problem by raising the awareness of the people. This research will focus on exploring the reasons behind FW in the hospitality sector of Dubai, one of seven emirates in the United Arab Emirates (UAE). Aiming to follow up with the national and international sustainability goals of the country.

1.1 Research Motivation (Significance of the Study)

The importance of studying FW and loss is based on many reasons. Briefly, around one-third of the food is wasted or lost through the supply chain, globally. Enough to feed people in hunger around the world; about 820.8 million people (Jones 2017). Environmentally, methane gas is released when FW is decomposed; it is twenty-five more harmful to the environment than carbon dioxide (CO2), (Abiad & Meho 2018). Besides releasing around 3.3 billion tons of CO2eq yearly from the energy used through the supply chain (Jribi et al. 2020).

The status of the Emirate of Dubai as a centre of international trading, second in having five-star hotels, and fourth in visited cities (*Dubai - Wikipedia* n.d.) increased its exposure to more FW as more tourists are targeting it yearly, besides having more than 200 nationalities living in it, increasing the demand on varieties and quantities of cuisines. More than 20,000 food outlets were available in Dubai in 2022 to meet the rising demands of the people (DubaiMunicipality 2022).

Land and water are two natural resources that are lost aligning with food loss and waste. Water depleted from avoidable FW globally is measured to be 82e9 m^3 from freshwater surfaces or subsurface resources through its supply chain (Bluewater footprint), (FAO 2017, cited in Coudard et al. 2021). In UAE, it is about 790 m3/capita/year, the highest in the Near East and North Africa (NENA) countries, (Berjan et al. 2018), with UAE having the least fresh water sources and a high percentage is used in agriculture (around 84% of the total water footprint). (*Dubai's restaurant numbers continue to grow - News | Khaleej Times* n.d.)

The land used in farming is prone to lose natural species and creatures living in it leading to a loss of biodiversity and an imbalanced ecological system. However, lowering FW amounts by 38% lowers the loss of biodiversity by around 30% and other environmental impacts by 41%, (Beretta & Hellweg 2019). Table 1 proves that the highest impacts come from UAE.

On the humanitarian side, the poor rate in UAE is around 19.5%, representing people gaining less than 80 AED per day (approx. 22 USD), (*Long 2018*). Economically, wasted resources contribute to higher monetary loss. Water depletion contributes to a loss of USD 164 billion yearly globally (around 602 billion AED) (FAO 2014 cited in Jones 2017). Global food waste is estimated to cost around USD1 trillion yearly, (Jribi et al.

Table 1. The impacts quantified in countries per capita from food waste on the environment (Skaf et al. 2021)

Impact Category	Agricultural Land Occupation (m^2)	Climate Change (kg CO^2 eq.)	Fossil Depletion (kg oil eq.)	Freshwater Eutrophication (kg P eq.)	Human Toxicity (kg 1,4 DCB eq.)	Natural Land Transformation (m^2)	Particulate Matter Formation (kg PM 10 eq.)	Photochemical Oxidant Formation (Kg NMVOC eq.)	Terrestrial Acidification (kg SO2 eq.)	Water Depletion (m^3)
USA	606.63	527.36	66.51	0.51	334.85	0.03	1.3	1.59	6.56	33.95
Canada	519.16	447	58.38	0.41	271.94	0.03	1.11	1.35	5.56	30.19
Italy	275.8	227.13	31.47	0.18	117.96	0.01	0.54	0.71	2.66	22.19
Mexico	131.59	94.3	11.41	0.08	48.89	0.01	0.24	0.27	1.26	9.05
UK	280.46	230.91	32	0.18	119.91	0.01	0.55	0.72	2.71	22.59
France	252.56	207.98	28.82	0.16	108.03	0.01	0.5	0.65	2.44	20.34
Japan	179.44	140.93	21.41	0.08	55.83	0.01	0.32	0.46	1.46	19.31
Iraq	176.16	124.13	17.64	0.08	53.39	0	0.29	0.39	1.37	19.85
Germany	208.81	171.94	23.83	0.13	89.31	0.01	0.41	0.54	2.01	16.83
Sweden	183.62	151.33	20.98	0.12	78.61	0.01	0.36	0.47	1.77	14.8
UAE	**678.28**	**477.78**	**67.87**	**0.31**	**205.4**	**0.03**	**1.11**	**1.48**	**5.28**	**76.43**
KSA	794.55	559.75	79.53	0.36	240.64	0.04	1.31	1.73	6.19	89.55
Argentina	123.08	88.24	10.68	0.07	45.76	0	0.23	0.25	1.18	8.46
Lebanon	21.83	15.36	2.18	0.01	6.54	0	0.04	0.05	0.17	2.45
South Africa	10.62	11.23	1.9	0.01	3.82	0	0.02	0.04	0.09	0.99

2020). While it costs around 282 million dirhams (about 77 million US dollars) in Dubai alone yearly, and around 6 billion dirhams yearly in UAE country (about 1.63 billion US dollars), (Sewatkar & Al Khayyat 2022). On a smaller scale, hospitality businesses will increase their profit and lower their costs by 14% when reducing FW.

UAE is making efforts to recover food waste in the country mainly using it in anaerobic digestion, donation, and animal feed. Besides, working on national plans such as "Zero Hunger" by 2051, proposed by The Emirates Council for Food Security. However, the theoretical part of preventing FW in the hospitality sector is minimal and needs further research which this research will suggest to do by suggesting research gaps to be worked on in this topic.

2 Methodology and Approach

This paper uses the method of literature review to address the gap in information in the Emirate of Dubai about FW in the hospitality sector to come up with knowledge gaps that could be addressed in the future by researchers.

3 Theoretical Underpinning (Literature Review)

3.1 International Studies

Target, Measure and Act plan, adopted in the UK, USA and other countries, suggests measuring FW to solve the problem, eased by the use of new technologies, or participating in the initiative "buy today, eat today" for lower-level food services which cannot afford these technologies, to lower their FW from expired items, (Soma et al. 2021 cited in Al-Obadi et al. 2022).

Many reasons for FW are common between countries as the problem is global. Some of these reasons are offering long menus (which increases item storage and preparation waste), poor forecasting (Filimonau & Ermolaev 2021) and ethnic restaurants such as in Chinese ones in UK, (Filimonau, Nghiem & Wang 2021). In Addition, poor storing, tourists, low prices of food, and portion sizes, (Okumus 2019), (Wang et al. 2017), and (Ravandi & Jovanovic 2019). Other causes could be overproduction, and others specific to buffet food services, which was confirmed to be one of the top types contributing to FW, caused by reasons like preparing food one day before the buffet time, discarding foods after 4 h of display…etc. (Papargyropoulou et al. 2016).

The motivation for FW reduction is saving money as it is the ultimate goal in businesses, (Neff et al. n.d. as cited in Jones 2017). Besides, achieving the customers' happiness and satisfaction through improved communication between customers and management. While national policies also have a significant share in encouraging guests and managers to prevent it.

Thus, many strategies are used globally to lower FW such as offering people discounts with portion reduction, increasing workers' wages to become more efficient, portion control, demand forecasting, the use of the 'pay-as-you-throw' fining method for business owners (Filimonau, Nghiem & Wang 2021). Plate size also plays an important psychological role, as people need to see the plate full, thus reducing its size will help to reduce about 20% of food waste, (Al-Obadi et al. 2022). Moreover, changing to different styles of buffets will make a big difference such as mixed restaurant types, or weighted ones, (Ravandi & Jovanovic 2019). However, the most important is to educate the people through awareness campaigns in all society parts; institutes, schools, and universities, especially about FW problems, labelling, expiration dates…etc., (Pinto et al. 2018 cited in Al-Obadi et al. 2022). Lastly, using new, efficient technologies through the supply chain, using intelligent scales, using cultivated seafood, and using 3D printing to minimize FW by using leftovers to invent new items are also recent reduction strategies for FW, (*Taste* Tomorrow 2021).

The progress reports in the world show that many new food services are joining and implementing the Target-Measure-Act approach such as the UK. Other countries are introducing laws and national plans, such as The Chinese Food Waste Law and the French Law. Moreover, food summits and conferences are taking over periodically. Besides assigning an international day for food loss and waste awareness on the 29th of September each year. (*SDG Target 12.3 on Food Loss and Waste: 2021 Progress Report | Champions 12.3* 2021), (*Event: International Day of Awareness of Food Loss and Waste 2022 | SDG Knowledge Hub | IISD* 2022).

3.2 Regional Studies

Food loss and waste rise to 44% in Arab countries. Around 34% of it is from FW at the consumption level. The composition of it may differ between countries due to their eating habits and diets; UAE and Kingdom of Saudi Arabia (KSA)'s cereals make up about 52% of the waste as it is a local cuisines' main item.

Available data about wasted food in the hospitality sector of the UAE is deficient, regardless of the high percentage of FW there, around 224 kg per capita per year (Kohli 2021). The only direct paper about FW in the hospitality sector was done by Pirani &

Arafat (2016) in the Emirate of Abu Dhabi. It distributed surveys and measured waste amounts to discover the main reasons behind the increased waste were faults in forecasting, mainly from the extra 20% of food preparations, the food varieties and the serving style and times. More recent papers explained new technologies used to help lower FW, like smart fridges, (Lamba 2021). Besides, a paper checked the percentage of media interaction with the FW subject according to gender. Other international papers mentioned the environmental impacts of FW internationally and in the UAE.

On the other hand, UAE has many initiatives and companies that are concerned about FW in hospitality or other sectors. Institutions are such as the UAE Food Bank, the Red Crescent, the Food and Agriculture Organisation (FAO) branch, and the Ministry of Climate Change and Environment (MOCCAE) whom is responsible for sponsoring campaigns and initiatives such as the Food for Future Summit held in Expo 2020 in February 2022. Besides, Dubai Municipality who is responsible for the food safety programs and Goumbook, an environmental enterprise that offers education and awareness about food waste.

UAE's attempts to fight FW are represented by leading by example. Thus additional initiatives are held in the country, which include signing a pledge (UAE Food Waste Pledge) by leading hospitality sector institutes such as Armani Hotel Dubai, Fairmont The Palm, Hilton Dubai Jumeirah, and Rotana Hotel. They pledged to reduce FW with the cooperation of Winnow Solutions "smart scales", (winnow n.d.).

"Ne'maa initiative" or "Blessing Pledge", is a recent initiative structured by the Emirates Foundation with the participation of the Ministry of Climate Change and Environment (MOCCAE) in June 2022. It aims to encourage all sectors of the UAE community to be responsible and limit wasting food through all stages of the supply chain, (Sewatkar & Al Khayyat 2022). Besides, their initiative in collaboration with Blue Planet Green People which is "I'mperfect initiative", a national campaign aims to support local food projects and raise awareness, (H. AlMarashi 2022).

Dubai Sustainable Tourism is responsible for lowering FW in hospitality sector through forcing nineteen regulations for hotels to become more sustainable. Two of these regulations are "Green Event" and "Waste Management Plan". The former forces the rules of giving pre-plans for the event and post-event reports to lower the chances of extra FW. While the later regulation aims to lower the disposal to landfills using reducing, reusing and recycling (DTCM 2018).

3.3 Knowledge Gap

"Albert Einstein said: "If I had an hour to solve a problem, I would spend 55 min thinking about the problem and 5 min thinking about solutions." While Tony Robbins said the opposite: "Leaders spend 5% of their time on the problem and 95% of their time on the solution." (Harding 2019). That is the Emirate of Dubai's situation in UAE, there are many solutions to recover the food waste, redistribute it, compost it…etc. and several organisations who are working on solutions. However, the studies on the root causes of the problem to try to prevent it are minimal. This research believes Einstein's words supported by the recent study by Essam, Gill & Alders (2022), working in the Dubai Municipality, who mentioned that the theoretical part of the FW problem, especially in

the hospitality sector in Dubai, is lacking and needs deep studying as wasted quantities are enormous in this sector.

To support the gap in the theoretical data about Dubai, surveys asking about causes of FW and investigating level of the people knowledge are recommended to take place in this emirate and other parts of the UAE country to reach a country-level awareness and suggest a framework that may allow food services to follow. These surveys may take part for users of the services and workers in them as waste could be from consumers as well as kitchen waste. This is important to achieve the sustainable vision of the country aligned with SDGs 12.3 of halving food waste by 2030 and SDGs 2 of achieving zero hunger. Moreover, studies on food loss in ports are in equal importance as there is a massive loss in these areas caused by food safety measures. Specific studies can be done depending on type of food service as each one has some special characteristics that need to be worked on, especially buffets and coffee shops in UAE.

Winnow Solutions has saved a lot of FW and money for the biggest hotels in Dubai, such as Hilton Dubai saved more than $70,000 and 100,000 meals since 2016 and a reduction of around 70% in waste. Fairmont Hotel also saved around $225,000 - and 170,000 tonnes of CO2e, with a reduction of 47% of FW. At the same time, Armani Hotel is saving around 117,000 meals yearly (winnow n.d.). These reports can be an influence for smaller and other hotels through the encouragement of institutes and the government. Researchers could help smaller businesses to make feasibility studies on their behalf that may push them to start working, as it is beneficial for future FW studies to be accompanied by quantitative, observational ones to quantify them. Observing customers' behavioural attitudes could be more accurate to analyse and suggest the suitable FW prevention strategies needed.

4 Conclusion

Food waste is an alarming, global problem. As easy as some people see it, as hard it is to eliminate its huge effects and the many factors that contribute to it. Different from other environmental problems, food waste damages the three pillars of sustainability; environmental, social and economic. UAE is one of these highly affected countries by this problem and ranks second in wasting fresh water globally from FW. Efforts have started to control this problem in the country, especially in the hospitality sector, which is a huge contributor to FW, as the Emirate of Dubai is a tourist hub. However, theoretical and data information must be collected upon this paper's recommendation to reach the country's goals.

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Estimating the Reliability of the Inspection System Employed for Detecting Defects in Rail Track Using Ultrasonic Guided Waves

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Abstract. This work focuses on the implementation of a data-based method to determine the inspection system reliability in terms of detecting different types of damages in rail tracks using ultrasonic-guided Rayleigh waves and a probability of detection (POD) technique. In this study, the reliability is tested against a surface crack (SC) and sub-surface damage – a through-side thickness hole (TSTH). The guided Rayleigh waves are generated using a custom-designed sensor that excites Rayleigh surface waves in the specimen and the propagating waves are sensed on the rail track surface. The wedge shape design of the sensor helps to excite a specific ultrasonic mode in the sample thereby hindering the ultrasonic energy of other coupled guided waves that can propagate simultaneously and the wedge angle is determined according to Snell's law relying on the wave velocity of Rayleigh wave and bulk longitudinal wave. The guided wave responses as a function of varying severity of defects are obtained through a simulation study after the verification of the obtained guided wave responses with the help of an experimental study. A damage index (DI) is defined depending on defect size that gives the trend of damage severity from the captured ultrasonic responses and for monitoring defects in the rail track. This DI is eventually fed into the POD model to determine the probability of defect detection which in turn helps determine the inspection system reliability. The POD method also helps to study the critical design parameters that could affect or improve crack detection results.
Purpose – To determine the reliability of inspection system deployed for interrogating health status of rail track.
Methodology – Employing the Probability of detection technique for determining how reliable the inspection system is in detecting the health status of the rail track specimen using the ultrasonic guided waves.
Findings – It has been found that the proposed inspection system is >90% reliable in detecting defects.
Implications – This methodology can help maintenance engineers to make an informed decision on their developed technique for investigating the health status of the rail track sample.
Originality/ value – 13%.

Keywords: Rayleigh-waves · probability of detection · damage estimation · wedge sensors · Rail track specimens

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Nomenclature

$C_R, C_L, C_T =$ Rayleigh, Longitudinal, Transverse velocity.
$\lambda, \mu =$ Lame's constants; $\nu =$ Poisson's ratio
$\rho =$ Material density; $E =$ Elastic Modulus
$I_R =$ Incident Rayleigh wave; $I_d^R =$ Damage reflected Rayleigh wave; $\lambda_R =$ Wavelength of Rayleigh wave

1 Introduction

Non-Destructive testing (NDT) systems are gaining worldwide attention by several researchers as they can detect surface and sub-surface defects without destroying the inspected component and offering good accuracy. The inspection is conducted using sensors permanently attached at the known critical locations of the specimen. The recorded data is processed using different algorithms to extract useful information.

There is an increasing attention worldwide for High-speed railways as being a timely means of transportation. However, the rail tracks are subjected to constant and fluctuating loads over different times of service which results in development of micro and macro scale damages in the rail material especially on surface. This will consequently decrease its load bearing ability and eventually result in failure and de-railing resulting into loss of economy and human life (Kim & Hoon & Woo 2012, Masurkar & Yelve 2017).

There are several NDT techniques available to inspect rail damage such as visual, contact, and non-contact ultrasound, eddy current, magnetic particles test, x-ray, and non-contact laser ultrasound-based scanning techniques. A large portion of the inspection is conducted with labour intensive visual inspection which is time consuming. For long range inspections, vehicles integrated with laser scanning devices or visual cameras have been utilized and commercialized. However, vision-based devices can only detect surface damages and accuracy highly dependent on the image quality and also affected by the outside weather conditions whereas laser-based ultrasound scanning can detect surface and embedded damages – shelling, sub-surface damages, etc. (Heckel & Wack & Mook 2019, Masurkar & Yelve 2022).

Of the several approaches, ultrasound-based NDT has gained widespread recognition as they can be excited and sensed by cost effective sensors and easily affixed to the specimen. Furthermore, non-contact sensors are available to improve the speed of data acquisition and repeatability of the measurements. Despite these advantages, ultrasound-based NDT suffers from a couple of drawbacks as following. First, the ultrasonic waves are highly dispersive and a thorough study of different guided and coupled wave modes must be conducted through dispersion analysis to design the simulation and experimental study. The method of actuation and sensing should be carefully adopted for high quality data acquisition. Nonetheless, the wave propagation physics could be simplified if actuation and sensing strategy is carefully developed (Masurkar et al. 2021, Masurkar & Rostami & Tse 2020).

(Janapati et al. 2016) discussed the estimation of POD for a metallic specimen using ultrasonic guided waves. (Forsyth 2016) discussed the POD principle using several inspections and experimental data. (Meeker & Roach & Kessler 2019) discussed how

effectively the POD can be applied to NDT studies. (Virkkunen et al. 2019) presented a comparison between hit/miss and â versus a for different ultrasonic wave-based data sets. (Cobb & Fisher & Michaels 2009) presented a case study concerning the implementation of POD curves using a model-based formulation. (Mishra & Yadav & Chang 2019) studied the POD method using the acousto-ultrasound quantified as "in-situ NDE" for detection of fatigue crack.

This work focusses on reliability estimation of inspection system employed for the NDT of a rail track using ultrasonic waves. The crack presence and progression are determined quantitatively using the POD method that helps to estimate the system reliability. Based on the dispersion curves, an excitation frequency is selected to conduct the simulation and experimental study. From the time-domain signals acquired for incremental progressions of crack, a DI curve is constructed to quantify the progression of SC and TSTH in the specimen. As a last step to determine the reliability, POD curve is constructed from the DI curve based on the mean and variance estimates that also predicts probability associated with each damage.

The organization of paper is as follows. First, the Introduction and background are given in Sect. 1, then the methodology and material description in Sects. 2 and 3 respectively. The details on the numerical and experimental studies in Sects. 4 and 5 respectively. The results are discussed in Sect. 6. Finally, the concluding remarks in Sect. 7.

2 Methodology

In this study, emphasis is on reliability estimation of the inspection system employed to detect SC & TSTH damages in rail track. Firstly, strategy is developed to generate and receive only the Rayleigh mode propagating within the specimen. The detection is conducted using wedge sensor and the pulse-echo configuration. The data is recorded for pristine specimen and later at different incremental progressions of damage. Further, a DI is determined from the recorded responses, and fed in the POD model to predict the system reliability and probability of each damage size that can be detected.

2.1 Theoretical Model of Probability of Detection Technique

Suppose 'a' being the true size of crack, '$\hat{a}$' be the calibrated size, and 'x' and 'y' is the natural log of the true and calibrated sizes respectively. The linear relationship is written as (Annis et al. 2009),

$$y = \beta_0 + \beta_1 x + \epsilon; \tag{1}$$

here 'ϵ' is the residual between the fitting and true data and has a gaussian distribution with mean $\mu = 0$ and 'δ^2' as its variance. The standard normal variate is,

$$Z = \frac{y - (\beta_0 + \beta_1 x)}{\delta}; \tag{2}$$

which has a normal distribution as,

$$\phi(z) = \frac{1}{\sqrt{2\pi}} e^{\frac{-Z}{2}^2} \tag{3}$$

The normal distribution has a cumulative distribution function (CDF) that is,

$$Q(z) = \int_{z}^{\infty} \phi(Z)dz \tag{4}$$

Thus, the POD associated to a specific crack size is,

$$\text{POD}(x) = \text{POD}(y > y_{th}) = Q\left[\frac{y_{th} - (\beta_0 + \beta_1 x)}{\delta}\right] \tag{5}$$

where, y_{th} is the detection threshold. The CDF complement is,

$$Q[-Z] = 1 - Q[Z] \tag{6}$$

$$\begin{aligned}\text{POD}\,(a) = \text{POD}\,(y > y_{th}) &= 1 - Q\left[\frac{x - \left(\frac{y_{th}-\beta_0}{\beta_1}\right)}{\frac{\delta}{\beta_1}}\right] \\ &= 1 - Q\left[\frac{\log_e(a) - \left(\frac{y_{th}-\beta_0}{\beta_1}\right)}{\frac{\delta}{\beta_1}}\right]\end{aligned} \tag{7}$$

Thus, mean $= \left(\frac{y_{th}-\beta_0}{\beta_1}\right)$ and standard deviation $= \frac{\delta}{\beta_1}$ which is used for estimating the POD curve versus true crack size.

3 Theory and Material Description

In this work, ultrasonic Rayleigh waves are employed for NDT of rail track. The fundamental background of Rayleigh waves is presented in the following sub-section.

3.1 Rayleigh Waves

Rayleigh surface waves are elastic waves having both longitudinal and transverse displacements and propagate only near the surface. Therefore, their energy decreases as the sensing point moves away from the surface. The governing equation of a Rayleigh wave is given as,

$$\eta^6 - 8\eta^4 + 8\eta^2\left(3 - 2\zeta^2\right) + 16\left(\zeta^2 - 1\right) = 0, \tag{8}$$

where,

$$\zeta = \frac{C_T}{C_L} = \sqrt{\frac{1 - 2\nu}{2(1 - \nu)}} \tag{9}$$

and $\eta = \frac{C_R}{C_T}$. The alternate solution of η is $(0.87 + 1.12\nu)/(1 + \nu)$. Thus, the Rayleigh wave velocity can be calculated as,

$$C_R = \left(\frac{0.87 + 1.12\nu}{1 + \nu}\right)C_T, \tag{10}$$

From Eq. 10, the Rayleigh velocity is free of excitation frequency f, and thus they are non-dispersive.

3.2 Material Properties of Specimen

The specimen used is a section of real rail track of the high-speed train as shown in Fig. 2. Normally rail track specimens are full of rust and to get the baseline measurements, the specimen was polished before employing it for the experimental study. Initially a hand grinder was used to remove the rust and later a fine sandpaper used to improve the surface quality. In particular, the surface portion of the rail track is always rust-free as it is in contact with the wheels of the train. This helps to acquire the wave propagation data with a higher signal-to-noise ratio (SNR). The material properties of the specimen are given in Table 1.

Table 1. Material properties of the Rail track

Mechanical properties	Value
ρ (kg/m^3)	7799
E (GPa)	212
$\nu(-)$	0.2866
λ (GPa)	110.7
μ (GPa)	82.4

The Lame's constants are obtainable from elastic modulus and Poisson's ratio as, $\lambda = \frac{E\nu}{(1-2\nu)(1+\nu)}$ and $\mu = \frac{E}{2(1+\nu)}$. Further, the bulk wave velocities can be determined using the Lame's constants and density as, $C_L = \sqrt{\frac{\lambda+2\mu}{\rho}}$ and $C_T = \sqrt{\frac{\mu}{\rho}}$. The Lame's constants and the wave velocities are shown in Table.1 and 2 respectively.

Table 2. Wave velocities in the Rail track

Type of wave	Value (m/s)
Rayleigh	3008.911
Longitudinal	5943.487
Shear	3250.455

3.3 Dispersion Analysis of the Rail Track

The possible propagation of several modes in the rail track as a function of different excitation frequencies can be determined using the dispersion curves in Fig. 1. Therefore, dispersion curves are first obtained for the rail specimen considering the upper portion of the specimen as a thick rectangular steel bar since the propagation of guided wave is limited to only the upper portion of the rail track. Due to higher thickness (~50 mm) of

the specimen surface, guided Rayleigh wave propagated in the specimen, and it has good penetration depth to detect any sub-surface flaws in the specimen. This is also confirmed by the wave structure analysis.

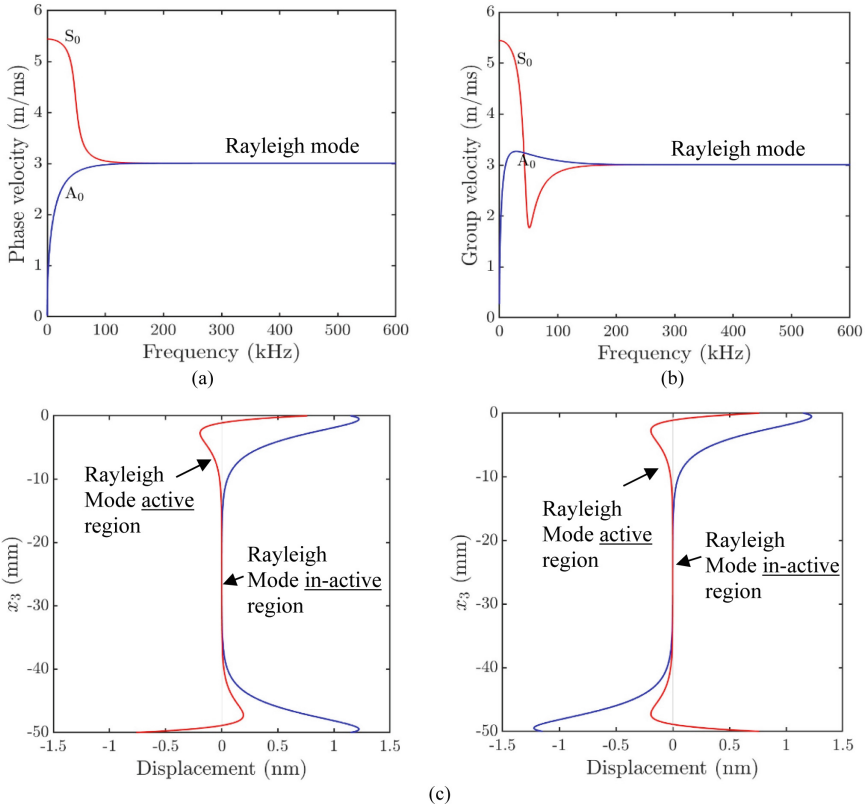

Fig. 1. Dispersion curves of rail track (a) Phase (b) Group (c) analysis of Rayleigh wave displacement.

4 Finite Element (FE) Study

4.1 The FE Model Setup

In order to excite Rayleigh waves in the specimen, a plexiglass wedge is modeled in the simulation as shown in Fig. 2. The angle required to excite the Rayleigh wave in the specimen is calculated as the inverse sin of the longitudinal velocity in the wedge over the Rayleigh velocity in the specimen. The wedge is modeled at a distance of 190 mm from the nearest end to correlate results with the experiments.

The excitation applied at the flank of wedge is a 6.5 cycles sine wave modulated with gaussian function and a central frequency of 500 kHz. This applied excitation signal in

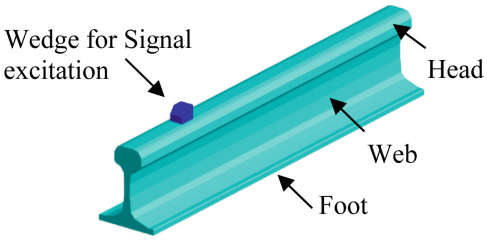

Fig. 2. Schematic diagram of FE model.

time and frequency domain can be seen in Fig. 3. For this frequency, a penetration depth of 6 mm can be achieved which is also equal to the wavelength of the Rayleigh wave. Thus, a Rayleigh wave signal launched into the rail track specimen at this frequency could be useful to interrogate the surface or subsurface damages.

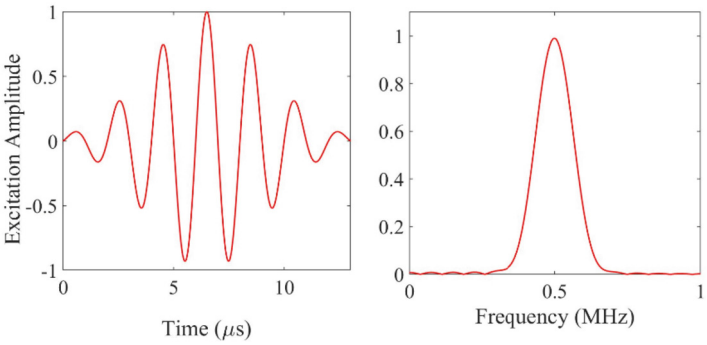

Fig. 3. Excitation signal in time and frequency domain.

5 Experimental Study

The experimental setup is fully non-contact comprising an actuation laser and a three dimensional (3D) receiving laser. Since a raw laser beam will induce multiple wave modes simultaneously into the specimen, a slit mask coupled with optics setup arrangement is used to convert the beam into a series of multiple laser lines (Masurkar & Rostami & Tse 2020). This ensures a generation of pure Rayleigh wave into the specimen and the frequency is determined by the spacing between each laser line as shown in Fig. 4. At the receiving end, a 3D scanning laser doppler vibrometer (SLDV) is used to capture the Rayleigh wave propagation exhibiting x, y, and z displacements. The schematic of the complete experimental setup and the equipment's used is shown in Fig. 4.

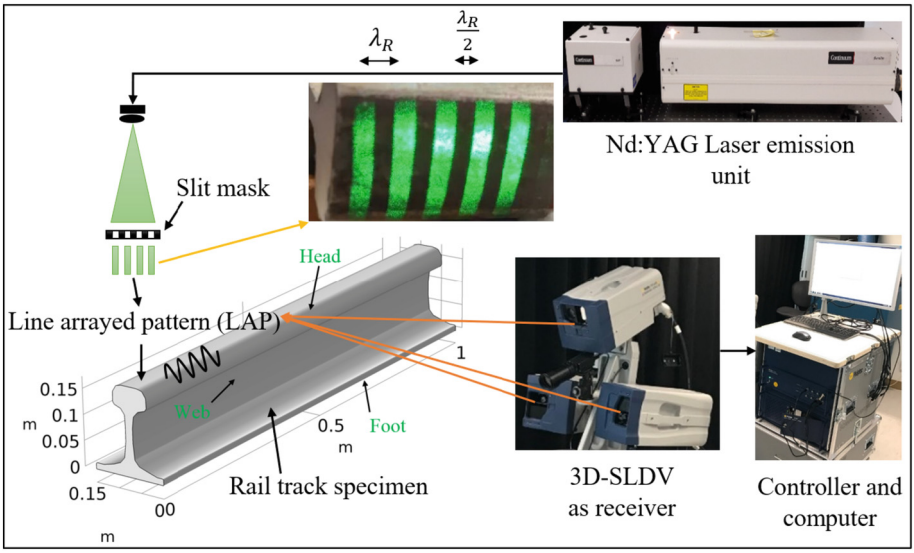

Fig. 4. Experimental setup for verification (Masurkar & Rostami & Tse 2020)

6 Results and Discussions

In this section, the results obtained from the study are discussed. Firstly, the results from an intact specimen are presented. The wave animation over two different time instants for a pristine rail track sample can be seen in Fig. 5. The longitudinal wave excited at the wedge flank at a crtical angle of 47.4^0, generates a pure Rayleigh wave in the specimen which then propagates along the surface.

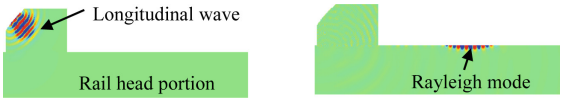

Fig. 5. Wave propagation showing generation of bulk wave in wedge and Rayleigh wave in Rail track specimen [side view]

Next, the results from experiments at intact state are presented for measurements conducted at different times. As a result of the surface conditions of the specimen as well as the repeatability issues associated with the use of the excitation Laser, the signals received using the laser system at different times are compared to check the variation between each of them. Thus, the repeatability of the experimental results is firstly verified and is presented in Fig. 6. Certainly, there are variations in the measurements – M1, M2, & M3. Thus, an effective signal processing method (Masurkar & Rostami & Tse 2020) namely Self adaptive smart algorithm (SASA) was applied to each of the recorded responses. SASA is based on the concept that a reflection of the incident wave caused by any irregularity (defect) or boundary in the specimen will exhibit almost similar shape

of the incident wave and thereby yield a maximum correlation. SASA is effective in suppressing high levels of noise while keeping only useful time-domain signal. One of the signals processed with SASA is shown in Fig. 6. The filtered signal is now fully free of noise and is dominated by the incident wave packet. There are no potential reflections as it's an intact specimen, and the excitation and sensing are optimized to minimize the reflections from the specimen boundaries.

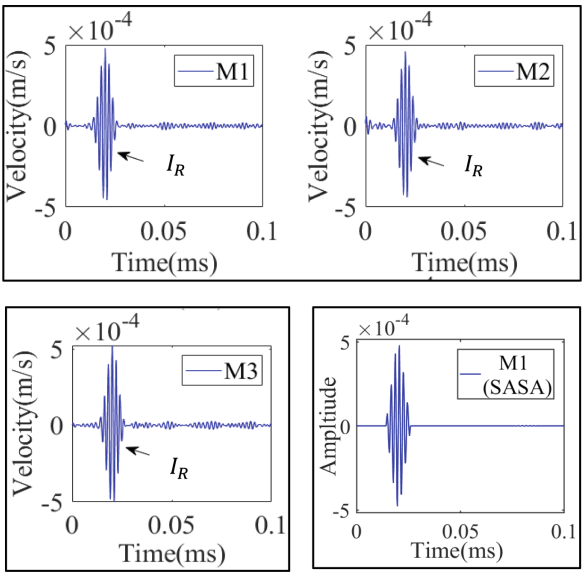

Fig. 6. Time domain responses for intact sample and SASA filtering.

Figure 7 shows the schematic of the actuation and sensing on the rail track specimen for both types of damages – SC and TSTH. Figure 8 shows the experimentally obtained time domain signal in presence of SC. Now the fidelity of built simulation model is verified with reference to these experimental results so that all results obtained through simulations could be confirmed to be obtainable in practice.

Figure 9 shows the simulation obtained time domain signal that shows good correlation with the experimentally obtained time domain signals as seen in Fig. 8.

After this verification, the FE simulations are conducted for increasing SC and TSTH in the specimen and responses are captured in the pulse echo mode for in and out-plane motion. For brevity, the ultrasonic responses for different damage sizes are not shown here. Instead, only the major results are presented. For a damaged specimen, wave is reflected from the damage and is sensed in the pulse echo mode. Thus, an index is defined that quantifies the discrepancies between the pristine and damaged state responses. The damage index (DI) used here is shown in Eq. 8 as follows,

$$DI = \frac{\sum_{n=1}^{N}[E_{Current}(n) - E_{Baseline}(n)]^2}{\sum_{n=1}^{N}[E_{Baseline}(n)]^2} \tag{11}$$

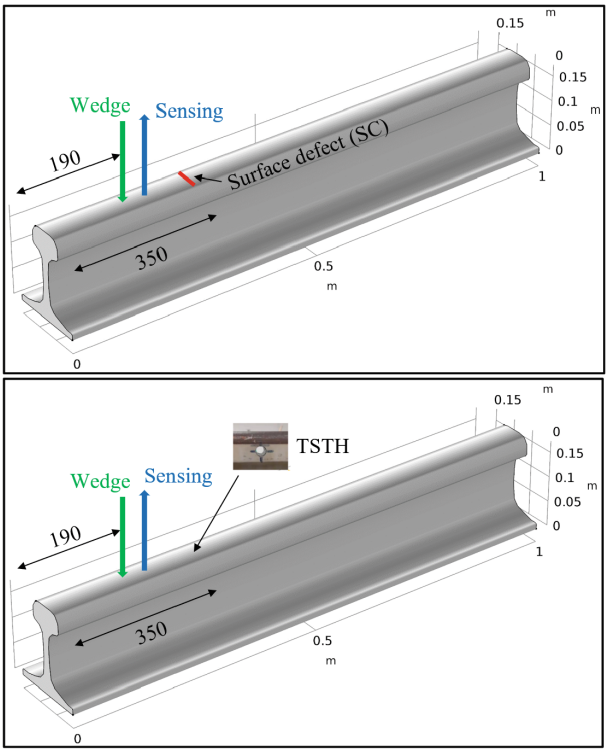

Fig. 7. Schematic of excitation, sensing & defect location

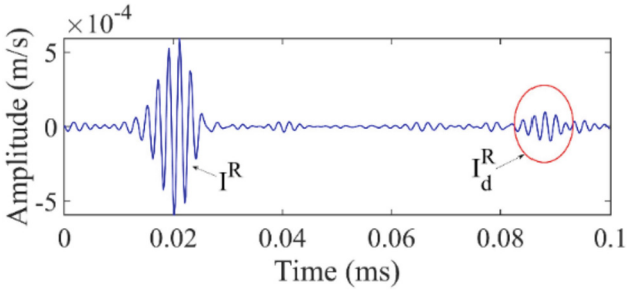

Fig. 8. Time domain waveform from experimental studies - Ext-End: 190 mm; Ext-Sensing: 60 mm; Ext-Defect: 160

where $E_{Current}$ is the response at the current state and $E_{Baseline}$ is the pristine condition response, and n being the samples in response. The DI is then calculated using the in and out plane responses captured at pristine and damaged states for incremental severity using Eq. 8. And is shown in Fig. 10. The DI curve is seen to increase with increase in sizes of SC. Further, a linear regression is employed that gives the mean and standard deviation parameters in Eq. 7, as well as variance and other parameters of the POD

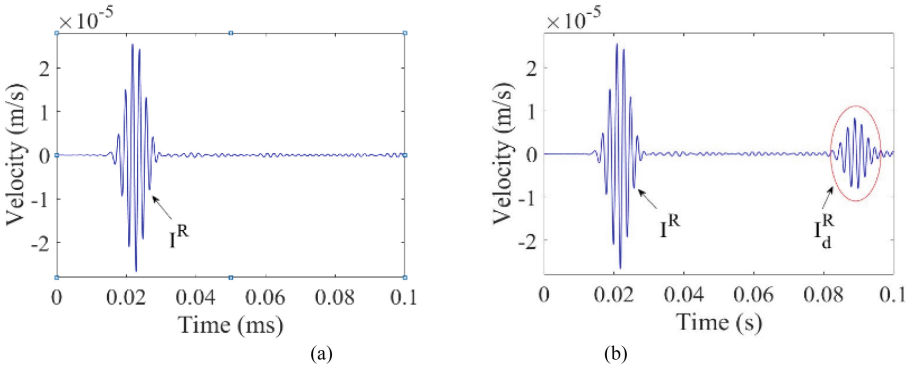

Fig. 9. Time domain waveforms from simulation studies (a) Intact (b) Ext-End: 190 mm; Ext-Sensing: 60 mm; Ext-Defect: 160

model. Thus, the POD curve is developed for the in and out plane responses for both type of damages – SC and TSTH. For brevity, the POD curves for only in-plane motion are shown in Fig. 11 for both damages.

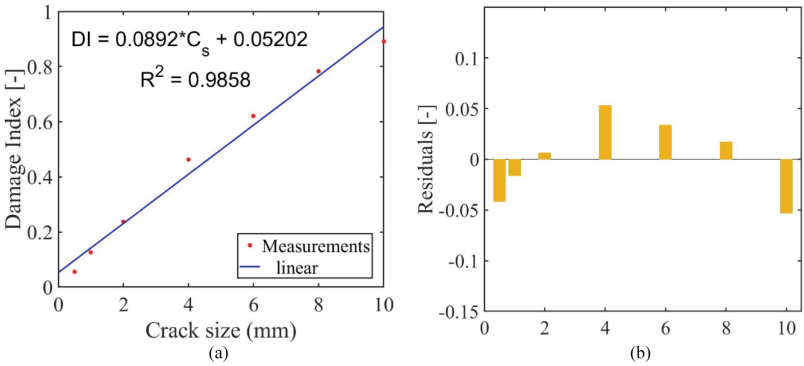

Fig. 10. (a) Damage Index versus Crack size - SC (b) Residuals for different crack size - SC

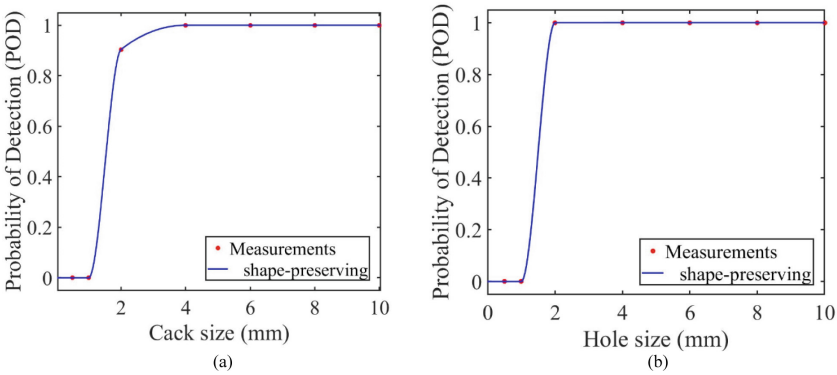

Fig. 11. POD estimation (a) SC (b) TSTH

7 Summary

This work focussed on determining the reliability of the system employed for inspecting structural integrity of rail track specimen using Rayleigh waves which were actuated using a wedge sensor and sensed at a specific location on the specimen surface for different progressions of SC and TSTH. The received time domain signals were used to estimate the DI curves as a function of damage sizes, and this was processed using the POD algorithm to determine system reliability further yielding the probability associated with each damage size. The results show that proposed inspection system and the strategy found after conducting multiple simulations duly supported with experimental study can be helpful for inspecting rail track specimens in a reliable manner.

The concluding remarks can be summarized as below:

1. The employed guided Rayleigh wave can detect the incremental SC & TSTH damages in the rail track sample.
2. The DI curve determined based on the guided wave data is very helpful to quantify the progressions of damages.
3. The POD curves yield the reliability of the employed inspection system and can reveal specific system parameters that could further help in improving system reliability.

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Durability Design Approach and Exposure Conditions in Eurocode, British Standard and ISO 13823 Standards: A Review

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Abstract. Several incidents of early deterioration of reinforced concrete structures have been reported in recent years. Consequently, the critical demand to incorporate durability in the structural design and construction approach has emerged. As a result, durability design provisions in many countries' standards have gotten increasingly stringent. In the absence of clear standard guidelines for design engineers, insufficient design and failures or an expensive over-design to provide for the worst-case scenario may occur. This paper compares and critically reviews the durability design requirements and provisions in the Eurocode, British standards, and ISO standards and proposes improvements that will contribute to the development of the coming generation of these documents. The review revealed similarities in the durability design approach, exposure conditions, and design requirements in the Eurocode code and British standard, whereas the ISO 13823 approach is different. The studied documents' durability provisions are comprehensive, detailed, and well-defined. Nevertheless, several provisions require to be revised to avoid misinterpretation by the code practitioners and to ensure an economically conservative durable design.

Keywords: British Standards · Durability Provisions · ISO13823 · Eurocode · Exposure Conditions

1 Introduction

Concrete is an extensively utilized building material, second only to water in terms of consumption (Gagg 2014) with an estimated annual usage of over 30 billion tonnes (Monteiro, Miller & Horvath 2017)**.** Ancient concrete structures, such as the Ponte de Gard in France, attest to the extraordinary long-term performance of this material. Concrete functioned remarkably well for load-bearing structures with rounded curves, such as domes and arches, and this classic concept is being recreated today with modern 3D-printing technology, such as the Striatus 3D-printed bridge in Venice, Rome.

Steel reinforcement in concrete enabled the development of diverse structural components capable of withstanding compression and tension stresses. However, if R.C. is

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not effectively handled, steel members may corrode, severely damage the structure, and shorten its service life.

There has been a growth in knowledge and understanding of durability in recent years. An extensive study on this topic was conducted between 1970 and 1990, resulting in a wealth of knowledge (Noyce & Crevello 2016). This is due to the economic effect of shorter structure life spans on a country's budget due to costly repairs, disruption of important daily activities, and a decrease in sustainability.(Beushausen et al. 2021). As a result, efforts have been carried out in most design codes and standards to include requirements for providing robust and durable RC structures.

This paper compares and critically review the durability design approach and provisions of three international codes: The British Code BS8500-1, Eurocode EN1992:1-1 and ISO13823 standard, it suggests improvements to these provisions that may be a beneficial start for these codes' update. The study revealed that the BS 8500-1 and EN2 are similar, they included provisions to guide the design engineer to produce durable structures, they adopted a prescriptive approach, which sets requirements for material compositions and quantities, techniques, and test methods that are assigned according to the environmental exposure category. On the other hand, the ISO 13823 International Standard has a different approach, even though it does not identify design procedures for durability, it establishes a sturdy framework by defining a process of concrete damage due to environmental effect.

2 Design for Durability

The process of designing and constructing buildings and/or infrastructure to meet design lifetime and required standards in severe conditions is known as design for durability. Designing for durability is a difficult task, it is a multilevel process that incorporates various factors, including design for the entire structure, structural elements, and structural materials. The project's service life must be established at the initiation of the project, and the design phase must outline the exposure conditions, and member features such as concrete cover, materials, mix design, and curing procedures, as well as build a monitoring and maintenance plan. Finally, workmanship and material quality must be considered throughout the project's execution stage. To do so, clear guidelines must be available for design experts to use to direct their design process toward long-lasting structures. Douglas Hooton (2019) and Grković & Folić (2015) stated that current building codes have generally focused on structural capacity and serviceability for life safety considerations, but many do not fully address durability design. From the scholars' conclusions, we can understand the importance of providing clear guidelines in the design codes to create a comprehensive design addressing the concrete structures' durability along with capacity and serviceability design.

3 Design for Durability in the Arab Gulf

The Gulf region's environment has an impact on concrete structures because it is one of the world's most aggressive exposures for the durability of reinforced concrete structures, which degrade faster unless special precautions are taken due to high ambient

temperature, low relative humidity, salt-contaminated dust, seawater, and underground salts.(Mehta 2003). Raouf (2012) mentioned that this is justified by the variable low rainfall, high evaporation rates, and frequent droughts that characterize the region.

To overcome the harsh environmental effect on concrete durability, multiple studies took place in different Gulf countries. To begin with, Ghous Sohail et al. (2020) examined how well newly created high-performance concretes (HPC) and ultra-high-performance concretes (UHPC) withstand over time. Al Nuaimi et al. (2021) assessed the durability performance of RC beams reinforced with CFRP composites performance after being exposed to sunshine and salt water.

According to the above scholars' outcomes, the adaptation of advanced materials and supplementary cementitious materials in the concrete mix, chosen at precise amounts and suitable to the exposure, together with correct curing, can overcome durability limiting factors in the Gulf's severe environment.

The Concrete Society's guide "Guide for the Construction of Concrete Buildings on the Arabian Peninsula" includes details on the durability design of RC structures. A four-step durability design approach for RC structures has been devised based on the fib principles (Demis & Papadakis 2019).

4 Comparison for Durability Design Provisions in International Codes and Standards

4.1 Durability Design Approach

BS 8500-1, EN 1992.1.1 have a similar approach for durability design requirements, they provide provisions for the environmental effect and recommend limits for critical values that directly impact concrete structure durability and methods for durability verification with variations among them of the details and given values. On the other hand, ISO 13823 has a different approach, it provides the limit state method and comprehensive guidance of the process of structure deterioration, starting from the environmental influence (exposures) that turns into agents throughout a transfer mechanism that will exert action and result in environmental effect.

4.2 Exposure Conditions

Both BS 8500-1 and EN 1992.1-1 codes based their exposure conditions on EN 206 code, consequently, they have the same exposure conditions except for the category of chemical attack due to seawater that is mentioned in the British standard but not in Eurocode. On the other hand, ISO 13823 listed 11 influences that have the same concept of exposure categories, and no subdivision due to severity is provided, nonetheless, the standard dictates that after assigning the deterioration assessment by experience, modelling and testing, the severity of the environment can be decided.

Freezing and Thawing

Freezing and thawing cycles are very detrimental for concrete structures (see Fig. 1), the British and Eurocode focus for each class on the water saturation concentration and

the usage of de-icing agents, they have two main categories, moderate and high-water saturation, each one is subdivided to two classes, with and without the usage of de-icing agents. In contrast, ISO 13823 doesn't categorize freezing and thawing as the compared codes, it is listed as an agent due to the influence of temperature and it must be considered in the durability design process.

Fig. 1. A concrete bridge parapet wall exhibits severe deterioration caused by repeated freezing and thawing cycles (Susca 2006)

Chemical and Sulphate Attack

EN 1992.1-1 included chemical attacks from natural soil or groundwater, three classes are given as per the aggressiveness of the environment, XA1, XA2, and XA3. Although the BS 8500-1 has similarity to the Eurocode, and such exposures don't exist in the UK, more comprehensive exposure classes are specified, six site exposure DS (design sulphate attack) classes depending on magnesium and sulphate amounts, and ACEC (aggressive chemical environment for concrete) exposure classes based on acidity and water mobility. Adding to that is the exposure category chemical attack from seawater which is not included in the Eurocode (Al-Haddad, Jokhio & Tair 2023).

From the ISO 13823 aspect, the chemical and sulphate agents act as an influence from the soil and ground containment. The effect of these agents depends on their amount, combination, and soil type. The standard then mentions that special concrete types and mortar mixes can be used to limit their effect. No specific concentrations are given or designated classes. (See Fig. 2).

In Contact with Water

Despite the detrimental effect of water in contact with structures, the British standard and Eurocode didn't provide a direct exposure category for it. Additionally, the analysed ISO standard contained water exposure (agent) in all its states (liquid, gas and solid) and with its different mechanisms to react with different contaminants and impact the structure's durability. The Eurocode mentioned it as part of a physical attack arising from water penetration.

Reinforcement Corrosion

For this exposure condition that is very damaging for the structures and if not repaired

Fig. 2. A structure subjected to sulphate attack (Sadanandam Anupoju 2009).

might lead to performance loss (see Fig. 3), the Eurocode and the British standard are more compendious than the ISO standards. The Eurocode and British standard grouped corrosion conditions according to the source of the agent that is initiating this reaction. Moreover, the British standard included a combination of exposures, as corrosion might be initiated with freezing and thawing, these exposures might occur simultaneously, these exposures are XC1 and XF3, XC2 and XF3 and or ACEC exposure.

Corrosion in the ISO 13823 standard is mentioned in different sections and for different metals, corrosion as per the standard might be initiated by chemical compatibility, electrical current in the ground and the presence of moisture and chloride under the effect of multiple environmental actions such as the environmental atmosphere, marine structures, type of soil, cracked concrete and masonry.

Fig. 3. Corrosion in concrete structures (Murari et al. 2021).

Other Exposure Conditions

The Eurocode and ISO standard mentioned other exposure conditions that the British

standard didn't include, the Eurocode includes them as indirect aggressive actions that might have a form of chemical attack, that arises from the function of the structure such as liquid storage, or solutions of acids or sulphate salts (EN 206-1, ISO 9690), chlorides contained in the concrete (EN 206-1), or alkali-aggregate reactions (EN 206-1, National Standards). Or the form of physical attack, arising from temperature change, abrasion, and water penetration (EN 206-1).

For the ISO, the inclusion of solar radiation such as UV and IR radiation, chemical incompatibility and biological agents are adapted as deteriorating agents for concrete structures.

5 Discussion and Critical Review of Durability Requirements

Structure durability is not a new phenomenon anymore; it has been addressed in the last decade, and several studies and research have been completed to further our understanding of it. As a result, it must be considered during all phases of the project to ensure that its impact on the structures is minimal.

Factors influencing durability could be from the concrete system itself or the environment, as reflected in the studied design codes as exposure conditions and allocated values or design parameters that should not be exceeded or allowed levels of some elements such as chloride in the material constituents of concrete.

As the study shows, the BS8500-1 standard is the most comprehensive and detailed among the compared documents, the Eurocode and ISO standard is also satisfying in covering durability design.

The studied existing exposure conditions are established to develop a prescriptive durability design approach rather than performance-based methods, alternative hybrid requirements enable the design expert to choose the best durability design approach and specification format for the overall project goals. Prescriptive requirements are beneficial to provide a minimum expected durability performance without the need for extensive concrete mixture design development. Performance requirements are effective means of optimizing concrete mixtures for durability, especially as concrete technology evolves.

Although the British and Euro standards are detailed about exposure conditions, some aspects need to be revised. To begin with, sulphate attack exposure, several parameters need to be included in the Eurocode that directly affect the severity of this attack: the source of sulphates, the frequency of water exposure, the type of cation associated with the sulphates. Hence, the type of sulphates must be included in the exposure conditions as each of them attacks concrete differently. Lastly is the chloride presence as it limits sulphate ingress.

The ISO standard covers water exposure but not the EC2 or British standards. Water can serve as an agent or as a transporter for other substances that can harm the structure, such as chlorides and sulphates. The ISO standard is more consistent in addressing such exposure and emphasizes a very critical impact: acidic rain, which is destructive to concrete.

Alkali-Silica reaction is another detrimental effect of water which the studied codes need to include to exposure conditions, the British standard allocated the obligation of avoiding it to the provider, whereas the ISO standards mentioned it as a degrading agent.

The Eurocode related it as a cause of the chemical attack. This could be explained by the factors that need to combine to start the reaction, where alkali is primarily from the materials making up the concrete and moisture is from the environment.

For corrosion exposure, class XC1 includes two scenarios which relate to the carbonation mechanism and corrosion induced by carbonation. XC1(wet) exposures can be neglected and XC1 (dry) is the same as X0 conditions, thereby, this category needs to be revised as carbonations requires humidity levels range 35%–75%.

For corrosion-induced carbonation, XC classes, a further exposure class should be introduced to encompass places with significant CO2 concentrations including tunnels, parking lots, and industrial locations. This will make it easier for designers to account for relative humidity and CO2 levels when creating durable designs.

Consideration for the notification provided from the amendment of the Norwegian Annex to EN206–1, on which EC2 and BS are based, for corrosion caused by chlorides from sources other than seawater, XD3 class. In this update, it is stated that exposure to XD3 indoor parking garages could have more severe effects than exposure to XD3 outdoors on a highway structure. This is due to the impact of salt slurry precipitation, followed by wetting/drying, on the slab surfaces of indoor parking garages, as well as the subsequent gradual increase in surface salt concentrations.

Steel corrosion for structures exposed to the maritime environment may be caused by the presence of chlorides that are either dissolved in water or airborne. Since numerous factors affect such chloride ingresses, such as the distance of the structure from the sea, ambient relative humidity, topographical conditions, wind features such as its speed, direction, and frequency, as well as the formation of salt-laden fog and mist, the exposure class that needs to be revised in this case is XS1. More information should be provided regarding the term “airborne”. In light of South Africa’s experience, they realized that, in contrast to other nations, chloride ingress began within 30 kms of the sea when there was a sufficient mix of onshore wind and relative humidity.

6 Proposal for the Improvement of Exposure Classes in the British and EC2 Code

Based on the comparison and critical review, the following exposure categories are indicated as a starting point for this area’s development in Tables 1, 2 and 3. For carbonation-induced corrosion, exposure class XC1 can be omitted as, exposure class XC4 is proposed to be added to consider areas with a high concentration of CO2 (see Table 1), XD4 class is added for chloride-induced corrosion apart from seawater to address indoor areas (see Table 2), and classes XS1a,b for chloride-induced corrosion from seawater to be assigned by several factors that vary from area to another (see Table 3). Additionally, the terms “Severe” and “very severe” are replaced with more relative terms “Major” and “Severe”, respectively.

Table 1. Proposed exposure classes for carbonation-induced corrosion.

Exposure class	Severity	Condition	Example
XC1	Moderate	Moderate humidity	External reinforced and prestressed concrete surfaces sheltered from or exposed to direct rain
XC2	Severe	Cyclic wet and dry	Reinforced and prestressed concrete surfaces subject to high humidity, repeated wetting and drying,
XC3	Very Severe	High concentration	Reinforced and prestressed concrete surfaces inside tunnels, car parking, and industrial areas

Table 2. Proposed exposure classes for chloride-induced corrosion apart from seawater.

Exposure class	Severity	Condition	Example
XD1	Low	Moderate humidity	Concrete surfaces are exposed to airborne chlorides. Reinforced and prestressed concrete wall and structure support more than 10 m horizontally from a carriageway. Bridge deck soffits more than 5 m vertically above the carriageway
XD2	Moderate	Wet, rarely dry	Parts of structures are exposed to occasional or slight chloride conditions. Reinforced and prestressed concrete surfaces are immersed in water containing chlorides. Buried highway structures more than 1 m below adjacent carriageway
XD3	Severe	Cyclic wet and dry	Reinforced and prestressed concrete walls and structural supports within 10 m of a carriageway. Bridge parapet edge beams. Buried highway structures less than 1 m below carriageway level. Reinforced pavements and car park slabs
XD4	Very Severe	Cyclic wet and dry	Reinforced and prestressed concrete slabs inside a parking garage

Table 3. Proposed exposure classes for chloride-induced corrosion from seawater.

Exposure class	Severity	Condition	Example
XS1a*	To be Locally specified	Exposed to airborne salt but not in direct contact with sea water	External reinforced and prestressed concrete surfaces in coastal areas
XS1b*	To be Locally specified	Exposed to airborne salt but not in direct contact with sea water	External reinforced and prestressed concrete surfaces in coastal areas
XS2	Moderate	Permanently submerged	Reinforced and prestressed concrete surfaces completely submerged or remaining saturated, e.g., concrete below the mid-tide level
XS3	Severe	Tidal, splash and spray zones	Reinforced and prestressed concrete surfaces in the upper tidal zones and the splash and spray zone, including exposed soffits above seawater

XS1a*, and XS1b* are assigned upon the distance of the structure from the sea, ambient relative humidity, topographical situations, wind features such as its speed, direction, frequency, and the formation of salt-laden fog and mist

7 Conclusions and Recommendations

This study investigated the durability approach and design provisions for concrete durability design in international codes, it provides a beneficial review of the situation on durability design in international codes and standards. The outcomes can be used as a starting point for amendment.

For the durability design approach, the British and Eurocode codes have a prescriptive approach, this can be adequate for conventional structures, however, for complicated or modern structures, a performance approach is required. This study recommends the utilization of hybrid specifications as each of them has its benefits depending on the type of structures.

For Exposure conditions, the BS8500-1 and EC2 have similar approaches whereas ISO 13823 follows a different approach, the three studied documents are comprehensive, with the British standard being the most detailed among all, nonetheless, more clarification is required for some terms and more classes can be added to include the most probable environmental situations that might affect concrete durability. Therefore, this study recommends considering the tables proposed in Sect. 5 for the improvement of exposure conditions.

Further research is recommended for assigning durability parameter values for the proposed additional exposure classes, the provided values in the studied documents are acceptable and adequate to lower the penetration of harmful elements to the concrete.

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Facade Retrofits: Sustainable Living Architectural Facades. The Case Study of "Baynunah Hilton Tower" in Abu Dhabi

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Abstract. Over the last few years, the concept of a more sustainable/eco-responsive skin featured as alternative envelopes for buildings (sometimes termed "Living Architecture"), designed to achieve low energy consumption, cost efficiency, and user comfort. Until today, architects in the UAE tend to design projects with double skin façades more than providing living architecture façade to achieve energy efficiency and sustainability in an extremely hot climate. Since the 1990s buildings in Gulf cities were dressed in cladding, which ignores the importance of building orientation, passive design ideas, and implementation.
Purpose – This paper examines the concept of living architecture in the context of the UAE and proposes a framework to retrofit existing unsustainable designs with more eco-responsive ones.
Methodology – Energy analysis will be applied to the façade of Baynunah Hilton Tower in Abu Dhabi before and after providing a living architectural façade technique in order to test the energy efficiency of the facade between the two scenarios. The analysis will be applied using FormIt software.
Findings – The new proposed façade design "Light-weight Aluminium with Arabesque pattern" have affected positively the energy performance of the building. The energy consumption has been reduced by almost 38% after applying the retrofitting design to the façade.
Implications – Façade retrofit is important as it helps in providing sustainable design solutions for the building's facade that plays an important role in achieving energy efficiency and saving the environment.
Originality/value – All the scenarios and simulations were done by the authors using FormIt software.

Keywords: Living Architecture · Eco-responsive Facade · Double Skin Facade · Adaptive Skins · Energy Performance

1 Introduction

In architecture, sustainability is an important approach that each building should achieve to help saving the environment. Develop and change of building's facades are linked with new ideas related to style, environment issues, availability of materials, technological

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application, time and building deterioration. Extreme climates require extreme design response: a need to re-think building envelops in a more sustainable, eco-responsive manner. Hot climate areas are one of the most important to consider the sustainable facade to resist the heat and protect the environment through energy efficiency solutions.

The reason behind choosing this topic to explore is the high importance of achieving sustainable design in building's design and save the environment. The building facades play an important role in the technical performance as they are the largest and most important elements in buildings. Moreover, facade design is the link between the building's interior and the exterior environment, in addition to being a deciding factor for architects to help them selling the idea to the client, as a result, I focused in my research on the building's facades only.

As the UAE has a very hot and arid climate, it is very important to take benefit of the façade design to provide shading for the building's occupants and reduce the energy consumption that is needed to cool the air inside the building. The strategy of façade design is to control the heat gain by preventing the sun heat to come into the building, while allowing the daylight and views. In addition, all windows that are located within the sun path should have shading elements that will prevent the harsh sun from coming inside the building and heat the indoor environment (GUIDE, 2009).

The aim of advanced façade systems can be summarized as follows:

- Making natural daylight and light levels available hence offering visual comfort
- Providing access to external views.
- Achieving efficient level of thermal comfort.
- Reducing energy consumption required for heating/cooling and lighting (Kambil, 2009).

In accordance to the Energy Information Agency (EIA, 2000), energy consumed due to a building's running costs including lighting and thermal control accounts for approximately 84% of energy consumption of the building over its lifespan. As building's facades separate between outdoor and indoor environments, the degree of success in accomplishing high efficiency thermal control in a building is highly dependent on the process selection, design, and selection of materials (Kambil, 2009).

2 Literature Review

2.1 What is a Living Architecture Façade?

The term of living architecture facade has been recently adopted in architecture to learn and mimic the design of natural systems. Rachel Armstrong, applied scientist, innovator and professor at the Bartlett School of Architecture, University College London, said that a living architectural façade consist of reactive systems that react to the different changes and effect on achieving the comfort levels indoors and outdoors. The only possible way to construct living architectural facades is by connecting them to the environment, not insulating the building's interior form exterior nature through the facade. R. Armstrong added that this development of facades is going to take a while, but gradually it will lead us to a sustainable connection between the buildings and the natural world (Armstrong, 2009).

According to Lindsey Kindrat, Owner and Director, Principal Sustainable Building Specialist, she said that we are all afraid of green buildings, although our target is to make our lives green and apply the right thing, but we are losing the connection with nature. The main goal of green buildings is to let nature in and connect the residents of buildings with the environment. (Kindrat, 2013). Emma Flynn, a practicing architect, and design researcher at London-based architecture practice Astudio, explains that living systems, unlike the majority of the machine-like building stock contributes positively to the biosphere, playing an essential role in wider ecosystems linked together through nutrient and energy flows. It is this collective nature that guarantees survival. By incorporating fundamental dynamic processes found in living systems, architecture has the potential to adapt or respond to changes in climate, seasons, or extreme acts of nature, just as our natural green landscapes respond to the availability of water, sunlight, and wind (Flynn, 2016). On the other hand, Katia Perini, Marc Ottelé, E. M. Haas, and Rossana Raiteri, are faculties of Architecture at University of Genoa Stradone S. Agostino - Italy, they agreed that living architectural facades refer to green facades (Katia Perini, Marc Ottelé, E. M. Haas, Rossana Raiteri, 2011).

All the above theories have somehow linked the concept of "Living Architecture Facade" to Sustainability, flexibility, adaptive capacity, sensor technology, integration of installations and façades, building management systems, renewable energy and the development and management, maintenance, and operational services during the lifespan of the buildings (Ulrich Knaack & Tillmann Klein, 2009).

2.2 Characteristics of a "Living Architectural Façade"

The Living Architectural Façade provides links between indoor and outdoor environments, which both emphasize comfort resulting in positive effects such as energy generation (renewable energy), expressive and aesthetic experience resulting an ideal working environment along with productivity levels. Moreover, the facade of living architecture designed as a zone or space with different facilities in addition to the original protective shell facility. The facade is considered as a transitional space in a way that it adjusts and combats all the undesired outdoor effects on the indoor environments and vice versa. In addition, it has the ability to adapt and balance between the indoor and outdoor environments based on their situation. The facade of living architecture is intelligent living system that can adjust itself to different possibilities through technology or changes in demands. As a result, the living architectural facade is considered sustainable as the specifications, engineering and developments depend on this desire to be adjustable, as well as focusing on the functionality and technology to modify the overall appearance and material use (Ulrich Knaack & Tillmann Klein, 2009).

2.3 Limitations of a "Living Architectural Façade"

Developers and designers still do not see the value of living architectural facade other than providing luxurious and iconic view to the building. In some types of facades, it is too expensive in terms of providing the design, operational cost and the maintenance, and the payback will be on the long term. In addition, many developers and owners still do not understand the need to protect our natural resources like saving the water or

energy. However, everyone in the society should do their role to enhance the building sustainability and save the natural resources of environment, because every little bit counts (Kindrat, 2013).

3 Case Studies of Sustainable Skins in the UAE

3.1 The Masdar Institute's GRC Residential Facade

The Masdar Institute is the first phase and development to be built in Masdar City to house residents and it is completely powered by renewable solar energy. The GRC material was the selection choice as a construction material for the Masdar Institute to match with the sustainable context of the city. The main purpose of using GRC that it will dispense the material transport and embodied energy, because it can be made locally in Abu Dhabi. The main goal of designing the façade was to respond to their orientation, provide shading to the interior environment of the building and to the nearby buildings and streets below as well. These required using computational modelling techniques in addition to the physical techniques to help choosing and finalizing the form of building. The facades consist of multiple layers, containing external screen layer with balconies, insulation layer and inner façade. These layers provide functional response to deal with UAE's desert environment, while the external balconies provide good shading to what is below, as shown in Fig. 1 (Palmer, 2011).

Fig. 1. The Masdar Institute's GRC Residential Facade - Different exterior shots for the curved forms of the Institute's GRC residential facade - (Palmer, 2011)

3.2 Siemens Middle East HQ

The Siemens Middle East Headquarters, located in Masdar City, achieved LEED platinum certificate, and considered one of the first buildings in the region. The design of the building combines the traditional design and parametric analysis to provide a compact and efficient form that achieves sustainability through using fewer materials and reduces the embodied carbon (Siemens HQ in Masdar City/Sheppard Robson, 2014).

The envelope design of the building presented as a box within a box, as shown in Fig. 2. The inner layer designed with highly insulted airtight facade to minimize the thermal conductivity. The exterior layer covering this inner layer will be an external lightweight aluminium shading element which helps in minimizing the solar gain and

allows for daylight to enter the interior environment along with the maximizing the views from the building. The external shading system consist of lightweight aluminium fins that provides a strong architectural language for the building as each facade designed to suit its solar orientation (Siemens HQ in Masdar City/Sheppard Robson, 2014).

Fig. 2. Siemens Middle East HQ - The details of the External shading system in the Siemens Middle East HQ- (Siemens HQ in Masdar City/Sheppard Robson, 2014)

3.3 Al Bahr Towers in Abu Dhabi, UAE

The main design goal of Al Bahr towers was to achieve an environmentally friendly project with sustainable features that can withstand in the world's hottest climates, in addition to full response to the cultural and environmental context. The design was achieved using outer skin "Mashrabiya" that covers the two towers on the west, east, and south side that are automatically open and close in response to the sun path over the surface. The dynamic shading device is programmed to respond to the sun path, providing shade in the morning to the eastern side of the building and moving towards the western side with the sun throughout the day, as shown in Fig. 3 and 4. The sustainable towers achieved 50% reduction in the energy consumption and 80% reduction in the solar gain within the two towers. The project is a landmark in Abu Dhabi and crowned as the "Best Overall Project in the Middle East" (Al Bahar Towers, Abu Dhabi, 2013).

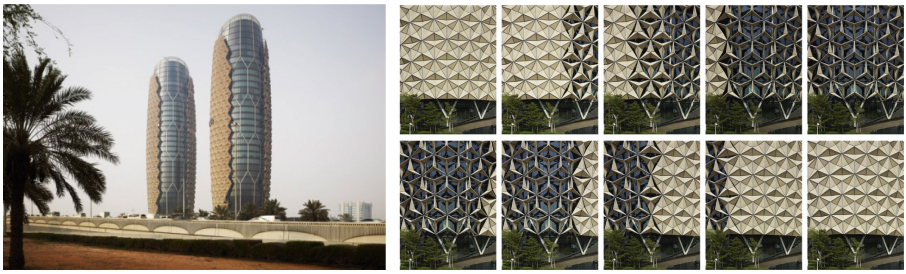


Fig. 3. Al Bahr Tower - The 1049 Mashrabiya shading devices are programmed to respond to the sun path- (Al Bahar Towers)

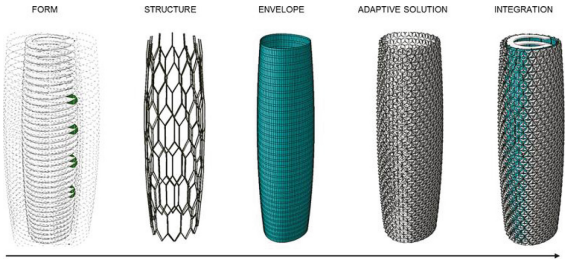


Fig. 4. The layers of Al Bahr Tower's façade skin- (Al Bahar Towers)

Reference to the mentioned examples earlier, there is a strong connection between the architectural design and the environmental thinking in the façade system, where sustainable principles can be applied to achieve the Living Architectural Façade design. The Living Architectural Façade can contain a combination of electronic devices, building components and mechanical installation. As the UAE has hot desert climate, it is important to take into consideration the type of façade used in the buildings, as the façade should resist the harsh sun while providing natural light, ventilation, access view to the exterior and achieve the energy efficiency of the building.

4 Methodology

The case study of Baynunah Hilton Tower will be used to study and apply the energy simulation on the facades using the computer software "FormIt". This will include analysing the energy performance of the facades for the base case scenario, and next applying the four design principals to analyse the façade performance in terms of energy efficiency.

4.1 Case Study

The Baynunah Hilton Tower shown in Fig. 5 is a landmark in Abu Dhabi, two kilometres away from the city centre, located on the coast of Abu Dhabi Corniche. It has been constructed in 1995 and considered as the tallest building in UAE at that time and remained the tallest until 1999. The main intention of the architects in designing this tower was to provide dynamism when looking to it from different angles. The tower consists of three wing towers 25, 31, and 37 floors and structured around a cylindrical core that rises to 42 floors (BESIX).

Base Case Scenario: The Baynunah tower consists of drilled reinforced concrete piles as a foundation with a concrete structure was built on top of it. The three-winged towers are covered with blue tinted glass curtain wall façade, while the three outer cylinders have concrete facades decorated with arabesque motifs. The interior's finishing of the tower contains a usage of large amounts of marble and high-quality granite (BESIX).

Energy Performance and Modelling: An energy performance analysis has been done on the base case scenario of the façade for the Baynunah Tower using FormIt software.

Figures 6 and 7 show the analysis results using FormIt software. The building consumes 428 Kwh/m^2/Yr of energy. The solar heat gaining on the façade is ranging between moderate to high percentage, while on the roof is gaining high percentage of solar heat. The tower's facades are gaining a lot of solar heat all over the year, specifically in the months of June, July and August, where the electricity consumption reaches the highest point. As the façade is fully glazed with no external shading or additional layers to prevent the heat gain, the tower has high electricity consumption. The tower has high energy consumption with high Co2 emission, where they can reach to 3,000 metric tons/Yr. Due to the façade type and the lack of any energy generation in the building.

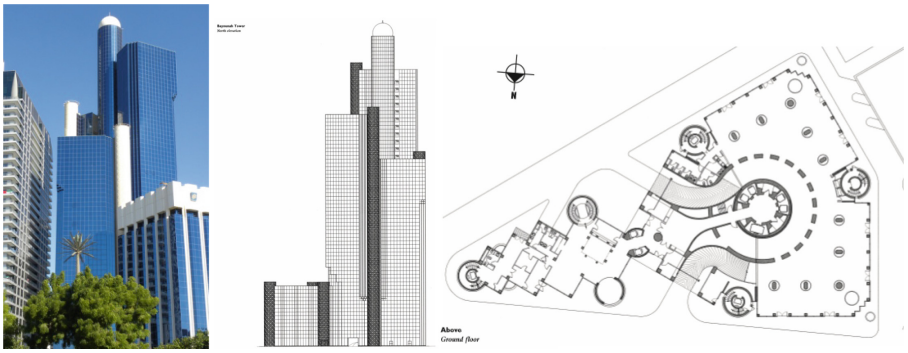


Fig. 5. The Baynunah Hilton Tower in Abu Dhabi – North elevation and ground floor plan.

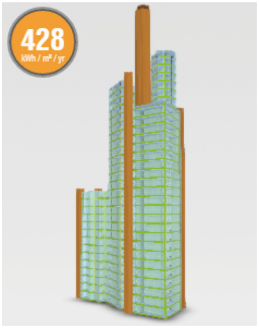


Fig. 6. The 3D of Baynunah Hilton Tower model on FormIt with the energy consumption test for the existing facade - FormIt

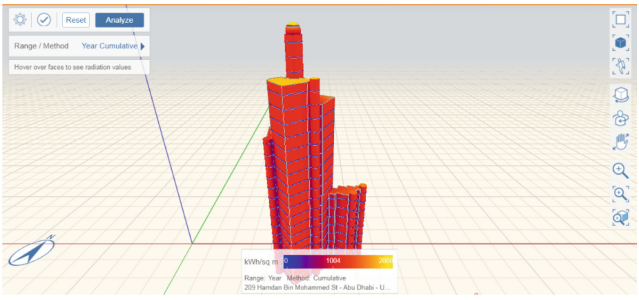


Fig. 7. Year Cumulative Solar analysis for the facade of The Baynunah Hilton Tower - FormIt

The three-winged towers are covered with blue tinted glass curtain wall façade, which allow for large amount of solar heat to pass through it inside the building as appearing the analysis previously. A new external layer will be proposed to be as a screen between the existing glass curtain wall and the external environment surrounding the tower. The material of this external layer will be lightweight aluminium and will consist of

arabesque pattern that acts as shading element to help in minimizing the solar gain while allowing for daylight to enter the interior environment along with maximizing the views from the building. The arabesque pattern idea is derived from the three cylinders which have concrete outer facades decorated with arabesque motifs; this will provide a strong architectural language for the building as the same arabesque pattern will continue on the glass and concrete side.

4.2 Proposal for Sustainable Retrofit for the Façade of Baynunah Tower

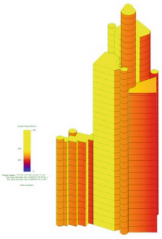
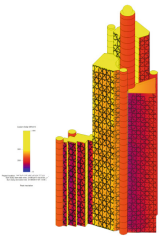
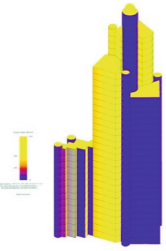
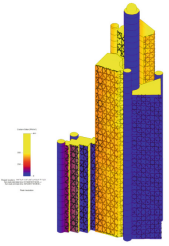
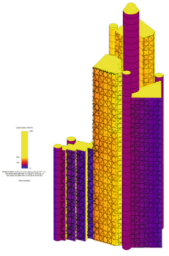
By using FormIt software, an energy performance analysis has been done on the new proposed facade to test the difference between the existing facade and the new design in terms of energy efficiency. As per the Fig. 8, the new added layer is enhancing the energy efficiency of the building. The amount of energy consumed through this design can reach 263 Kwh/m^2/Yr.

Fig. 8. The 3D of Baynunah Hilton Tower model on FormIt with the energy consumption test for the new proposed facade - FormIt

The Table 1 shows the difference between the existing façade "blue tinted glass curtain wall" and the new proposed layer for façade "Light-weight Aluminium with Arabesque pattern" in terms of solar heat gained using Revit software.

The added layer is affecting positively on the energy performance of the building, reduces the amount of CO consumption, saves the electricity bill, and protects the non-renewable energy to save the environment. Figure 9 shows the difference in energy consumption between the existing facade and the new proposed facade. The energy consumption reduced by almost 38% after applying the retorting design to the façade.

Table 1. The difference between the façade of the base case scenario and the new proposed façade in terms of solar heat gained.

Time of Year	Existing façade "Blue tinted glass curtain wall"	New Proposed façade "Light-weight Aluminium with Arabesque pattern"
Summer		
Winter		
Yearly		

Source: (Eid, via FormIt software)

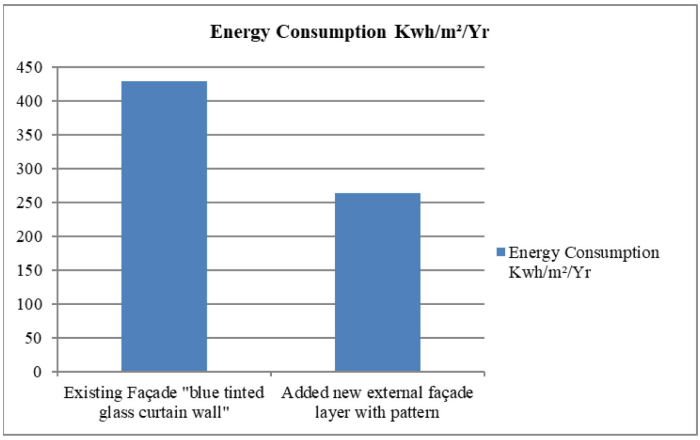


Fig. 9. A Comparison between the existing façade and the new proposed one in energy consumption Kwh/m^2/Yr.

5 Conclusion

To conclude, applying sustainable design in the projects plays an important role in saving our non-renewable resources and the environment. As the population is continually increasing, the CO2 emission and the amount of energy consumed will be increased as well. As a result, the next generation will face problems in surviving in such a damaged environment. That is the reason why all projects should be designed using sustainable strategies to enhance and save the green environment, protect the resources, and minimize the CO2 emission.

The UAE is one of the countries that took an immediate action after paying attention to this issue to solve and reduce the overall energy consumption of the country. The Living façade acts as a concept for change, where a new direction in the façade sector have been represented and developed. The living façade features and solutions require using the most advanced technological capabilities to test the design before applying it on the site. The Living façade acts as a concept for change, where a new direction in the façade sector have been represented and developed. The living façade features and solutions require using the most advanced technological capabilities to test the design before applying it on the site. The living façade contains a combination of electronic devices, building components and installation. At the end, the goal of sustainability is to provide possibilities and not limiting the options. All people are responsible for their actions toward the environment to achieve an environment that doesn't need protection. Architecture and sustainable strategies should be linked together when designing the facades of buildings.

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Pre-training on Multi-modal for Improved Persona Detection Using Multi Datasets

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Abstract. Persona identification helps AI-based communication systems provide personalized and situationally informed interactions. This paper introduces pre-training on CNN, BERT, and GPT models to improve persona detection on PMPC and ROCStories datasets. Two speakers with different personalities have dialogues in the PMPC dataset. The challenge is to match each speaker to their persona. The ROCStories dataset contains fictional character traits and activities. Our study uses transformer-based design to improve persona detection using ROCStories dataset external context. We compare our method to leading models in the field. We found that pre-training and fine-tuning on several datasets improves model performance. External context from tale collections may improve persona detection algorithms and help understand human personality and behavior. Our study found that pre-training CNN, BERT, and GPT models improves persona detection, improving user experiences and communication. The method could be used in chatbots, personalized recommendation systems, and customer support. Additionally, it can help create AI-driven communication systems with tailored, context-aware, and human-like interactions.

Keywords: Persona · Detection CNN · BERT · GPT · PMPC · ROCStories

1 Introduction

Communication is vital in the digital age. The identity of participants in social networking, instant messaging, and customer care conversations are revealed. Identification of speaker identities in conversational texts could improve online forum and customer service interactions and consumer satisfaction. Marketing, customer service, and healthcare increasingly use persona identification. Persona identification analyzes consumer personalities to improve customer service. This analysis helps organizations classify client demands by attributes. Thus, customized support can increase customer satisfaction and loyalty. Persona identification helps chatbots grasp human tone and style which can help them increase communication, user engagement, and personalized responses.

Automatically creating human-comprehensible language is a major challenge in Natural Language Processing (NLP). Natural Language Generation teaches robots human-like speech (Santhanam and Shaikh 2019). Personalizing dialogue agents helps dialogue

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systems provide more specific, consistent, and engaging responses (Zhou, Li et al. 2021). Machine-to-human talks needed persona detection for better services. Conversational messages are informal and unstructured, making speaker persona detection difficult. Exploiting the data to create diverse and sustainable human-machine discussions is still difficult (Song, Zhang et al. 2019). User profile, language behavior, and interaction style make up a persona (Li, Galley et al. 2016). The persona is a complete description of an individual, comprising demographic information like age, gender, and location and personal data like interests and hobbies. Personal values, opinions, and purchase habits may be included in the persona.

NLP methods and Person Match on Persona Chat (PMPC) and ROCStories datasets are proposed to improve persona detection. These datasets provide rich linguistic information that we hope to use to improve persona detection programs. We suggest modeling persona-specific traits in PMPC and ROCStories data using CNN, BERT, and GPT. The hypothesis states that training machine-learning models on additional data sources can improve their persona recognition.

Our study found that integrating PMPC and ROCStories datasets using NLP improves persona detection algorithms. This suggests that the supplemental data sources obtained the persona-specific features needed for accurate persona identification. Our experiments showed that Convolutional Neural Networks (CNN), Bidirectional Encoder Representations from Transformers (BERT), and Generative Pre-trained Transformers (GPT) captured the dataset's linguistic characteristics and improved model performance. These findings affect chatbots, virtual assistants, and tailored information delivery systems.

2 Related Work

Personality identification has been extensively researched. Zhou et al. (2021) used interaction history to automate speaker recognition in order to personalize dialogue agents. Li et al. (2016) investigated the Speaker Model and Speaker-Addresses Model using a sequence-to-sequence architecture. Gu et al. (2021) employed natural language processing and machine learning methods to identify personalities in conversational text. Their research was influenced by Gao et al. (2020), Gupta et al. (2020), and Yang et al. (2018).

In persona recognition investigations, SVMs and decision trees have been applied (Liu et al., 2017; Zhang et al., 2017). Recent research has concentrated on the use of deep learning networks, such as RNNs and transformers, for persona detection. Previous research on persona detection has focused on unsupervised learning methods such as clustering and dimensionality reduction (Kannan et al., 2018). Human-machine communication is still evolving, despite these attempts (Zhang, Dinan et al., 2017).

Persona Chat and ROCStories datasets have been utilized in numerous experiments for NLP-based persona detection. The Persona Chat and ROCStories datasets were integrated by Zhang et al. (2020, b) to improve chatbot responses, making them more human-like and diverse. The researchers used word embeddings and attention mechanisms to capture each persona's distinct characteristics. On several evaluation measures, their investigation revealed that their proposed model outperformed numerous baseline models.

Moreover, Wu et al. (2019) created a framework for dialogues that take into account the personas of the speakers. This framework was built using data from Persona Chat. They employed a hierarchical recurrent neural network (RNN) and an attention mechanism. This method was developed in order to collect dataset persona-specific data. The researchers demonstrated that their technique resulted in more diverse and tailored replies.

Persona Chat and ROCStories datasets have also been used in other projects for NLP tasks. Gao et al. (2019) proposed generating persona-based questions utilizing Persona Chat data. A sequence-to-sequence model with an attention mechanism was adopted by the researchers. Using this technique, user personas were utilized to develop questions. Mostafazadeh et al. (2016) developed the ROCStories dataset to aid with narrative production. The dataset was useful in assessing models' ability to construct logically consistent and engaging narratives, according to the researchers. The preceding tests show the Persona Chat and ROCStories datasets' promise in natural language processing (NLP) tasks, notably persona detection.

As for the use of a multi model approach, several research have used CNN, BERT, and GPT to detect personas in natural language processing. To recognize personalities, the researchers utilized a hybrid model that integrates CNN, BERT, and GPT, according to the Journal of Artificial Intelligence Research. The model exceeded earlier benchmarks on the Persona-Chat dataset. Integrating numerous pre-trained models is effective.

Another paper published in the Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing proposed a multi-view framework for detecting personas that integrates BERT, GPT, and LSTM results. On the Persona-Chat dataset, the model outperformed baseline models.

Researchers employed Convolutional Neural Networks (CNN), Bidirectional Encoder Representations from Transformers (BERT), and Generative Pre-trained Transformers (GPT) to identify social media personality traits in a recent Journal of Big Data study. The program correctly recognized personality traits after training with a huge collection of tweets. This supports utilizing different persona detection models in different settings.

According to our literature review, combining CNN, BERT, and GPT models improves natural language processing persona detection. Combining models can improve the accuracy and efficacy of persona detection models, making them helpful in a variety of natural language processing applications. Building on previous research, this work recognizes personas using several methods and datasets. This study demonstrates how using many data sources might improve persona detection methods.

3 Approach

3.1 Dataset Selection and Preprocessing

The Person Match on Persona Chat (PMPC) and ROCStories datasets were utilized in this study for the purpose of training and assessing our models. The PMPC dataset comprises conversational texts that are accompanied by predetermined personas, whereas the ROCStories dataset consists of lengthier tale texts that do not possess established

personas. Prior to training our models, the data will undergo preprocessing procedures such as tokenization, stop word removal, and text conversion to lower case.

3.2 Model Architecture

3.2.1 Pre-training

During the initial training phase, the Convolutional Neural Network (CNN), Bidirectional Encoder Representations from Transformers (BERT), and Generative Pre-trained Transformer (GPT) models undergo training using a substantial collection of textual data. Each model is trained utilizing a distinct architecture and objective function.

The CNN model is specifically built for text classification tasks. It employs a convolutional layer, which is subsequently followed by a max-pooling layer, to effectively detect and recognize patterns within the input data.

The BERT model is a transformer-based model that employs a disguised language modeling objective to acquire the semantic understanding of words within their respective contexts. The model undergoes training utilizing an extensive corpus of textual data, enabling it to effectively grasp the intricate connections between words inside a given sentence.

The GPT model, like other transformer-based models, is specifically engineered to excel at text generation tasks. The model is trained with a language modeling aim, which involves predicting the subsequent word in a given sequence.

3.2.2 Fine-Tuning

During the fine-tuning phase, the pre-existing models undergo further training using the PMPC and ROCStories datasets, specifically for the purpose of persona detection. The fine-tuning procedure entails training the models to perform a particular goal, namely, discerning the persona of a speaker or writer by analyzing their language patterns. The process of fine-tuning entails iteratively adjusting the parameters of the model in order to enhance its alignment with the specific job being addressed.

The ultimate model design incorporates a fusion of pre-training and fine-tuning techniques. The base models utilized in this study include the pre-trained Convolutional Neural Network (CNN), Bidirectional Encoder Representations from Transformers (BERT), and Generative Pre-trained Transformer (GPT) models. These models are further refined using a process known as fine-tuning, using the PMPC and ROCStories datasets. The objective of this fine-tuning process is to enhance the models' performance specifically in the context of persona detection. The final forecasts are generated by aggregating the outputs of the three models.

Overall, the model architecture for the experiment on persona detection using pre-training on CNN, BERT, and GPT involves a combination of different architectures and objective functions, and is designed to leverage the strengths of each model for improved performance on the persona detection task.

4 Experiments

Building a persona detection model typically requires a dataset that includes demographic and behavioral information about users. There has been growing research interest in training conversation systems from large datasets containing human-to-human conversation (Li, Galley et al. 2016). Existing persona-oriented dialogue systems can be classified into two categories: Structured Persona-oriented Dialogue Systems (SPDS) and Unstructured Persona-oriented Dialogue Systems (UPDS) (Xu, Li et al. 2020). In this study, two different datasets are used and below is the description of each:

Dataset 1: The first dataset used in this study is UPDS Person Match on Persona -Chat developed by (Gu, Ling et al. 2021). This dataset construction is based on the Persona-Chat dataset (Zhang et al., 2018) that contributes a persona-chat dataset with natural sentences persona information (Xu, Li et al. 2020).

The Persona-Chat dataset and Persona Match on Persona-Chat (PMPC) dataset are both used for the task of persona detection. However, there are some differences between the two datasets:

1. **Dataset Size:** The Persona-Chat dataset contains 10,936 dialogues, while the PMPC dataset consists of 6,000 dialogues. Therefore, the Persona-Chat dataset is larger than the PMPC dataset.
2. **Task:** The Persona-Chat dataset task involves one speaker assuming a given persona, and the other speaker tries to guess it. In contrast, the PMPC dataset requires both speakers to assume a given persona, and the task is to match each speaker with their corresponding persona.
3. **Persona Diversity:** The Persona-Chat dataset contains a wider range of personas, including fictional characters, celebrities, and historical figures. In contrast, the PMPC dataset places its emphasis on personalities that embody diverse demographic characteristics, including age, gender, and occupation.
4. **Annotation Quality:** The PMPC dataset exhibits superior annotation quality in comparison to the Persona-Chat dataset. The PMPC dataset was annotation by many annotators and underwent a rigorous quality control process to assure the accuracy of the annotations. For the purpose of this study, which focuses on detecting specific demographic characteristics of a person in a story, context, which will in return expand the demographic identification quality of the person the PMPC dataset has been seen as more appropriate.

The PMPC dataset is annotated by multiple annotators in order to enhance the accuracy of the annotations. The process of annotating the data is conducted at the level of dialogue, wherein each dialogue is assigned annotations indicating the appropriate persona for each speaker. In addition to the primary data, the dataset incorporates supplementary information known as metadata, which encompasses attributes such as the age, gender, and occupation of each individual persona.

The Person Match on Persona-Chat (PMPC) dataset is a compilation of conversational data specifically curated for the purpose of doing research in the domain of natural language processing and its associated disciplines. The composition comprises a collection of talks characterized by the presence of two speakers, each of whom assumes a

distinct persona. The dataset included in this study was created by a team of researchers affiliated with the University of California (Gu, Ling et al., 2021) and is openly accessible for the purpose of academic investigation.

The PMPC dataset comprises dialogues including two speakers, namely A and B, each of whom is assigned a persona. The persona refers to a concise passage that delineates the attributes, inclinations, and personal history of the individual assuming the role of the speaker. The personalities have been strategically developed to offer further background during the conversation, facilitating the speakers in establishing their own identities and objectives.

The dataset has a total of 10,197 dialogues, which are divided into three subsets: the training set consisting of 4,347 dialogues, the validation set containing 1,000 dialogues, and the test set comprising 4,850 dialogues. Every conversation is accompanied by a series of potential responses, with the objective being to choose the response that best suits the given persona and context of the dialogue.

Dataset 2: According to the study conducted by Majumder, Berg-Kirkpatrick, and colleagues in 2021 (Majumder, Berg-Kirkpatrick et al. 2021), Although dialog models based on personas are capable of generating responses that align with a specific persona, they frequently overlook persona-related events. In this study, the researchers enhanced dialogue models by incorporating background narratives associated with a persona. This was achieved by utilizing fictitious tale datasets, such as ROCStories (Mostafazadeh et al., 2016).

The ROCStories dataset comprises a compilation of concise narratives specifically curated for the purpose of conducting research in the domain of natural language processing and its associated disciplines. The content comprises a collection of narratives, each of five sentences. Each narrative is accompanied by a prompt and five alternative conclusions, presented in the form of multiple-choice questions. The dataset was created by the University of Rochester and is accessible to the public for the purpose of doing research.

In addition to the five-sentence stories, the dataset includes five possible endings for each story, labeled A through E. These endings provide different resolutions to the conflict or obstacle introduced in the story.

The dataset contains 98,162 five-sentence stories with five possible endings each, resulting in 490,810 multiple-choice questions. The stories are divided into a training set of 73,806 stories, a validation set of 9,637 stories, and a test set of 14,719 stories. The dataset also includes additional metadata such as story IDs, prompt IDs, and the correct ending for each multiple-choice question.

5 Evaluation Metrics

In the case of using ROCStories with Persona Match on Persona-Chat (PMPC) dataset, we experimented on this task with the F1 and Bleu measurements.

F1-score is a harmonic mean of precision and recall. Precision measures the proportion of true positives over the total number of predicted positives, while recall measures the proportion of true positives over the total number of actual positives. In the context of

persona detection, precision measures the proportion of correctly identified personas of characters over the total number of predicted personas, while recall measures the proportion of correctly identified personas of characters over the total number of actual personas. F1-score balances between precision and recall and provides an overall measure of the model's performance.

BLEU (Bilingual Evaluation Understudy) is a metric used to evaluate the quality of machine translations or text generations. It measures the similarity between the machine-generated text and one or more human-generated reference translations. Bleu is not usually used as an evaluation metrics for persona identification but we wanted to experiment and assess the similarity between a machine-generated text and a reference text. In order to achieve this goal we followed the below steps:

- Defined a set of persona traits or characteristics that we wanted to identify in the text. For example, to identify whether the text was written by an extroverted person, we defined a set of extroverted phrases or words.
- Collected a set of reference texts that represent the persona traits or characteristics we want to identify. These texts were written by individuals who are known to possess the traits or characteristics you want to identify.
- Generated texts using the model and calculated the BLEU score between the generated texts and the reference texts.
- If score is high, it suggested that the generated texts are similar to the reference texts and may indicate that the texts were written by individuals with the identified persona traits or characteristics. A low score on the other hand identifies that there is no match between the reference text and the individual trait identified.

We evaluated the performance of the fine-tuned model on the validation and test sets using F1 and BLEU. The F1 score is a measure of the model's precision and recall on the task of persona detection, while BLEU measures the quality of the generated responses by comparing them with human-generated responses.

6 Results

Based on the experiment results in the table, we can see that the BERT model performs the best in terms of F1 score on both evaluation sets, with F1 scores of 0.1981 and 0.1997 for ROC-STORIES and PMPC, respectively. The GPT model has the second highest F1 score, while the CNN model has the lowest F1 score.

Similarly, the BERT model also performs the best in terms of BLEU score on both evaluation sets, with BLEU scores of 0.009131 and 0.01911 for ROC-STORIES and PMPC, respectively[1].

The GPT model has the second-highest BLEU score, while the CNN model has the lowest BLEU score (Table 1).

Upon examining the outcomes, it is evident that the pre-trained models exhibit superior performance compared to the non-pretrained models across both datasets. This is seen from the higher F1 and Bleu scores. Out of the three pre-trained models,

[1] https://github.com/SalwaAbdulla996/PD32.git.

Table 1. Results of the pre-training and fine-tuning

Methods	Pre-training result				Fine-tuning result			
	ROCStories		PMPC		ROCStories		PMPC	
	Evaluation Metrics							
	F1	Bleu	F1	Bleu	F1	Bleu	F1	Bleu
CNN	0.0801	0.000431	0.0807	0.00111	0.0927	0.00051	0.1927	0.00911
GPT	0.1901	0.007131	0.1987	0.01111	0.1927	0.00911	0.1927	0.00911
BERT	0.1981	0.009131	0.1997	0.01911	0.1987	0.00981	0.1988	0.00991

BERT exhibits the most superior performance, as evidenced by F1 scores of 0.1981 and 0.009131 for the ROCStories and PMPC datasets, respectively. The GPT model exhibits notable performance, as evidenced by F1 values of 0.1901 and 0.007131 for the ROCStories and PMPC datasets, respectively.

The CNN model has the least favorable performance when compared to the other two pre-trained models. It achieves F1 scores of 0.0801 and 0.000431 for the ROCStories and PMPC datasets, respectively.

In general, the findings indicate that incorporating pre-training techniques using CNN, BERT, and GPT can enhance the accuracy of persona detection on both the PMPC and ROCStories datasets. The impressive performance exhibited by BERT and GPT models implies that these models provide significant potential for effectively addressing persona detection challenges within the field of natural language processing (NLP).

7 Conclusion

This study used the PMPC and ROCStories datasets to examine how pre-training affects CNN, BERT, and GPT models' persona detection performance. It is found that pre-training improved persona detection models. BERT performed best of the three models. Moreover, the study shows how pre-training CNN, BERT, and GPT improves persona detection on the PMPC and ROCStories datasets. The findings are promising, but more research is needed to address the study's limitations. To improve natural language processing persona detection, pre-training and other methods must be explored.

The result of this study can be utilized by researchers and practitioners who detect personas. Pre-training on a large corpus of textual data allowed the models to recognize linguistic patterns and linkages. Thus, they became better at assessing speakers' and writers' personalities, backgrounds, and motives. Accurate and effective persona detection can improve user experiences in chatbots, virtual assistants, and customer support.

8 Future Work

The lack of large, diverse, and annotated datasets for persona detection was a major challenge in this research. The PMPC and ROCStories datasets used in this study were small, which may have reduced their ability to capture persona detection tasks. The datasets

focused on persona matching rather than detection, limiting their application. The computational resources needed for model pre-training and fine-tuning were another issue. The computational and time requirements of pre-training on large textual data sets may limit model scalability. Future study may focus on data augmentation, model architecture design, transfer learning, and assessment measures to address these concerns.

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The Role of Artificial Intelligence in Enhancing Sustainability: The Case of UAE Smart Cities

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Abstract. The purpose of this research was to study the case of the UAE smart cities with specific focus on how artificial intelligence (AI) was used in enhancing the achievement of sustainability in the UAE. The research narrowed down to investigate sustainability from the lens of the socio-economic sustainable development goals of the UAE as per the UN sustainable goals objectives 2015.

The research adopted a quantitative methodological framework to rigorously examine the subject matter above. A survey was developed and distributed to 300 practitioners in AI, smart cities, and sustainable development programs across the UAE (mainly, Abu Dhabi, Dubai, and Sharjah). The research noted that environmental factors of AI application in UAE smart cities such as infrastructure readiness, stakeholder readiness and regulatory environment, strongly impacted the smart cities development in the UAE which in turn led to the attainment of socio-economic sustainable development goals. Implicatively, the research suggests the need for the development of a strategic roadmap for the adoption, usage, and implementation of AI in UAE smart cities to facilitate socio-economic sustainability through achievement of socio-economic sustainable development goals. The research novelty lies in bridging the paucity in literature regarding the use of AI in smart cities and its role in promoting sustainability; by establishing the connection between AI, smart cities and socio-economic sustainable development goals.

Keywords: Artificial intelligence · UAE smart cities · Sustainability · Sustainable development goals

1 Introduction

In today's world, technology has become an integral component that individuals and businesses rely on to perform their day-to-day activities and transactions (Ullah et al., 2019). Currently, many industries are catching up fast with advanced technology to give better products and services to their customers and to attain their competitive edge in the market (Ullah et al., 2019). Chief among all technological developments is the introduction of Artificial Intelligence (AI) into the matrix, which as scholars contend, has been most consequential. Evidences of research highlight on the fact that the adoption and application of AI has ubiquitously encroached upon human being's each and every activity from normal living to work, social to economic activities, small scale to large

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scale manufacturing activities and the list is endless (Purdy and Daugherty, 2016; West and Allen, 2018; Vinuesa et al., 2020).

Purdy and Daugherty (2016) noted that the plateauing levels of economic growth and efficiency have provided impetus for the introduction of the new factor in contemporary production thanks to innovation and technological exploits of humans – this new factor of production is AI which has come to revolutionalise the way organizations operate and lead to economic transformation. This notion is seconded by West and Allen (2018) who posit that AI's broad range of tools and functionalities bequeaths people the ability to integrate information and conduct insightful data analysis which promotes objective and transformational decision making. The foregoing is expounded upon by the study from Vinuesa et al. (2020) which focuses on a very much related aspect of the AI phenomena in the global environment. Vinuesa et al. (2020) in an attempt to clarify the revolutionary aspects of AI investigated the capabilities of AI to support the attainment of the seventeen UN Sustainable Development Goals 2030. The researchers acknowledges that AI is the new factor in all operations from manufacturing and production, service to everyday social living and therefore highlight that it is important to critically understand how this phenomenon will be useful in helping the world attain its sustainability goals as envisioned by the framers of the charter. The scholars note that from the 169 indicators of sustainable development enshrined in the UN SDG 2030, AI acts as a facilitator to 134 indicators but may potentially inhibit almost 59 others (Vinuesa et al., 2020).

A key point of necessity for AI application is the smart cities which are grounded on the sharing of information, integration of systems and the use of the information to operationalise these systems (Woetzel et al., 2018). Multiple functionalities in the broad spectrum of AI are integrated in an effort to support the functionality of smart cities and Woetzel et al. (2018) mention that the bottomline of all these functionalities and the success of smart cities is the collection and use of data. A preliminary definition of AI accentuates the above submitting that AI generally refers to the integration of systems and machines allowing them to respond to stimuli synonymous with humans, given the human aptitude for rationale, judgment and intent (Davenport et al., 2017; West and Allen 2018). Considering the notion presented by Vinuesa et al. (2020) regarding AI and UN SDGs 2030, the ability to effectively understand the incontestable role of AI to successful smart cities is critical and underlies the goal and premise of the current study.

1.1 Significance of the Study

Vinuesa et al. (2020) note that there is paucity of empirical research evidence on the synergy between AI and smart cities both locally and globally. There is an apparent lack of knowledge among scholars and practitioners alike, on the role of AI in the current socio-economic market dynamics despite its appraised revolutionary characteristics (Davenport et al., 2017). According to Davenport et al. (2017), out of a total of 1500 top business leaders and scholars who participated in the 'Cognitive Technology Adoption Survey' administered by Deloitte, only 17% - roughly 235, expressed familiarity when asked about AI's role in sustainability. Therefore, the current study is significant as it:-

- Underscores the core goal of development of smart cities globally of sustainability and improved livelihoods (Woetzel et al., 2018);

- Highlights the supremacy of the UN SDGs as the hallmark of all global and local sustainability initiatives that countries pursue, being a joint agreement between countries around the world (United Nations 2015);
- Brings about the appreciation of the role of AI as the underlying fabric of all smart cities functionalities for systems and processes towards the attainment of sustainability.

In a nutshell therefore, the main research question that the current study seeks to address is – what is the role of artificial intelligence (AI) in promoting sustainability through smart cities in the UAE?

2 Theoretical Underpinning

The hallmark of sustainable development is the UN SDGs that are an agreed set of indicators for sustainability, which countries around the world should adhere to or strive to achieve. While some researchers through polemic analysis have highlighted some contradictions among some of the sustainable development goals thereby highlighting some goals as counterproductive to others (Fonseca et al., 2020; Vinuesa et al., 2020), the SDGs still remain a key roadmap to the achievement of a sustainable environment. The foregoing being the position, the question arises of how the SDGs help in the achievement of sustainability? Or better still, what are the efforts put in place towards the achievement of certain sustainable development goals. Evidence of research from (Woetzel et al., 2018) helps to better answer the foregoing questions by intimating that, the development of smart cities is directly related with the growth of better responsive cities and people as far as environment, economy and society is concerned. The scholars inform that smart cities through the interconnectedness brought about by digital technologies enables the effective communication and sharing of information which in turn supports the management of functions to the extent of being able to regulate negative consumption externalities, prevent crime, reduce disease burden, and increase social well-being.

The above can be further understood by singling out one of the SDGs as per the UN 2015 SDGs framework namely SDG3 and highlighting based on research how smart cities can promote their achievement (UN, 2020). To visualize, Fig. 1 below, depicting the SDGs framework is shared. The selected SDG has been randomly selected based on the closeness of its name to the aspects of the research – socio-economic sustainability, and their singling out does not mean that the others are not related to the smart cities and vice versa. The goal of the research is not to deviate into the relationships of each SDG, rather, to paint a picture of the way smart cities are related to some of the mentioned sustainable development goals.

Taking the third SDG for example and aligning it with evidence of research on the role of smart cities in its attainment, Woetzel et al., (2018) report that in their pilot study of smart city applications in three different cities with varying level of smart city readiness, it was found out that smart city applications resulted in the reduction of fatalities by 10%. Together with the above, the connectivity of smart cities enabled improvement in emergency response by 20–35% and lowered the disease burden by almost 15%. These statistics by Woetzel et al., (2018) find support from other evidence of research which note that smart city functionalities directly affect the health and well-being of city dwellers

Fig. 1. UN SDGs framework. Source: UN (2020)

(Trencher and Karvonen 2017; Cook et al., 2018; Rocha et al., 2019). Moreover, Trencher and Karvonen (2017) for instance mention that the health and well-being agenda is a primer for the attainment of the social component of sustainability and that through increased connectivity through sensors that gather information, health professionals are now able to closely monitor health developments, respond to emergencies and understand trends in age and diseases for the general population.

On another note, Cook et al. (2018), intimate that highlight that through smart city applications that are integrated with the healthcare services, smart cities can be able to effectively promote wider access to healthcare for the populations while at the same time lowering the costs of healthcare. This aligns squarely with the third SDG which aims at promoting healthcare and well-being for all and subject to the evidence shared briefly hereby, it can be confirmed that smart cities through their interconnectedness can enhance better healthcare for city dwellers. Rocha et al. (2019) explain that while smart applications in smart cities can promote healthcare, effective integration and development of infrastructure is required for the appropriate functioning of smart cities for purposes of improved healthcare. The scholars note that most of the competencies of smart cities towards improved healthcare are in their early stages but reflect a promising trend of much accessible, responsive, and proactive healthcare systems in cities supported by well-integrated and interconnected technological systems which is synonymous with artificial intelligence (AI) systems.

2.1 Role of Artificial Intelligence in Smart Cities

Multiple evidence of research has to this point alluded to the involvement of technologies such as ICT and their interconnectedness in the provision of necessary information to smart cities systems to enhance the making of decisions. While this is an agreed datum, the actual role of AI in the development and operations of smart cities remains in paucity as far as empirical evidence of literature is concerned. The paucity notwithstanding, the

research has stumbled upon evidence of research that directly considers the role of artificial intelligence in smart cities. In agreement to afore-cited evidences of research, the evidence notes that, smart cities thrive through the integration of multiple technological competencies and continually supporting innovative technologies that in turn support the socio-economic and environmentally friendly development of cities (Vodă and Radu 2018). In underscoring the need for artificial intelligence in smart cities, Vodă and Radu (2018) educate that smart cities are complex systems which rely on a collaboration of functions including innovative capacities of the cities, ICT technologies development, adoption and investment, and the residents' readiness to effectively utilize these technologies. The scholars essentially indicate that, the numerous numbers of people living in urban centers require the use of revolutionary approaches in the management of the city functions and dynamics to ensure that the living standard of the residents are sustainable and secured. To this extent, artificial intelligence functions as a boost to the technological advancements of ICT through bringing the human logic aspect and enabling the technologies to scale heights of their utility and support better functionality of cities' processes and systems.

The integration of the urban systems and sub-systems, hardware, software and humans to accentuate the sharing of knowledge between systems can only be achieved through artificial intelligence which include machine learning, natural language programming and logic and problem solving, among others. The need for human intelligence being paramount, Vodă and Radu (2018) cite evidence from Holland (2008) who mentions that human knowledge and ability to understand, adopt, utilize and develop smart and innovative systems is the bedrock of all smart cities. The researchers contend that artificial intelligence is the calibration of human intellect into systems, machines and machinery and to this extent, it is a prerequisite that akin human capital is present first to foster development and remains present to foster the adoption and appreciation of AI in smart cities. Concurrent evidence of research from Impedovo and Pirlo (2020) shares more light into the use of artificial intelligence in smart city systems. Through an analysis of a corpus of more than 20 empirical evidences on the application of artificial intelligence in the management of smart cities, Impedovo and Pirlo (2020) highlight areas such as life quality, health, safety, localization, driving and routing, city systems management, vehicular traffic prediction and social big data analysis as supported fully by artificial intelligence of systems, devices and equipment among others. A case in point that is highlighted by scholars Impedovo and Pirlo (2020) in their research is the social big data analysis for the purposes of healthcare determination of a population. Impedovo and Pirlo (2020) identified one such application executed in the Kingdom of Saudi Arabia named as Sehaa and which relied in artificial intelligence competencies such as logistic regression, multiple feature extraction and naïve bayes to analyze data from hundreds of thousands of populations in the country from their Twitter bio data. Through an analysis of a little below 19 million tweets, this tool was able to identify common diseases including hypertension, diabetes, coronary diseases and cancer as the primary diseases among the population. When relating the above function of AI in smart cities to earlier cited capabilities of smart cities to promote better health efficiency in line with SDG3, it can be confirmed hereby that AI is the interlocutor between smart cities and sustainability and by extension, the better livelihoods promised under the latter two.

3 Method and Approach

The current research utilized quantitative research approach. According to the evidence of research regarding philosophy and approaches to research, it is noted that certain philosophical inclinations are aligned to particular research method choices (Zikmund et al. 2013; Tsang 2014). For this fact therefore, in the current study, the quantitative approach relied on a 5-point Likert scale survey questionnaire that touched on the three primary constructs of the research – artificial intelligence, smart cities and socio-economic sustainable development goals. The question(s) of the survey were used to measure and derive a weighting of the practitioner's perception of the role of AI in the UAE smart cities in supporting the attainment of socioeconomic sustainability. A total of 300 practitioners drawn from organizations in the UAE involved directly or indirectly with AI, smart cities development and the attainment of socio-economic sustainable development goals participated in the research. The structured quantitative data was analyzed using SPSS software where the research sought to examine the correlations between the three constructs of the study in order to come forth with weighting for the strength of their relationships. Essentially, structural equation modeling (SEM) was conducted based on a conceptual framework of the three constructs of the study. In the conceptual framework, AI formed the independent variable, socio-economic sustainable development goals formed the dependent variables while the smart cities mediated the relationship thereof.

4 Results

The independent constructs of the study – AI were found to be majorly responsible for impacting the attainment of socio-economic development goals in the UAE when mediated upon by the smart cities at a strong regression coefficient of 0.789. Together with this, one of the other findings of the study that drew a lot of attention and went contrary to expectations was the impact of smart cities on socio-economic sustainable development goals while not affected by AI. This relationship was rejected a few times and recorded instances of negative correlations going contrary to evidence of literature on the impact of smart cities on sustainable development. A point to note however was that, while smart cities did not have a direct effect on socio-economic sustainable development, when impacted by AI, it reflected a very strong relationship. On the other hand, findings from the path analysis drew a strong regression correlation coefficient between AI and socio-economic sustainable development goals at 0.348 without the mediation of smart cities. These two findings can be explained by the fact that smart cities on their own may be suspected of environmental degradation during development as well as having high costs which are far beyond people's affordability. This way, therefore, they are bound to have a negative correlation with sustainability. On the other hand, when impacted by AI, smart cities develop new efficiency in terms of aspects such energy consumption and overall maintenance which are capitalized to realize better socio-economic sustainability through savings and the mitigation of negative externalities. In the case of the positive relationship between AI and socio-economic development without the mediation of smart cities, the explanation can be taken to imply that, the interconnectivity

advantage brought about by AI is impactful to sustainability even without smart cities. An example of this is the case of hospital and healthcare services delivery through artificial intelligence technologies which as seen from literature has the capacity to promote socio-economic sustainable development among other multiple examples that can be drawn.

5 Conclusion

The results from the analysis of the path relationships between AI, smart cities and socio-economic sustainable development goals showed that the relationship between the independent construct of the study were mostly strengthened by the mediating variable of smart cities to realize better attainment of socio-economic sustainable development goals. When considering AI's relationship with the socio-economic development goals, while the relationship was positive, its regression coefficient was not as strong as when it was mediated upon by the smart cities in the UAE. This is implicative of the fact that the three constructs work effectively together. The current research was therefore successful in highlighting the role of AI in fostering the achievement of socio-economic sustainability in the UAE through the mediation of the UAE smart cities.

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Enhancing Student Services: Machine Learning Chatbot Intent Recognition for High School Inquiries

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Abstract. Purpose - This paper aims to develop a novel chatbot to improve student services in high school by transferring students' enquiries to a particular agent, based on the enquiry type. In accordance to that, comparison between machine learning and neural network is conducted in order to identify the most accurate model to classify students' requests.

Methodology - In this study we selected the data from high school students, since high school is one of the most essential stages in students' lives, as in this stage, students have the option to select their academic streams and advanced courses that can shape their careers according to their passions and interests. A new corpus is created with (1004) enquiries. The data is annotated manually based on the type of request. The label *high-school-courses* is assigned to the requests that are related to elective courses and standardized tests during high school. On the other hand, the label *majors & universities* is assigned to the questions that are related to applying to universities along with selecting the majors. Two novel classifier chatbots are developed and evaluated, where the first chatbot is developed by using a Naive Bayes Machine Learning Algorithm, while the other is developed by using Recurrent Neural Networks (RNN)-LSTM.

Findings - Some features and techniques are used in both models in order to improve the performance. However, both models have conveyed a high accuracy score which exceeds (91%). The models have been validated as a pilot testing by using high school students as well as experts in education and six questions and enquiries are presented to the chatbots for the evaluation.

Implications and future work - This study can add value to the team of researchers and developers to integrate such classifiers into different applications. As a result, this improves the users' services, in particular, those implemented in educational institutions. In the future, it is certain that intent recognition will be developed with the addition of a voice recognition feature which can successfully integrated into smartphones.

Keywords: Intent Recognition · Lstm · Naive-Bayes · Chatbot · High School · Machine Learning

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1 Introduction

In this era of time, artificial intelligence is growing at an alarming rate and it is becoming a part of everyday life. However, the most important components of the artificial intelligence that can make a successful chatbot are the natural language processing (NLP) and machine learning (ML) (Satheesh et al., 2020; Ranavare & Kamath, 2020; Lalwani et al., 2018).

According to the Caldarini et al. (2022) the chatbot works by taking the natural language texts as input and the output is expected to be a relevant to the user's input. Thus, the natural language processing can enable the machine to understand the user's request, nevertheless, the a chatbot can learn continuously as long as it is answering more questions from users, and it keeps learning from the past data which can improve the performance without being explicitly programmed (Samuel, 1967). Nowadays, the chatbot can take multiple roles in different educational sectors such as teaching, advising, and providing a real time 24/7 to support the students and parents (Abdelhamid et al., 2020). Moreover, Assayed et al. (2023a, b) conducted a chatbot classifier for identifying the students' emotions during Covid-19 pandemic. Indeed, High school is one of the most important stage in students' lives, as in this stage, students have the option to select their academic streams and advanced courses that can shape their future career to their next important milestone in the post-secondary education. Accordingly, students in high schools need to be advised and guided effectively before going through their final college-major choices.

In fact, during the busy periods of universities' applications, students might need one-to-one adviser for guiding them toward their applications during a limited time, besides other students might need to know the minimum score of the admission tests before submitting their applications. To begin with, these students need to receive effective answers from their schools' representatives without waiting longtime. Thus, this paper aims to develop a novel chatbot for improving the students service in high schools by transferring students' enquiries to the particular agent based on the enquiry type. This technique is called the intent classification. Which can work by identifying the intent behind the student's question and accordingly it will transfer the student's request to the assigned agent. The main role of the chatbot in this study is using the state-of-the-art machine learning algorithms as well as the natural language processing (NLP) to understand and identify the intention behind the student's request and accordingly classify it into a proper class for further process. As a result, a comparison between machine learning and neural network models will be conducted to identify the most accurate model. To do so, we created a new dataset with 1004 high school students queries that annotated with two classifications, 1- *high school courses* 2- *majors & universities.* The request will be transferred to the correct agent based on the classification type. For example, if the student is interested to know more about the deadline for the university application, the request will be transferred immediately to the *majors & universities'* agent, on the other hand, if the student requests to register a new advanced course during the A-level year, then the request will be transferred to the *high school courses' agent*. This paper is organized as follows: Sect. 2 explore the related works, Sect. 3 describes the experiment and development, Sect. 4 describes the results and finally the conclusion and future works are described in Sect. 5.

2 Related Works

There are several researchers study the chatbots as a conversational assistants and for classifying the intent of users' input in order to improve the services into different aspects of industries. For instance, Henfy et al. (2020) developed an intent classifier of chat messages that were used in communicating between the teams of the software developers. Moreover, Schuurmans and F. Frasincar (2020) used multiple Machine Language algorithms to enhance the intent classification of the dialogue system. Furthermore, Pérez-Vera et al. (2017) developed a chatbot classifier to answer to FAQ by using 5000 tweets from the twitter's account in the electricity's companies in order to enhance their services as well as the customers' satisfaction. In general, the researchers used different algorithms for identifying the intent classifications. For example, Setyawan et al. (2018) compared the chatbot classifiers with using the Naive Bayes model and the Logistic Regression, the data in this study is collected from the reports that have been reported by the public, then the authors take some data samples from the test dataset and determine the class recognition used as training data. Furthermore, a deep learning neural network technique is adopted into other chatbots classifiers. Lhasiw et al. (2021) developed a chatbot classifier by using a bidirectional LSTM model to classify a question message into five intention classes. Despite the fact of the essential stage of students in high school in shaping their future career, but few researchers studied the chatbot classifiers for students advising in high schools. Hamzah et al. (2022) developed a chatbot for education by using SVM algorithm to provide an instant feedback in interactive sessions with students and Assayed et al. (2023a, b) conducted a deep learning based chatbot for classifying students' enquiries into two classifications. In this paper we aim to fill the gap by providing a novel chatbot classifier with using the state-of-the-art machine learning algorithms along with other neural network techniques, the MLP and the national language understanding (NLU) are the main components in processing the intent classifications. Nonetheless a new corpus of high school advising questions and enquiries is created, Fig. 1 illustrates the main architecture of the chatbot.

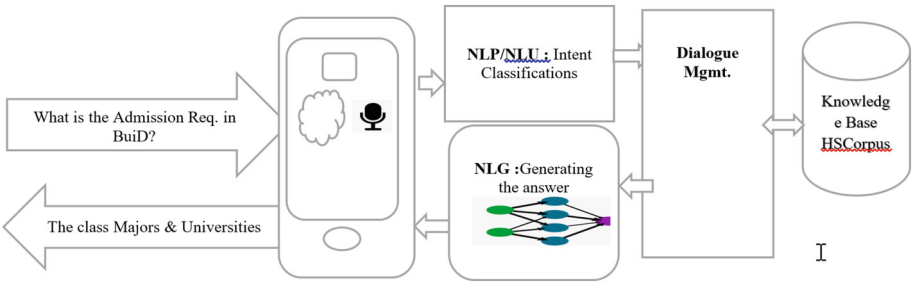

Fig. 1. The main architecture of the classifier chatbot

3 Experiment and Development

3.1 Corpus Selection

The corpus is collected from unstructured resources such as social media, students, parents and schools' websites. The selected data includes new (1004) questions and enquiries. Most of the questions are asked by high school students and parents, usually students in high schools have many concerns about universities requirements and majors.

Data Annotation
Each question is annotated manually; if the question is related to school's curriculum and the advanced courses in high school, then the tag of "high *school courses"* will be assigned to it, on the other hand, if the question is related to the majors and universities selections then the *"majors & universities"* will be annotated to it. However, Table 1 shows the distribution of the data annotation.

Table 1. The description of the data annotation

code	Enquiries Annotation	Counts
0	High school courses	401
1	Majors & universities	603
Total		1004

3.2 Preprocessing the Dataset

This function aims to prepare the dataset for the machine learning models as well as to improve the performance in processing the data. This task includes several subtasks starting from cleaning data, removing stopping words, normalization and tokenization. Figure 2 shows the main tasks of preprocessing the data.

Fig. 2. The main tasks of preprocessing the data.

Afterward, all tokens are normalized and identified. Figure 3 shows 1036 unique tokens from 1004 texts after -applying all the preprocessing techniques.

```
[28]: cv=CountVectorizer()  # Tokenzation(rovides a powerful way to extract and represent j
      # this steps generates word counts for the words in your docs
      word_count_vector=cv.fit_transform(df_dataset["Comment"])

[29]: word_count_vector.shape

[29]: (1004, 1036)
```

Fig. 3. The vector dimension after preprocessing the data.

3.3 Features Extraction

Features Extraction is quantifying the features by converting the unstructured text to structural dataset, in order to be identified by the machine language successfully (Liu et al., 2018), however in this paper the authors applied the function TfidfTransformer for improving the performance of the model.

TfidfTransformer

This function is weighing the features that are repeated in the majority of the texts. Accordingly, it can reduce the impact of the more frequent words with less valuable, on the other hand, it will enhance the impact of the infrequent with more valuable words (Zhao et al., 2018). Figure 4 shows an example of quantifying the probabilities by using the tfdf for all the (1036) unique tokens.

[32]:

	tfidf
stream	0.712023
advance	0.702156
aaa	0.000000
original	0.000000
overseas	0.000000
...	...
essay	0.000000
essential	0.000000
establish	0.000000
estimate	0.000000
ysa	0.000000

1036 rows × 1 columns

Fig. 4. The TFIDF features after using the TfidfTransformer.

3.4 Building the Model

Tools and Techniques

In this study we used the Python software from the Anaconda platform to write and run the codes of developing the models and algorithms. The Anaconda platform is an open source platform for Python distribution which comes with effective packages and libraries ("Anaconda Software Distribution," 2020), we used particularly the JupiterLab 3.0.14 to write the Python codes.

Naive Bayes Machine Learning Algorithm

Naive Bayes is a probabilistic algorithm that depends on the Bayes Theorem, it calculates the probability of each feature based on the past results as shown below:

P(A|B) = (P(B|A) * P(A)) / P(B)

P(A|B): The probability of event A given B (called posterior)

P(B|A): The probability of event B given A (called likelihood)

P(A): The probability of event A (called prior)
P(B): The probability of event B (called evidence)

In fact, Naive Bayes assumes that all features are equally important, which can cause a low performance. Therefore, in this study we applied the features extraction (Tfidf) in order to improve the accuracy of this model.

Recurrent Neural Networks (RNN)-LSTM

The long short-term memory (LSTM) network is the advanced approach of recurrent neural network (RNN) with extending the memory. LSTM can be capable to remember inputs from long text over a long period of time by learning the order dependence in input sequences (Datta et al., 2022). The extension memory is responsible for remembering the inputs from long sentence. In this model we constructed a simple architecture, since we have a small corpus. Therefore, the model started with connecting the input data with the embedding layer. Nevertheless, before feeding the input sequences to the LSTM, we used the padding function to make all the length (200) for all sequences, finally we used a sigmoid function for the output layer. Figure 5 explains the structure of this model.

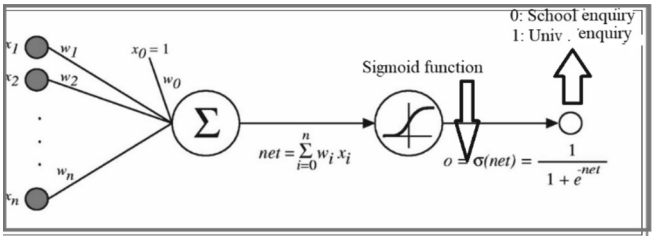

Fig. 5. LSTM architecture for students 'intent classifications.

In fact, the training process in this model is improved by keep tuning the hyper-parameters, consequently, an embedding layer with (32) dimensions has been added in this model with using (10) LSTM neurons and (1) output layer as displayed in Fig. 6.

```
Layer (type)                 Output Shape              Param #
=================================================================
embedding_2 (Embedding)      (None, 200, 32)           36320

lstm_2 (LSTM)                (None, 10)                1720

dropout_2 (Dropout)          (None, 10)                0

dense_2 (Dense)              (None, 1)                 11

=================================================================
Total params: 38,051
Trainable params: 38,051
Non-trainable params: 0
_________________________________________________________________
```

Fig. 6. The architecture of the layers in the RNN-LSTM model.

The Adam optimizer is selected to compile the model with using 20 epochs, the model did a good job, as the result shows that data is trained with high accuracy level (99%), as shown in the Fig. 7.

```
Epoch 20/20
57/57 [==============================] - 17s 299ms/step - loss: 0.0329 - accuracy:
0.9906
<keras.callbacks.History at 0x1b5bd5bce20>
```

Fig. 7. Training the data high accuracy level 99% by using only 20 epochs.

After that, the model is evaluated by passing the test data to the prediction function with using the accuracy metrics; indeed, the accuracy score is the most popular metric for the classification task in the deep learning models particularly. The accuracy score is calculated as the following formula: by dividing the formula of estimating the accuracy performance is:

The accuracy value = Number of corrected predictions/ Total number of predictions.

3.5 Testing the Model

Both models the Naive Bayes and the RNN-LSTM are tested with using the unseen data from students' questions -without including the students' intention classes-. The following performance metrics are used in the Naïve Bayes model: Precision, Recall and F1-score. On the other hand, only the accuracy metric is used in LSTM; since it's the most popular for the classification task in the neural networks models.

4 Results and Discussion

Both models in this study show a high level of accuracy, the Naive-Bayes algorithm with using feature extraction technique (Tfidf) shows a high accuracy level in all performance metrics, as the accuracy metric along with other performance metrics show scores close to (92%) as shown in Table 2.

Table 2. The performance of the Naive-Bayes algorithm

Multinomial Naive-Bayes	Accuracy	Precision	Recall	F1-Score
TfidfTransformer	92%	92.4%	92%	91.9%

On the other hand, the deep learning technique with using the LSTM layer shows as well a high level of accuracy. Though, before start calculating the accuracy level in the neural network model (RNN-LSTM), the number of the predicted classes from the test dataset should match the same number of the test data from the students' enquiries (X). Therefore, in this model we selected randomly the first (518) data from both lists in order to be sure are both have same number of records as shown in Fig. 8.

```
[35]: #Y_test.shape
      X_Test_encoded_padded_words=X_Test_encoded_padded_words[: 518]
      Y_test=Y_test[0:518]
      Y_test.shape,X_Test_encoded_padded_words.shape

[35]: ((502,), (502, 200))

[36]: scores = model.evaluate(X_Test_encoded_padded_words, Y_test, verbose=0)
      scores

[36]: [0.23284812271595, 0.9143426418304443]
```

Fig. 8. The accuracy score in evaluating the RNN-LSTM model.

Afterward the accuracy level shows a high score as it reached (91.4%) as explained in the above-mentioned python code (see Fig. 8).

For more clarifications, the below Table 3 shows the comparisons in the accuracy level along with the main features that used in both models:

Interestingly, that a chatbot has been evaluated successfully with using both models. Figure 9 shows the real requests that asked by students. For example, the student is asking about the requirement of BUiD, and as we can see, the chatbot is able to understand the question to classify it to the appropriate class *Majors & Universities*. The second example shows that student is enquiring about the AP exam at year 12 and the chatbot is able to understand it as well and assign it effectively to the class *HighSchool Course* as shown in Fig. 9.

Table 3. The comparisons of the accuracy level for the performance in both models.

Model	Main Features	Accuracy
Multinomial Naive-Bayes	TfidfTransformer	92%
RNN-LSTM	- Embedding layer with 32 dimension - Padding the input texts to (200) - (10) LSTM neurons - (1) output layer	91.4%

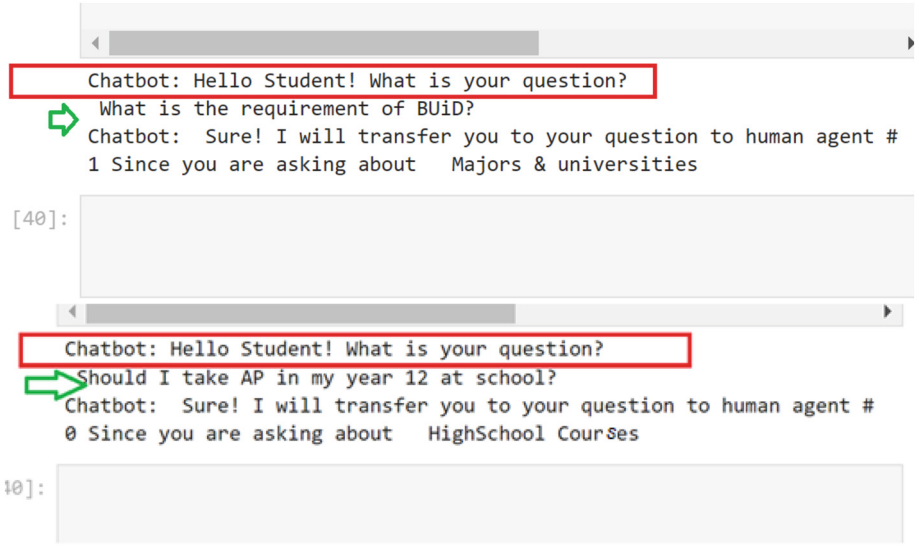

Fig. 9. Testing the chatbot with using real students-enquiries.

4.1 Validation Models

In this study, the models have been validated as a pilot testing by using high school students as well as experts in education. The researchers presented six questions and enquiries to the chatbots for the evaluation. The below Table 4 shows the classifications of these answers based on each model:

According to the educational experts' answers, the chatbot with Naïve Bayes model outperformed the RNN-LSTM; for instance, the response to enquiry # 6 with using the RNN-LSTM model does not align with that of the human educational experts.

Table 4. The validation of the models

	Enquiry/Question	Answer		
		Naive Bayes	RNN-LSTM	Edu. Expert
1.	What is the requirement of Khalifa University	You are asking about Majors & universities	You are asking about Majors & universities	Majors & universities
2.	Should I take AP class in my year 12?	You are asking about High school courses	You are asking about High school courses	High school courses
3.	What is the data science major?	You are asking about Majors & universities	You are asking about Majors & universities	Majors & universities
4.	What is the deadline for SAT test?	You are asking about High school courses	You are asking about High school courses	High school courses
5.	What A-Level courses should I select?	You are asking about High school courses	You are asking about High school courses	High school courses
6.	Where should I apply for medical degrees?	You are asking about Majors & universities	You are asking about High school courses	Majors & universities

5 Conclusions and Future Work

The chatbots and conversational agents play an essential role in enhancing the students' success from different perspectives, for example, high schools are the most crucial stage in student's live as they have higher stress levels regarding their future compared to other students. Therefore, these students want advices more than any others, they need help to find the best-fit universities and courses that can fit with their passions and goals. In this study, the novel classifier chatbot is developed to understand the intention behind the student' request and enquiry, and accordingly it will be able to categorize it to the right classification. As a result, it can add value to high schools by providing students with 24/7 support services with can increase the efficiency in students' service processes.

Two novel classifier chatbots are developed and evaluated, where the first chatbot is developed by using a naive bayes machine learning Algorithm, while the other is developed by using recurrent neural networks (RNN)- LSTM. Some features and techniques are used in both models in order to improve the performance, for example the Tfidf function is used as a feature engineering technique to improve the Naïve Bayes model. Where as, in contrast, tuning the hyperparameters in the neural network layers is used to improve the accuracy level. Take for example, the tuning of the size of epochs and batches, as well as, the number of neurons in the LSTM layer. Interestingly, both models reveal high accuracy scores which exceed (91%). This study can add value to the team of researchers and developers who are interested in using state-of the-art algorithms in recognizing different aspects of data. Moreover, schools and educational institutions can benefit from these techniques by improving the student services effectively. In the future, the chatbot intent classification will be improved to include the voice input in

order to embed it into phone services, which can assist schools by transferring student calls immediately to the right agent.

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Sustainability in Healthcare Practice

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Abstract. Purpose - This study examines sustainable healthcare approaches by reviewing the literature on sustainable healthcare practices. Understanding the dimensions of sustainable healthcare and the influencing variables will assist in strategic recommendations and future insights. It will further clarify various countries' approaches, the UAE and EU in particular.

Methodology - This study examines sustainable practice in healthcare, with the aim of compiling all relevant research and comprehending the study dimension and strategies through conducting a systematic mapping investigation.

Findings - The paper emphasizes the significance of a comprehensive approach to comprehend the measurements and challenges of UAE and EU, and further develop strategies to consistently improve sustainability implementation in healthcare.

Implications - Despite using scientific databases for the search that include high-quality journals, the scope of this paper is limited to the time during submission of this paper and keywords specified in this paper.

Originality/value - This paper will improve academics' understanding of the research and motivate them to broaden their studies of healthcare sustainability and adopt a more comprehensive approach.

Keywords: Healthcare · Sustainable Healthcare · UAE · EU

1 Introduction

The SDG framework has reshaped development strategies, government priorities, business and citizen duties, and measures for monitoring development progress globally. Even though the term "sustainability" was first introduced through the topic of environmental degradation, sustainability in the context of SDG evolves around the three components of environment conservation, social responsibility, and economic progress (Fiksel et al. 2012).

Thus, more attention was drawn to the concept of sustainability within different sectors, and since public health is impacted by the state of our environment and social responsibility, sustainable practice in healthcare became a priority to governments and decision-makers (Mehra & Sharma 2021)The difficulty remains in determining how to

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best design and deliver sustainable healthcare to attain optimal health outcomes, such as improving health status in the future and creating a viable healthcare delivery system.

The application of sustainability approaches and understanding their dimensions are critical for an integrated system to address sustainability concerns in healthcare in light of existing standards and society's needs. When carefully chosen and executed, sustainability measurements can assist managers and policymakers in developing strategies, establishing improvement targets, tracking progress, and benchmarking against other systems (Mehra & Sharma 2021).

Therefore, to gain more understanding of the emerging scope of sustainability practices in healthcare and ways to develop sustainable healthcare, this paper will explore the following research questions:

1. What are sustainable healthcare's dimensions?
2. What are various practices for sustainable healthcare?
3. What are the strategies to implement sustainability effectively?

The present section gives a brief, outlining the idea of the paper. The second section presents the literature review with an overview of the keywords and their correlation. The third presents the methodology of the paper mentioning the sources of the literature, the search criteria, and the total number of papers reviewed. The fourth section outlays the findings and discussions of this paper. The fifth section summarizes the paper's conclusions and recommendations for future research.

2 Literature Review

2.1 Dimensions of Sustainable Healthcare Practice

All national, regional, and international societies must prioritize healthcare and ensure its long-term viability. Sustainable healthcare refers to a complicated system that is long-term economically, socially, and environmentally sustainable for all people, with no adverse effects on any component of the healthcare system (Momete 2016). While Jameton & McGuire (2002) elaborate that sustainability in healthcare is maintaining a balance between patient requirements, financial considerations, and environmental costs.

Understanding sustainability-based activities is crucial for maximizing the advantages of sustainability practices inside a corporate or healthcare facility. Marimuthu & Paulose (2016) verified that sustainability practices in hospitals can be divided into four categories environment, customer, employee, and community oriented as a way to achieve sustainability goals to continuously improve quality and financial performance. Another approach explained by Mehra & Sharma (2021) came with a conceptual framework that incorporates three categories of environmental, social, and economic indicators and sub-measures derived from these practices.

Thus, for countries and nations to develop sustainable healthcare it is necessary to consider local and global challenges that impact it from the perspective of social, demographic, economic, and environmental variables. Then based upon that set conceptual frameworks that serve the country obtaining sustainable healthcare.

2.2 Sustainable Healthcare Practice in UAE

Yeboah (2016) investigated the healthcare system in relation to the social, economic, and environmental factors that make up the UAE society. Then worked to create a conceptual framework that would be used to suggest strategies and further used by healthcare professionals to improve healthcare toward sustainability and support governments for policymaking.

According to Yeboah (2016) developing sustainable health care within the UAE is affected by several different but linked variables that could have an impact. These include effective resource management, good planning and management, community factors, statistical evidence, and stakeholder partnership.

According to the framework, a variety of human, financial, and associated resources collaborate to accomplish sustainable healthcare in the UAE. Generally speaking, no nation offers appropriate funding for healthcare, and this is due to the scarce funding sources and competition for the country's assets. Effective administration of health finances, creative funding strategies, and investments should all be part of the funding concept. This calls for skilled, qualified, and professional health personnel according to Yeboah (2016).

Yeboah (2005) explicates an innovative funding and planning approach that suggests the UAE adopt a place-based model instead of the population-based model as a comprehensive approach. As it considers the local demographic, socioeconomic, and environmental factors and accessible resources of each Emirate. Furthermore, Yeboah (2016) includes several community factors in the framework. They comprise of the population including size, composition, distribution, and dynamics within 7 Emirates as well as sociocultural, economic, and political aspects. As these factors vary between 7 Emirates, this request to skillfully handle and analyze their different needs and availability of the resources to provide long-term quality healthcare accordingly.

The identification of important stakeholders and the creation of partnerships are the focus of another component of the framework for sustainable health care. This is consistent with place-based health planning principles. Patient and patient advocacy groups, public and private service providers, and professional associations for the healthcare industry are some of the key stakeholders. Consultation and collaboration are key aspects of partnership to achieve sustainable healthcare, according to Richetta (2013). And this should be guided by effective and efficient management between the federal and Emirate level to achieve a collaborative decision-making process. Management and leadership skills are one of the main variables in the sustainable healthcare framework (Yeboah 2016).

The framework further suggests using epi-statistical data in the planning and provision of sustainable healthcare for each Emirate. This will allow to attain affordable healthcare for all populations and evolve new strategies to attain sustainable health care incorporating evidence from needs assessment, including future predictions, data on patterns of disease and injury, funding, and demographic dynamics (Yeboah 2007).

On the other hand, AlJaberi, Hussain & Drake (2020) examined the factors that measure sustainability in healthcare in the UAE and prioritize them. Data was gathered from five major hospitals in the capital of UAE, Abu Dhabi. The factors include corporate social responsibility (CSR), lean management, patient satisfaction, staff satisfaction,

continuous improvement, brand, and accreditation. Further, the main resources of the healthcare sector are those who carry out the industry's goals and objectives. Many different elements go into employee work satisfaction.

The Analytical Hierarchy Process (AHP) approach is used to rank items according to their level of relevance in order to analyze the results. This aids in the development and stimulation of multi-criteria decision-making (AlJaberi, Hussain & Drake 2020).

According to the study's findings, respondents ranked patient satisfaction as the most significant attribute, giving it a priority weight of 25%. Employee satisfaction came in second, with a competitive priority of 20%. Brands and accreditation were deemed to be the two least significant attributes, whereas continuous improvement, lean management, and CSR were ranked third, fourth, and fifth, respectively. This concludes the importance of social aspect factors to influence healthcare sustainability. This suggests that decision-makers in the healthcare industry must work to guarantee that best practices are applied in favor of patients and staff through appropriate policies, rules, initiatives, and strategies.

2.3 Sustainable Healthcare in European Union

The healthcare systems in the European Union are designed to aim that everyone has access to high-quality healthcare without placing a heavy financial burden on them or driving them into poverty (Popescu et al. 2018). However, the difficulties that European health systems face are numerous, but in the current socioeconomic environment are; firstly the aging of Europe's population, which increases the risk of developing chronic conditions and increasing the demand for health care. Secondly the uneven distribution of health professionals, which hinders some areas of care and adversely affects certain geographic areas; also, the access to healthcare is not spread equally in the EU causing differences in health outcomes at the social level; lastly the costs of innovative technologies and medications are rising, placing stress on the public finance systems (Pavoni and Piselli 2016).

Momete (2016) states that the current difficulties associated with population aging, financial responsibilities, and the management of chronic diseases, EU28 needs to pursue a new set of objectives when creating sustainable healthcare. Momete (2016) further developed a conceptual framework considering the inputs and outputs into and out of the healthcare system, in which sustainable healthcare includes four components and eight fundamental variables that promote individual well-being in terms of health. Due to the use of quantitative data in the European Comparative Analysis, the data for all the criteria is available and comparable for all EU28 member countries.

To explain the framework, the input consists of two components of "Supply access" and "Providers of health". The supply access further consists of two factors medical doctors and out-of-pocket expenditure. The number of health graduates was regarded as a sign of the qualified medical supply that was accessible considering social and demographic needs. While "out-of-pocket expenditure" element was taken into account since a patient's access to the healthcare system may be hindered by their inability to pay out-of-pocket, as healthcare systems with minimal out-of-pocket payment requirements may offer better protection to the poor population (Xu et al. 2005). The providers-to-health component consists of two factors of "available hospital beds" as socioeconomic improvement in the EU is typically measured by the number of hospital beds available

as a measure of healthcare accessibility. International organizations also utilize it as a health service indicator to represent the hospital capacity available to the population of a certain nation. And the second factor of "health expenditure" as a percentage of GDP, since McKee et al. (2004) stressed that decreased healthcare spending is associated with the key issues in the 13 member states that joined the EU after 2004.

On the other hand, the output of EU healthcare in the framework has "personal health" and "disease control" as two major components. Personal health further considers two aspects of "life expectancy" and "fertility rate". An essential result of the medical systems, life expectancy at birth was chosen as the measure of all-cause mortality and includes preventable deaths, it also includes quantity and quality of life. Additionally, the fertility rate was chosen as a component because it considers three different aspects: lifestyle choices, national policies supporting rising birth rates in developed countries, and health issues and how they are handled by the healthcare system. For the disease control component, two factors were studied first is "incidence of tuberculosis" as its prevalence is used as a marker for the healthcare system's potential to eradicate serious illnesses that could be prevented and treated. The second is "infant mortality rate" as it illustrates how to assist the emergence of new life, thus the likelihood of a newborn survive is one key result of the sustainability of the healthcare system (Eurostat 2011).

Momete (2016) employed a composite index for sustainable health (ISH) as a tool for analysis while looking at the results of this study. Findings indicate that the EU28 region's healthcare system declined, with the EU average showing a decline of roughly 7% during the previous 20 years. The alarming fact is that in 2013 there were six more unsustainable nations than there were in 1995. This calls for efficient decision-making and collaboration of academics and stakeholders to work for the ultimate goal of population welfare.

3 Methodology

This study conducted a systematic mapping process, the main research steps in the methodology are as follows: identifying, reading, and comprehending significant publications; and systematic analysis of the discovered articles. This section breaks down the methodological approach of the paper into the following categories:

(1) Identifying the research questions
(2) Identify the scope and conduct the search
(3) Screening for the relevant paper
(4) Keywording the using abstract and inclusion and exclusion search criteria
(5) Data extraction and mapping process

The following keywords were used to search the papers: "sustainable practice," "sustainability," "healthcare," and "sustainable model," in the search engine's title, abstract, and keywords sections. Only those papers that have been indexed by the university database for high credibility and are written in English match the given query are retrieved and examined; all other papers are rejected. The databases initially produced a combined 30 records as a result of this. A list of publications for further analysis was produced

after manually applying inclusion-exclusion criteria based only on abstracts and keywords and removing the duplicate articles. The study flow diagram for the research papers under examination is shown in (Fig. 1).

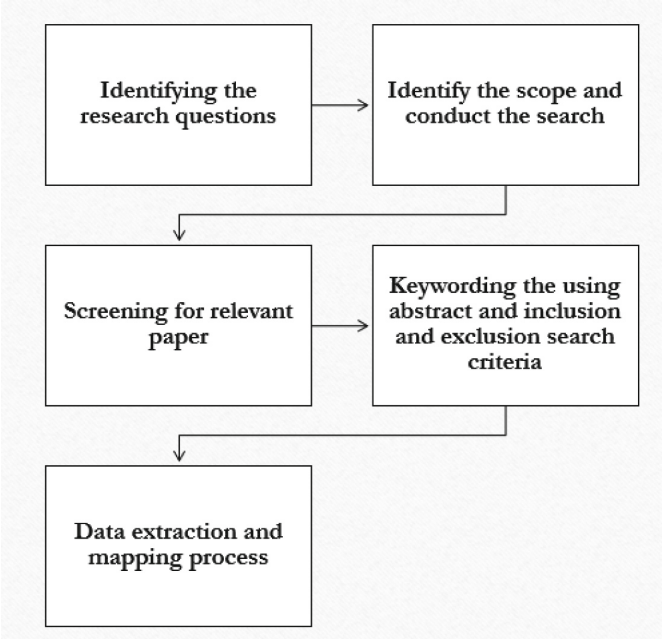

Fig. 1. Systematic mapping process (Sharma, Yadav & Chopra 2020)

4 Discussion

This paper aims to examine the existing studies linked to sustainable practice in healthcare. The mapping study's findings would assist us in identifying and outlining potential research areas and best practices for understanding sustainable practice variables and developing frameworks and strategies (Sharma, Yadav & Chopra 2020) (Fig. 2).

The first step of the systematic mapping process starts with defining the research questions which were stated earlier followed by the second step through identifying the scope and conducting the study. To implement this step, we developed a search scope to be used to gather papers relevant to the topic and keywords to avoid research bias. This process starts with identifying keywords to be used for searches within databases. The words "sustainable practice," "sustainability," "healthcare," and "healthcare sustainability," are in the search engine's title, abstract, and keywords sections. The process of extraction of articles was completed by manual research on Google Scholar (GS) through the monitoring of citations of further relevant articles in high-ranking quality journals. The selection of journals was made based on relevance to the topics investigated. The selected papers were from Springer Link, Elsevier, Emerald, and other global

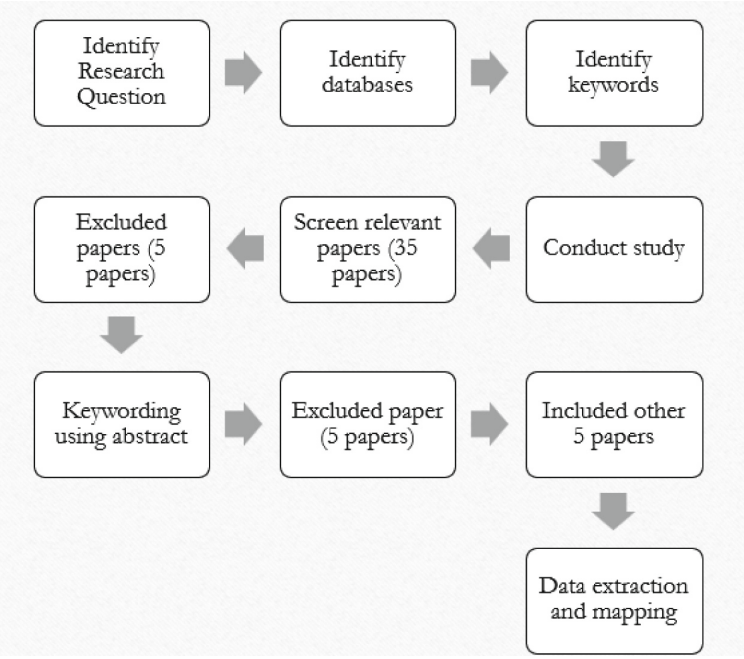

Fig. 2. Systematic mapping process steps (Sharma, Yadav & Chopra 2020)

journals. Additionally, journals that are known to receive documents on global sustainable practice in healthcare were consulted, such as the Journal of environmental research and public health, BMJ global health journal, BMC Medical informatics and decision making, Greener journal of medical science, Journal of Business Research and Business Horizons. The official websites of the UAE government and the United Nations (UN) were searched for relevant recent data and records, and this resulted in 35 papers in total.

The third stage of mapping requires the screening of relevant papers. The initial selection was based on titles and keywords and eliminating studies that did not apply to the research question. Five papers were legitimately excluded since they were obviously outside the scope of this mapping project. However, in several instances, it was challenging to infer the paper's relevance from the title alone. In these cases, we forwarded the article to the following step for additional reading. The excluded papers with keywords "socially sustainable", "education for sustainable healthcare", and "sustainable digital health". Going further with the fourth step of keywording with reading the abstract in the first stage. The next step was to build on these terms to have a more advanced understanding. Through clustering the keywords and forming titles to retrieve more accurate results such as "sustainable dimensions in healthcare practice", "sustainable model in EU" and "sustainable practice in UAE". The "Snowball" technique was then used on a few chosen articles to discover any further articles that might have inspired the first keyword search. This led to excluding another 5 papers and including another 5, ending up with 35 papers for this paper data extraction which is the last step of the process. As the papers that made it through the first and second stages were included along with papers

that addressed research questions and were relevant to the title and inclusion keywords. Findings from 30 papers extracted concluded that a comprehensive approach to managing influencing variables and challenges would facilitate improvement in developing sustainable practices in healthcare.

The findings demonstrate that a sustainable healthcare system must include environmental, social, and economic considerations along with the current challenges and needs in a comprehensive approach. Therefore, to add value, these variables must be considered while developing frameworks and strategies for the healthcare sector. When creating a conceptual framework for the UAE, it should consider the efficient funding for healthcare and patient and staff satisfaction should be primarily taken into consideration as a basis for enhancing strategy and future efforts. Furthermore, to summarize the findings the of EU study, it highlights the challenges that Europe is facing in the context of input and output factors that collaborate to make the EU28 high quality healthcare affordable and sustainable. The eight factors considered for analysis do provides an outline of the group of countries that are sustainable, on track and, not sustainable and therefore identify measures needed for each group to improve the healthcare through encouraging strong factors and improving weak factor.

5 Conclusion and Future Recommendations

To conclude, healthcare throughout the globe including UAE and EU is pulled by two main contradictory requirements, the need to sustain an increased demand and the need to lower the cost of healthcare services. The task is to balance healthcare costs with the importance of patient care by developing a cost-effective sustainable healthcare system for future years, which will be able to confront challenging issues. This can only be done through an integrated approach that balances social, environmental, and economic variables within proactive strategy.

For the UAE in specific, sustainability can be achieved through leadership, commitment, collection, and analysis of health data that will acquire current social needs. This could be done through collaborative effort of all stakeholders involved to support innovative improvements in healthcare systems in an integrated approach. It will further generate community initiatives and government programs to support country's policy-making and strategies to cost effective healthcare development and economic growth. To improve funding and quality of healthcare, the UAE recently has used public private partnership (PPP) as an alternative model to fund and operate existing public healthcare services.

For EU 28 member countries, sustainable healthcare development requires supporting health system strong factors and working on the weak factors, this requests for improving funding and governed health policy. Thus, a common health policy that creates improvements rather than reforming will allow to improve patient quality care and lower cost. Creating a uniform European health strategy will address resource inequalities and promote equal access to affordable healthcare. This would help the EU countries score more similarly and enhance it further while taking socioeconomic challenges and resources into account.

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Artificial Intelligence for Sustainability Development in Healthcare

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Abstract. Purpose - Digital technology is frequently employed in the healthcare sector to innovate and add value. This study examines AI-based technology implementation in the healthcare industry. The purpose of the study is to provide a review of publications on artificial intelligence (AI) and how it has enabled the healthcare sector to progress toward sustainable development goals (SDG).
Methodology - The method is based on a systematic mapping review of 40 papers. It also contained relevant publications to this paper's research questions for comparison.
Findings - The paper emphasizes the significance of AI implementation in healthcare and further facilities' implementation of SDG and health-related SDG and its evolving contribution to humanity for affordable global healthcare.
Implications/limitation - The scope of this paper is limited to the time during submission of this paper and keywords specified in this paper's research question.
Originality/value - The paper will expand knowledge of AI to achieve sustainable development goals and health-related SDGs and further highlight research gaps to be addressed for healthcare improvement.

Keywords: Artificial intelligence · sustainable development · healthcare system

1 Introduction

The United Nations' sustainability goals, known as the Millennium Development Goals, have made the concept of sustainability more important than ever in recent years. To achieve sustainability the three interconnected dimensions of economic, environmental, and social must be balanced (Laguna 2014).

To ensure the well-being and development of individuals and societies, the 17 Sustainable Development Goals of the 2030 Agenda must thus be adopted by all nations since they set the global priorities for 2030 and define a course of action for the well-being of people, the planet, prosperity, and peace.

Therefore, governments must innovate their current practices in order to increase citizen participation, accountability, and interoperability in order to serve as facilitators of innovation, sustainability, and competitiveness. This could be achieved by using intelligent technology to adapt to and become resilient in the face of global change (Sharma, Yadav & Chopra 2020).

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Digital technologies including artificial intelligence (AI), machine learning, smart sensors and robots, big data analytics, and the Internet of Things are being aggressively implemented by hospitals and care providers around the world, particularly in developed nations (Hee Lee & Yoon 2021). AI is the study of "intelligent agents," which are any creatures or objects that have the capacity to see, comprehend, and behave in a way that will increase their chances of success (Rong et al. 2020).

To support the sustainable development goal of health as part of the coordinated implementation of the SDGs for health and related issues (HHSDG), this study aims to improve the understanding of the research by academics and policymakers and to inspire them to further their research on the use of AI in healthcare. The paper further provides an insight into post-Covid AI implications and lessons learned to provide better resolutions for human well-being during future pandemics.

Therefore, to gain more understanding of AI implications in healthcare to achieve SDG, this paper will explore the following research questions:

1. What part does AI play in the healthcare industry in achieving SDGs?
   1a) How AI improve the implementation of health and health-related SDG?
   1b) What are AI's new opportunities and challenges in the healthcare industry?

The present section gives a brief outline of the idea of the paper. The second section presents the literature review with an overview of the keywords and their correlation. The third presents the methodology of the paper mentioning the sources of the literature, the search criteria, and the total number of papers reviewed and categorized under each theme. The fourth section outlines the findings and discussion of this paper. The fifth section summarizes the paper's conclusions and recommendations for future research.

2 Literature Review

2.1 AI in Healthcare to Achieve SDG

Vinuesa et al. (2020) elaborate on the impact of AI on the 169 targets and 17 goals listed in the 2030 Agenda for Sustainable Development. The 134 targets (or 79%) across all SDGs are facilitated by AI, while 59 targets (or 35% of all SDG targets) are negatively impacted by the development of AI.

As only one of the 17 SDG goals concerns health which is SDG 3, the other goals include a variety of health variables that improve health and human well-being. As Nilsson et al. (2018) emphasize due to the interconnectedness of the SDGs, success must be ensured through integrated implementation of health and health-related sustainable development goals (HHSDG) to meet numerous healthcare targets and avoid compromises.

Thus, innovative cross-sectoral implementation strategies would be needed to achieve the SDGs, particularly SDG 3 and the HHSDGs, even though the millennium developmental goals helped many countries improve, notably in the area of health, the globe as a whole lagged in achieving the health targets. Therefore, it is the WHO's 2018 Global Reference List of 100 Core HHSDG Indicators which serves as the foundation for the health-related SDGs that contain SDG3 and all of its targets (World Health Organization 2018).

Therefore, to have a consolidated implementation that encompasses all dimensions of health and health-related SDGs (HHSDG), Aftab et al. (2020) developed nine areas that make a framework, each of which represents a crucial step in the national planning and implementation of the HHSDGs. The nine domains conceptually represent institutional, technical, and political circumstances that may influence whether and to what extent HHSDG targets and indicators are attained with a fundamental role of governance and collaboration of organizations in different sectors. The domains are political and financial commitment, institutional setup, stakeholder engagement, the role of development partners, multi-sectorial collaboration, improving equity, capacity development, monitoring, and evaluation.

To summarize the nine domains; the majority of political support for the SDGs is articulated in the context of broader, frequently preexisting national development ambitions. Thus, governments need to utilize SDGs to attain national development objectives, improve the socioeconomic condition, and further fulfill obligations for regional development for health. This requests multi-sectoral collaboration and governance of multiagency institutions along with other active SDG stakeholders including think tanks, academia, development partners, health professionals, and civil society organizations to assess from different focal areas, such as policy guidance, financing, research, and advocacy. While SGDs are typically incorporated into existing financed development strategies and plans to ensure financial allocation. The creation of monitoring and evaluation policies, costing and budgeting for the SDGs, gender mainstreaming, technical capability, and management of statistical data, particularly administrative data, are among the key areas where requirements have been identified. In terms of equity, nations are working hard to pay close attention to the requirements of underprivileged people to secure accessible universal healthcare (Aftab et al. 2020).

2.2 AI Opportunities and Challenges in Healthcare

The growing use of AI-based technology in the healthcare sector has opened up a wide range of new options (Hee Lee & Yoon 2021). Safavi and Kalis (2019) state that it is crucial to evaluate the role that AI can play as it needs to investigate the prospects and problems related to AI applications in the healthcare sector.

AI-based technologies can significantly enhance patient care services in rural farming communities of developing countries, according to Guo and Li (2018). Additionally, this can be accomplished by increasing accuracy and reducing error. In the end, if AI can be widely used to assist such ideal healthcare, it can help ensure both high-quality healthcare and significant cost reductions. ABI Research, a marketing research consulting company, published a paper claiming that clever AI applications in the healthcare sector might result in savings of up to $52 billion in the US by 2021 (*AI to Save Healthcare Sector US$52 Billion in 2021 | EPICOS* n.d.) To conclude AI-based technologies can alter and develop healthcare operations to optimize, and connect with patients to boost the overall effectiveness of healthcare.

Despite its evident potential, AI does not offer a comprehensive solution. As noted by Amann et al. (2020) history has demonstrated that when technology advances, new problems and difficult tasks constantly arise. Hee Lee & Yoon (2021) agrees that as AI applications present new possibilities for enhancing people's daily lives, they also present

challenges that must be successfully overcome.Thus it is vital to adopt a multidisciplinary approach because some of these challenges are related to the technical aspects of AI while others are connected to the legal ethical, medical, and patient viewpoints (Amann et al. 2020) The stakes in the healthcare industry are particularly high since lives are on the line.

One of the most important challenges is the liability of AI use if an accident or error occurred within a patient treatment or service delivery. Given the numerous technical, managerial, and ethical considerations involved, this is an extremely challenging matter (Amann et al. 2020). Lupton (2018) stressed the importance of creating moral and ethical attitudes and behaviors for AI to benefit society.

2.3 AI Application in Healthcare in the Post-Covid Era

During COVID-19, AI technologies generally had a significant impact on reducing patients' needs for medical care and enhancing anti-epidemic effectiveness, illustrating the vast potential of an information-driven healthcare sector (Zhang et al. 2021). The BMJ global health journal agrees that the pandemic has highlighted the strategic importance of AI and expedited its use in health.

However few societies are well-prepared for the post-COVID era as the COVID-19 pandemic is gradually brought under control through widespread vaccination. Different nations are at different stages in the process of utilizing AI technologies in the post-Covid era. Some nations have successfully included AI in their pandemic response, and they are now looking to expand its use and increase its impact more sustainably. Other nations have increased the accessibility of AI technologies and are currently looking to expand their use in specific industries. Many others are still learning about AI and are unaware of its possibilities hence growth is not linear (*Get ready for AI in pandemic response and healthcare - The BMJ* n.d.).

WHO (2021) is actively offering advice for two strategic stages that nations looking to improve their AI capability for health should through operational readiness and fundamental readiness. The prerequisite of Infrastructure and data support systems required to apply AI technologies is fundamental readiness. Furthermore, the key to using AI technologies responsibly and sustainably is operational preparedness.

Additionally, PWC (2020) suggests that governments must safeguard data classification, and privacy protection on data retention in terms of regulation. To ensure that the technology that supports AI is sufficient, including standards for technological integration and interoperability, cloud infrastructure, connectivity, and the creation of centralized platforms for data management through AI governance. In the long-term using the knowledge gained through COVID-19, AI can help governments be informed of the next pandemic.

3 Methodology

This study conducted systematic mapping process to allow better results and review processes overall, it further reduces bias and errors and increases the process validity due to the phase's reproducibility during the review process (Sharma, Yadav & Chopra

2020). The main research steps in our methodology are as follows: identifying, reading, and comprehending significant publications; and systematic analysis of the discovered articles. This section breaks down the methodological approach of the paper into the following categories:

(1) Identifying the research questions
(2) Identify the scope and conduct the search
(3) Screening the or relevant paper
(4) Keywording the using abstract and inclusion and exclusion search criteria
(5) Data extraction and mapping process

The following keywords were used to search the papers: "AI," "Artificial intelligence," "sustainable development," "SDG," "Healthcare," and "healthcare industry" in the search engine's title, abstract, and keywords sections. Only those papers that have been indexed by the BUiD database for high credibility, are written in English for appropriate interpretation, and match the given query are retrieved and examined; all other papers are rejected. The two databases initially produced a combined 60 records as a result of this. A list of publications for further analysis was produced after manually applying inclusion-exclusion criteria based only on abstracts and keywords and removing the duplicate articles. The study flow diagram for the research papers under examination is shown in Fig. 1.

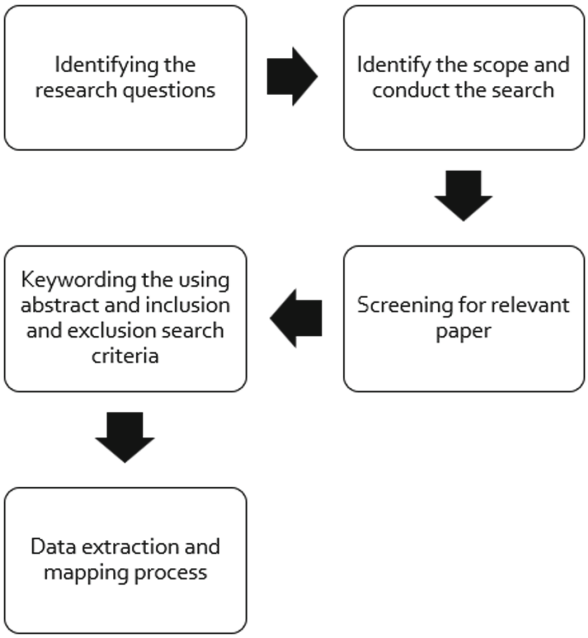

Fig. 1. Systematic mapping process (Sharma, Yadav & Chopra 2020)

4 Findings and Discussion

This paper's aim is to examine the existing studies linked to AI in healthcare to achieve sustainable development goals in a systematic mapping approach. The mapping study's findings would assist us in identifying and outlining potential research areas for AI for good health and well-being in the post-Covid era (see Fig. 2).

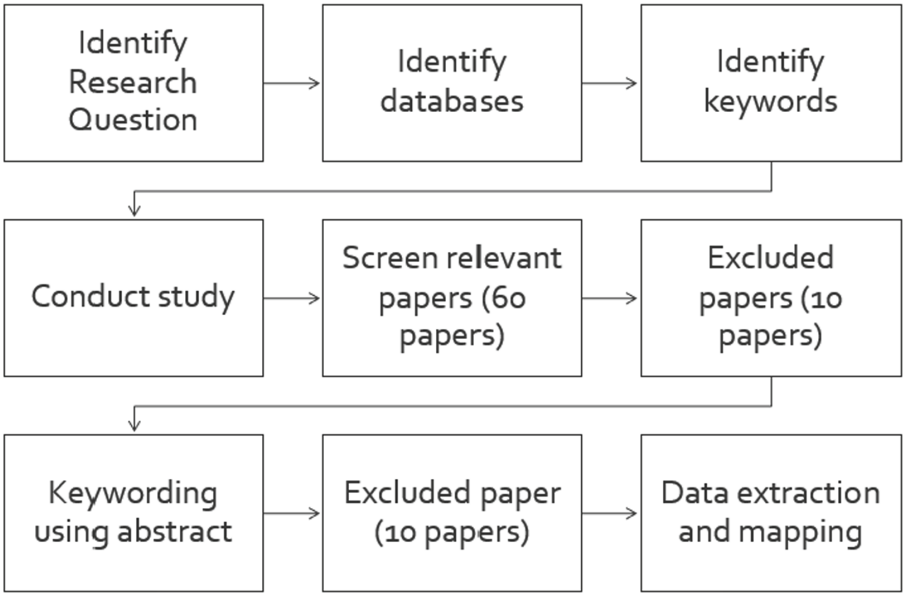

Fig. 2. Systematic mapping process steps (Sharma, Yadav & Chopra 2020)

The first step of the systematic mapping process starts with defining the research question as stated previously. The second step of the systematic mapping process identifying the scope and conducting the study. To implement this step we developed a search scope to be used to gather papers relevant to the topic and keywords to avoid research bias. This process starts with identifying keywords to be used for searches within databases. The words "AI" "Artificial intelligence," "sustainable development," "SDG," "Healthcare," and "healthcare industry" are in the search engine's title, abstract, and keywords sections. In detail, the initial process of identifying databases involves the extraction of articles with the selection of the university databases. The process of extraction of articles was completed by manual research on Google Scholar (GS) through the monitoring of citations of further relevant articles in high-ranking quality journals. The selection of journals was made based on relevance to the topics investigated. The selected papers were from Springer Link, Elsevier, Emerald, and other global journals. Additionally, journals that are known to receive documents on AI, sustainable development, and healthcare were consulted, such as the Journal of environmental research and public health, BMJ global health journal, BMC Medical informatics and decision

making, greener journal of medical science, Journal of Business Research and Business Horizons.

The third stage of mapping requires screening of the relevant papers. The initial selection was based on titles and keywords and eliminating studies that did not apply to the research question. 10 papers were legitimately excluded since they were obviously outside the scope of this mapping project. However, in several instances it was challenging to infer the paper's relevance from the title alone. In these cases, we forwarded the article to the following step for additional reading. The excluded papers with keywords "sustainable", "robotics", "digital health intervention", "digital process".

Going further with the fourth step of keywording with reading the abstract in the first stage. The next step was to build on these terms to have a more advanced understanding. Through clustering the keywords and forming titles to retrieve more accurate results such as "AI and healthcare", "healthcare to achieve SDG" and "AI in post-Covid". This led to excluding another 10 papers, ending up with 40 papers for this paper data extraction which is the last step of the process. As the papers that made it through the first and second stages were included along with papers that addressed research questions and were relevant to the title and inclusion keywords.

According to findings from 40 publications that were retrieved, AI largely makes it easier to accomplish SDGs. As a result, it acts as an enabler for the social, economic, and environmental pillars, directing governments and communities to prioritize its use. If opportunities are considered and risks are addressed, AI can bring about revolutionary changes in healthcare that will enhance SDGs related to health. Additional research highlighted AI as a crucial component in strategy, governance, and policy formulation to support health-related SDG's. Innovative AI applications and technology support healthcare during and after the COVID-19 pandemic, helping to prioritize infrastructural and operational preparation as well as understanding lessons learned.

5 Conclusion and Recommendations

This paper concludes the AI mainly works as an enabler to sustainable development goals through its three dimensions social, economic, and environmental through technological enhancement. Thus, AI is a transformative tool in healthcare that can be investigated further to help attain HHSDG's.

AI developed to serve humanity through its social duty and economic advantage, promoting universal access to affordable healthcare and assisting in the reduction of global health inequities. Additionally, AI-based healthcare applications boost the efficiency of the healthcare system while cutting costs. A less resource-constrained environment, improved innovation, and access to affordable, high-quality healthcare are all made possible by this method's cost-effective usage of AI.

Additionally, regulations regarding confidentiality must be considered while developing AI software, and privacy and ethical standards must be developed. Also, governance should be of great attention when addressing AI implications. Standardized governance will ease policy and regulations measures globally. A main recommendation is to offer global remote training that is applicable worldwide even for low- and middle-income nations. This will improve this challenge and work toward 2030 agenda for better living.

The government can use AI to influence the three pillars of sustainable development the economy, society, and environment by implementing it in public service delivery and policymaking. However, in order to fully utilize the benefits that AI has to offer, effective applications of AI would necessitate strategies and frameworks to revolutionize the overall healthcare service. Based on papers reviewed and practical aspiration of covid-19 era there is a need for governance and collaboration of organizations in different sectors to implement a universal approach to sustainable development and necessities a policy coherence to adopt all sectors to contribute to health and HHSDG in all policy agenda. AI helps countries advance further by enabling them to concentrate on innovation, beneficial activities, and wise decision-making rather than repetitive tasks. This would ultimately help countries achieve sustainable health-related goals by enhancing quality and execution.

As the paper takes a comparative analysis approach through systematic mapping, it throws light on further research gaps and future agendas, thus portray the requirement of conducting more research on AI adoption in healthcare to implement and achieve health related SDG's. This paper and other comparative approaches encourages further contributions related to improving global health during and post Covid era.

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Towards Gulf Emirati Dialect Corpus from Social Media

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Abstract. Purpose: This paper discusses the need for a corpus of Emirati traditional phrases and idioms in natural language processing (NLP) for the Gulf Emirati dialect and its potential applications in fields like voice recognition, machine translation, and sentiment analysis.

Methodology: The researchers collected a corpus of more than 3000 traditional Emirati words and idioms by gathering data from several social media platforms, such as forums, YouTube, and Emirati radio stations. In addition, the researchers used the website scraping technologies to collect suitable resources, subsequently cleansing and organising the gathered material to ensure accuracy and consistency. A pilot investigation was undertaken, including an individual who is a native speaker of Emirati, in order to verify the precision of the dataset.

Findings: The researchers successfully compiled a substantial dataset of traditional Emirati phrases and idioms, so enabling potential future investigations in the realm of Arabic dialects, specifically focusing on Gulf Arabic dialects such as the Emirati dialect.

Implications: The compilation of Emirati traditional idioms and words presented in this study has potential practical effects in several domains such as medical, education, and business. These implications mostly revolve around enhancing communication among and with individuals proficient in the Emirati language.

Originality/Value: This study distinguishes itself by concentrating on the compilation of an NLP corpus comprising traditional Emirati phrases and idioms, with a specific emphasis on the Gulf Emirati dialect. The dataset generated as a result of this effort may prove indispensable for further studies into Arabic dialects.

Keywords: Emirati dialect · Natural Language Processing · Corpus

1 Introduction

In computer science, natural language processing, or NLP, is an essential technique that allows humans to communicate with computers even when the machines can only comprehend programming languages or machine language. Arabic dialects have unique vocabulary and syntax, and MSA, a non-spoken Arabic language, is used in formal

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situations. NLP resources are needed for speech recognition, machine translation, and sentiment analysis. Corpora, libraries of text or voice data, are used to train and assess language models, helping researchers understand a dialect's linguistic quirks. NLP has gained importance due to its ability to improve machine interpretation and serve various applications. Discourse analysis, multilingual data frameworks, sentiment analysis, chatbots, and voice recognition are some of the applications that utilize NLP (Alkhatib and Shaalan, 2018). As NLP technology improves, new and intriguing applications will emerge. NLP in computer science could significantly impact our daily lives by enabling computers and people to communicate in natural languages like English, Arabic, and Chinese.

NLP improves usability and productivity in several applications (Alkhatib and Shaalan, 2018).

Language corpora include texts in many languages (El-khair and Ibrahim, 2003). It is one of the most important data sources (CL) in IR, NLP, and CL. It can replicate written language and process opinions and apply suitable applications. Arabic NLP practitioners suffer from underfunded and underresearched corpora compared to English corpora (Al-Thubaity, 2014). Arabic has three main dialects: Classical Arabic (CA), Modern Standard Arabic (MSA), and Dialect Arabic (DA). DA is geographically specific, while MSA is used in news. Arabic's morphology is complex and inflected due to its diverse subcategories (Alruily, 2020).

Thus, many researchers are now creating enormous Arabic corpora. Since most Arabic NLP developments have focused on CA and MSA, they perform poorly with DA data (Habash et al., 2012). In colloquial English, DA lemmas may have hundreds of surface forms (Al-Twairesh et al., 2017). Morphologically wealthy. DA lacks orthographies and differs from MSA in syntax, morphology, and pronunciation (Habash, 2010). As noted in the literature, a single NLP solution for all Arabic dialects is almost impossible (Farghaly, n.d.). Despite MSA being the most extensively used written language, DA is currently written more often than (Al-Twairesh et al., 2018; Shaalan et al., 2018). Therefore, the presence of a corpus that accurately represents contemporary usage of the English language has significant importance. (Sawalha et al., 2019).

1.1 Arabic Language

Arabic, which is one of the top five languages, is spoken by over 1.5 billion Muslims and 422 million non-Muslims. It is an example of diglossia, with Modern Standard Arabic (MSA) being the government's written language. Arabic is varied across countries, including Morocco and Oman, and is used in education, media, and culture (Elsherif and Soomro, 2017).

Arabs speak MSA, but dialectal Arabic varies significantly across the Arab world. Social media has led to the introduction of various dialects in written social interactions, affecting phonologically, lexically, and morphologically. The main categories include Maghreb, Egyptian, Levantine, Iraqi, and Gulf (Zbib et al., 2012).

1.2 Dialect

Dialectal Arabic is infrequently employed in formal contexts such as media and education, whereas Middle Eastern Standard Arabic (MSA) is widely encountered and utilized, as indicated by Bouamor et al. (Bouamor et al., 2019), However, native Arabic speakers rarely use MSA while interacting with others. The development of linguistic resources for dialects plays a crucial role in improving the functionality and effectiveness of Dialectal Arabic, particularly in applications such as dialect-specific machine translation for several Arabic dialects, including Tunisian, Algerian, Lebanese, Syrian, Jordanian, Kuwaiti, and Qatari (Al-Mulla and Zaghouani, 2020).

In this paper, we focus on the Gulf dialect which is spoken in the United Arab Emirates, and the data extracted from social media. Our study uses text extracted from social media to address the Emirates Arabic dialect, and from the YouTube Emirate dialect radio channel. The remainder of this work is structured as follows: Sect. 2 reviews relevant literature; Sect. 3 briefly describes the basic features of Gulf Emirati. Section 4 describes the dataset. Section 5 discusses the strategy and resources for gathering the corpus. Finally, in Sect. 6, we bring the project to a close.

2 Related Work

Arabic NLP resources have surged, particularly Modern Standard Arabic (MSA), per Rosso's findings (Rosso et al., 2018). Interest grows in projects like (Rangel et al., 2019), gathering user-generated Arabic content from social media, aided by MADAR (Bouamor et al., 2019) and ARAP-Tweet (Zaghouani and Charfi, 2018). Dialectal Arabic gains traction, seen in Gulf Arabic's comprehensive dictionary (Al-Twairesh et al., 2017) and Lahajat's directory, Al-Badawi's site showcases Arabic phrases from various origins (Al-Badawi, 2013). (Al-Malki, 2015) presents camel-related idioms, while (Al-Kuwari, 2014) researches marine life. Georgetown University's "Qatari phrasebook" app offers "1,500" Qatari terms with English translations. A Saudi Twitter Corpus (Assiri et al., 2016) aids sentiment analysis with 4,700 SD tweets across disciplines. BRAD (Elnagar and Einea, 2016) offers sentiment analysis material from 156,506 annotated reviews. Saudi sentiment corpus (Al-Twairesh et al., 2017), includes 2.2M tweets, labeled for sentiment. Habibi corpus (El-Haj, 2020) holds 500K phrases from Arabic songs in six dialects across 18 nations. Arabic Sentiment Analysis Dataset (Alyami and Olatunji, 2020) covers Saudi societal concerns with 15,149 words, aiding sentiment classification in Saudi Vision 2030 context.

Al Shamsi & Abdallah (2022a, b) emphasized on Sentiment Analysis of Arabic Dialects in Social Media. The author highlighted that the majority of research papers did not indicate the dialect type, however several expressly investigated the Saudi dialect. Around half of the datasets utilized in the investigations were created by the authors, with sizes ranging from (10,000 to 50,000) words. Machine learning techniques were the most commonly used approach for sentiment analysis, with different classifiers producing the best results. Twitter was the most popular site for building databases of Arabic Dialects texts.

Al Shamsi & Abdallah (2022a, b) developed a meticulously curated dataset for the purpose of conducting sentiment analysis on the Emirati dialect as seen on the

social media platform Instagram. The dataset had a total of 70,000 comments, with a predominant use of the Emirati dialect seen among the bulk of the comments. The quality of the corpus was assessed using Cohen's kappa coefficient, and it was declared to be of high quality. The corpus was examined using eight different machine learning approaches, including TF-IDF for text vectorization. The results revealed that the corpus has appropriate compatibility, with various approaches attaining an accuracy of more than 70% (the greatest accuracy achieved being 80%).

This work aims to construct a corpus specifically dedicated to the Emirati dialect, as there is a dearth of electronic resources available for this particular dialect. The absence of a dedicated Emirati dialect corpus for NLP applications necessitates the significance and competitiveness of this research endeavor.

3 Gulf Emirati (Background, Orthography and Morphology)

Emirati Arabic, spoken by Emiratis in the United Arab Emirates, is a series of closely related Arabic dialects with similar phonological, lexical, and morphosyntactic structures. Within the UAE, there are regional variations, classified into three sub-varieties based on their distribution in the Northern, Eastern, and western Emirates.

There are differences in the pronunciation and spelling of Emirati Arabic. For instance, the word "mob, (مب)"—which meaning "not, (ليس)"—can be pronounced as "mesh, (مش)" in Abu Dhabi, "mob, (مب)" in the Northern Emirates, and "ma, (ما)" on the East Coast. In Emirati Arabic, several letters are also changed to ones with a similar sound, such as "j (ج)" becoming "y, (ي)", "k, (ك)" changing to "ch, (تش)" and "q, (ق)" changing to "g" or "j (ج)".

Emirati Arabic speakers distinguish their dialect from nearby dialects based on a number of phonological, morphological, and syntactic characteristics (Leung et al., 2021).

For Emirati languages, there are no fixed orthographic conventions, unlike Modern Standard Arabic. This causes inconsistent spelling, even across authors. The mispronunciation or the way the words are written when derived from the Modern Standard Arabic orthography may be the source of the typo. For instance, the word "truth" is written "صدق" ("sedq") in Modern Standard Arabic, while most Emirati dialect speakers spell it "sedg", "صدج" (Al-Twairesh et al., 2018).

4 Dataset Description

The project aimed to create a comprehensive dataset for natural language processing applications, specifically for the Gulf Emirati dialect. The dataset was gathered from various internet resources, including specialized websites, social media platforms, Emirati language blogs, and YouTube emirate radio channels.

We used manual data gathering techniques, such as crawling the web for relevant pages and extracting comments and news items from social media sites like Facebook and YouTube emirate dialect radio stations, to guarantee a wide variety of phrase lengths and coverage of different domains and issues. Throughout the past decade, social media platforms have grown in popularity and variety. We use these social media platforms to acquire questionable data. The purpose of collecting data involves extracting and organizing terms (Rekik et al., 2018).

The main source of data for this study came from forums devoted to Emirati dialects, which included conversations on a range of topics, including word definitions, conversational use, problems with Emirati terminology, and storytelling in the dialect. About 1800 words acquired from various forums where it was made easier to collect data.

We also looked at YouTube radio stations that played content in the Emirati Gulf dialect. These channels produced information in the Emirati Gulf dialect and covered a wide range of subjects. We used specialist websites created for speech-to-text translation to convert the spoken input into written form. We took a selection of words from the transcriptions after the conversion procedure. To remove duplicates and improve data quality, the resultant corpus underwent stringent cleaning operations. We eventually ended up with a collection of 3000 words. We enlisted the aid of a knowledgeable specialist in the Emirati dialect to guarantee the reliability and quality of the dataset that was collected. Their knowledge was essential in confirming the dataset and identifying any possible flaws or discrepancies.

To guarantee clarity and consistency, this dataset, which includes over 3000 traditional Emirati phrases and idioms, has undergone extensive treatment, cleaning, and classification. Future research on Arabic dialects, especially Gulf Arabic dialects like the Emirati dialect, would substantially benefit from its availability. Researchers can utilize this dataset for various purposes, particularly emphasizing tasks such as voice recognition, machine translation, and sentiment analysis specifically targeting Gulf Emirati speech. Furthermore, this dataset possesses the capacity to augment communication in a diverse range of contexts, encompassing corporate, medical, and educational environments, among others. It may increase nuanced knowledge in these areas and assist successful communication by promoting a deeper awareness of the nuances and special characteristics of the Emirati accent.

The dataset produced is a significant advancement in the study of the Gulf Emirati Arabic dialect and the development of natural language processing tools, potentially simplifying future research and advancing the growth of NLP applications for Gulf Arabic dialects by addressing resource scarcity.

5 Data Pre-processing

The research utilized a combination of human and automated data collection methods to gather social media data in the Gulf Emirati dialect, aiming to create a dataset for developing dialectal Arabic speech recognition software and applications for the dialect.

The study team first created precise search keywords and inquiries that were directed at social media postings made in the Gulf Emirati dialect. The words and phrases "يلا, yalla" (let's go), "shlonik, شلونك" (how are you), and "ان شاء الله, inshallah" (God willing) were among the search keywords used.

Since speakers of the Gulf Emirati dialect often utilize social media sites like Facebook, and YouTube emirate radio channels, the researchers used these sites to gather data. They manually looked for postings that satisfied the requirements for inclusion in the dataset, such as those that included idioms and terms common to the Emirati language.

The researchers employed automated data gathering methods in addition to conventional data collection methods. They automated the collection of data from social media networks using speech-to-text techniques.

The study presents a method for identifying the Gulf Emirati dialect in online conversations by utilizing a dataset of Emirati language-specific idioms and phrases, aiming to enhance the development of Arabic speech and NLP technologies..

The data collection process involved multiple phases, including locating relevant web resources, Emirati-friendly websites, forums, and social media networks to gather relevant social media postings in the Gulf Emirati dialect (Alkhair et al., 2019).

Next, we used a number of preprocessing processes to clean up the social media postings, eliminate noise and undesirable symbols. For instance, we eliminated dates, hours, Arabic and English digits, URLs, and unique characters like the @ (mention sign). Along with emotions, stop words, and extra punctuation and symbols, we also deleted the comments. In addition, we eliminated elongation and switched to a single occurrence (Nerabie et al., 2021). Our dataset contains the following classic phrases and idioms from the Emirati language:

A phrase for expressing appreciation or respect for someone or something is "ya zain, يازين".

"Khallas, خلاص" is a phrase often used to denote the conclusion or completion of a task.

"Mafi mushkila, مافي مشكلة" is a saying that means there isn't an issue or a challenge.

"Yallah, يلا" is the Arabic word for encouragement or urging.

In summary, the research methodology involved identifying online sources, preprocessing social media posts, and annotating data to determine if it was in the Gulf Emirati dialect. A dataset of traditional Emirati phrases and idioms was compiled to improve dialectal Arabic Speech and Natural Language specific to the Gulf Emirati dialect (Fig. 1).

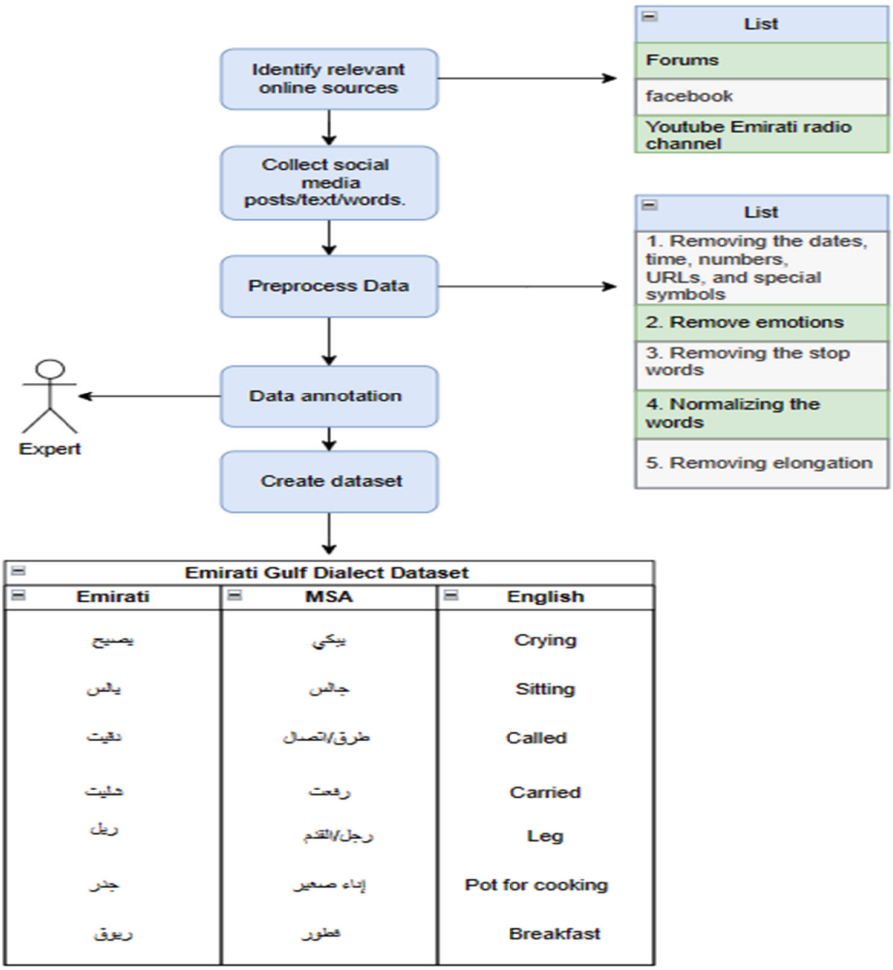

Fig. 1. Cleaning of corpus data and preprocessing

6 Conclusion

On summary, this study has introduced an innovative methodology for identifying the Gulf Emirati dialect on online platforms by using a collection of conventional phrases and idiomatic expressions. The absence of standardized orthographies in Arabic dialects is a significant obstacle for academics, resulting in the arduous and time-consuming process of creating language databases. Our argument is that the dataset we have produced will make a valuable contribution to the advancement of research in the fields of dialectal Arabic Speech and NLP methods and applications, with a special focus on the Gulf Emirati dialect.

Furthermore, we have surveyed the previous Arabic corpora and presented the methodology used to process the Emirati Gulf dialect dataset, which has resulted in

the extraction of 3000 Emirati dialect words from social media. It is anticipated that this research will serve as a catalyst for more exploration into the utilization of social media as a means of constructing language datasets, therefore making a valuable contribution to the advancement of more precise and efficient language resources specifically tailored for the Gulf Emirati dialect.

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Impact of Innovative Lighting Strategies on the Performance of Workplace Environment

The Case: Workspace Office, Masdar Visitor Center, Abu Dhabi

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Abstract. Innovative lighting layouts ILS is crucial in the office environment, with a significant impact on occupants' well-being, visual quality, and saving energy consumption. A technical understanding of light sources and performance is vital in lighting design. Open office lighting settings varies from small areas based on light quantity, fixed approach (recessed/suspended), and layout, affecting illuminance lx-level and visual quality. This study evaluates minimalist lighting conditions and identifies the most efficient solution for uniformity in a workspace. It focuses on specific zones (accent light seating zone, task area, and circulation zones). Considering many factors, such as luminaire type, layout distribution, and quantity, influence illuminance levels and visual quality. The aim is to establish various innovative lighting layouts for multiple tasks in an open office, and identify key factors enhancing illuminance levels, distribution uniformity, and energy efficiency. This work utilizes Dialux-evo 10 simulation software to develop various strategies using different minimalist luminaires shapes, quantities, and layout distributions within an existing office in Masdar City, UAE to improve visual workspace performance. Two-strategies have created, analyzing current conditions and evaluating proposed lighting concepts by installing various artificial lighting types and designing different layouts for each workspace independently. The results emphasize the importance of different factors such-as light efficacy and fixed lighting approach in achieving required illuminance levels. The visual impact of each workspace is influenced by lighting uniformity, color, and distribution, a CRI of 80 or higher is preferred for accurate color representation. The type, quantity, and arrangement of luminaires play a crucial role in the overall visual outcome. The linear arrangement with batwing-shaped distribution Scenario-C achieves an acceptable illuminance level of 565lx, resulting in a reduction of approximately 10.9% compared to the regular arrangement of the base case.

Keywords: Illuminance (lx) · Workplace · DiaLux-evo 10 · Innovative Lighting Strategies (ILS) · Color rendering index CRI · Light Distribution

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https://doi.org/10.1007/978-3-031-56121-4_28

1 Introduction

Since people spend majority of their time indoors, approximately 90% on average, with 36% of that time usually spent at work. Spending more time indoors reduces our exposure to beneficial light effects, leading to inadequate nutrition from natural daylight to support our biological, emotional, and visual needs (PHILIPS 2021). Prioritizing pleasant indoor lighting is crucial for enhancing productivity and occupant satisfaction. Lighting contributes for approximately 25% of energy consumption in commercial buildings and 15% in most homes (Alsaeid 2019). Fluctuations in light levels, known as the circadian rhythm, have a significant impact on our internal clock. Exposure to light and darkness affects hormone production, influencing our sleep patterns, alertness, mood, memory, and performance (Greenled 2020). Recent research highlighted the potential benefits of using lighting to synchronize our body clock. Lighting design focuses on emphasizing architectural features and providing acceptable visibility for occupants. The final design must meet the visual requirements of various tasks performed by human eyes while illuminating architectural components and immediate surroundings.

The European Standard EN 12464 identifies the key photometric parameters, such as illuminance, uniformity, and glare, to ensure visual performance in indoor workplace lighting (Zumtobel 2017). To enhance indoor lighting, various approaches can be employed, including improving natural light performance, using suitable light fixtures for specific functions (e.g., bright and cool-toned lights for workspaces), employing a combination of different light sources (task, overhead, and accent lighting) to create a layered lighting effect, and installing energy-efficient lighting to achieve a balanced and comfortable environment.

2 Office Lighting

2.1 Opening Office Concept Development

In the 1960s, the Schnelle brothers created the concept of "Bürolandschaften" or office landscapes in Germany. This concept emphasized open-plan offices and encouraged two-way communication between management and staff, reflecting the human relations movement in architecture (Christoph F. Reinhart 2014). The office layout intended to facilitate interaction by physically bringing co-workers together, fostering a sense of equality. It contrasted with the Tayloristic view of offices as document assembly lines by placing everyone in an open environment. Over time, interlocking, modular furniture concepts that are grouped in tighter, highly predictable rectilinear clusters of work stations replaced the early free-form floor design. Office lighting directly affects employees' mood, energy levels, and productivity. Insufficient light can cause tiredness and irritability, while excessively bright lighting can strain the eyes, possibly leading to migraines and disrupting the body's natural circadian rhythms. The optimal illumination in the workspace environment promotes employee activity, creativity, energy, and a positive mindset. Nevertheless, finding the right balance between excessive brightness and inadequate lighting can be challenging (Collective 2023).

2.2 Artificial Lighting

Artificial lighting typically refers to electrically powered light sources, such as lamps, bulbs, or tubes, that can be adjusted to achieve the desired outcome. The four adjustable characteristics of light are intensity, color, direction, and movement. Each of these characteristics can be modified to impact the four main functions of illumination: setting the mood, specific focus, and ensuring visibility. In the field of architectural design, the primary categories of artificial lighting include accent lighting (highlight specific features), task lighting (activities like reading), and ambient lighting (overall illumination in a space) (Sholanke, Fadesere and Elendu 2021).

2.3 Interior Lighting Considerations

Several terms are used to assess lighting performance in office environment, such as efficiency and effectiveness. The lighting requirements should meet the average luminance on a horizontal plane is met while achieving the highest level of lighting with minimal power consumption (A. Bhatia 2012). To achieve appropriate illumination in an office, a combination of daylight, direct, indirect, and task lighting is recommended. Ideal lighting color temperatures for office settings include warm white, neutral white, or daylight white with a significant blue content (Dötsch 2023).

1. **Luminaire Selection**
   Fluorescent lighting is commonly used in office settings, a general lighting setup with a relatively uniform level of illumination is recommended. Modular (plug-in) wiring for fluorescent lighting fixtures utilized in office spaces to facilitate adjustments. In open office spaces, the coefficient of occupancy needs to be reduced to account for light obstruction and absorption of systems furniture partitions. It is important to consider the recommendations provided by the Illuminating Engineering Society of North America (IES) Lighting Handbook when designing for glare, contrast, visual comfort, color rendering and correction (GSA.gov 2019). Office areas require an illumination level of approximately 500 lx (30 footcandles) under cabinet task lighting. To achieve greater visual comfort and enhance glare control, it is recommended to use luminaires with wider cut-off angles. Increasing the cut-off angle will result in different light distributions on the walls, as shown in Fig. 1-a. This narrowing of the beam spread can be observed in the combinations indicated for 30-, 40-, and 50-degree angles in Fig. 1-b (Roudger Ganslandt 2009).
2. **Ceiling Lighting**
   Ceiling lighting may be the primary source of illumination in a room, particularly when the room has significant architectural features. Indirect illumination can make the ceiling typically the brightest surface in the space. High ceiling luminance can resemble an overcast sky, leading to discomfort and glare for long periods spent indoors. Ceiling wash-lights, either mounted on walls or integrated into them, are used to create effective ceiling lighting. Cove lighting, in particular, is a significant type of ceiling lighting. To prevent direct glare and achieve consistent light distribution, mounted luminaires must be positioned at an appropriate distance from the ceiling (Roudger Ganslandt 2009). Ceiling luminaires can be arranged in various ways,

depending on the design concept and task requirements. Figure (1-left) illustrates 4-major point distribution designs for lighting in an office ceiling.

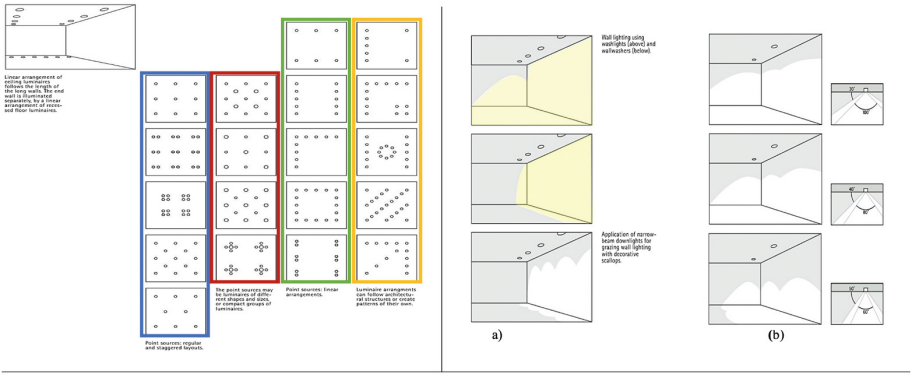


Fig. 1. Right) a) Wall lighting using wash- lights, b) Luminaire selection in terms of cut-off angle. Left) Ceiling luminaires arrangement in different approaches. Source: (Roudger Ganslandt 2009)

3. **Lighting Layout**

Many factors affect the lighting layout in a space. The lighting layout depends on specific tasks and requires arranging luminaires according to the diverse lighting needs of different areas, such as placing downlights above seating areas or using a combination of downlights and floodlights in control rooms. Luminaires should be evenly distributed for uniform lighting. The design of the ceiling form is crucial for the lighting layout. Existing ceiling grids, modules, joists, and other structural elements must be considered when designing the lighting layout. It is also important to coordinate with engineers to ensure safe installation of the cabling. Lighting distribution should not solely rely on technical considerations. The arrangement of luminaires should align with the design concept and enhance the appeal of the ceiling design. In quantitative lighting design, it is common practice to arrange ceiling-mounted luminaires to achieve uniform light distribution. A differentiated lighting with different luminaires can be created with arranged uniformly. Lighting design and effects are not directly correlated, there is no comprehensive form for lighting layouts. Lighting ceiling layout in each space is developed based on lighting tasks, technical requirements, architectural features, and design concepts. Figure 2 illustrates various design concepts for lighting distribution on ceiling surfaces derived from ERCO hand-book. Considering the point as a key design element involves using individual luminaires or compact clusters of luminaires within a spatial structure (Roudger Ganslandt 2009).

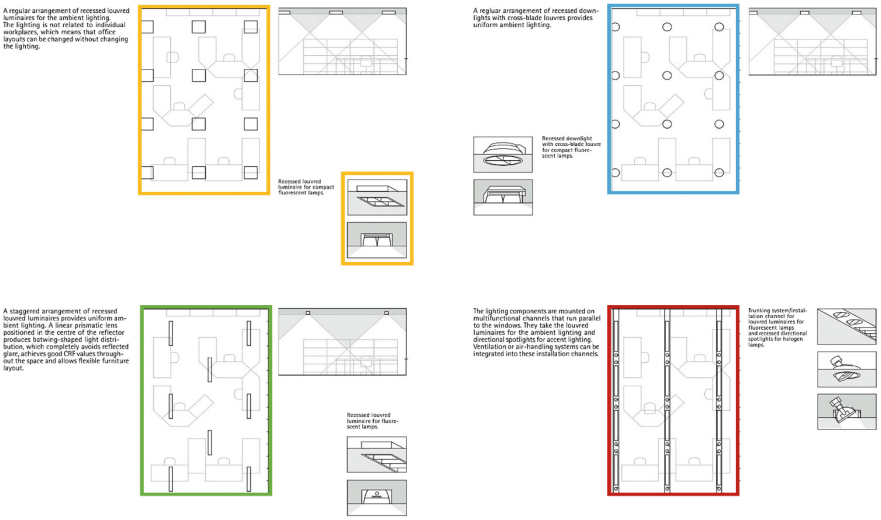


Fig. 2. Light distribution concepts for team office space based on the ERCO handbook. Source: (Roudger Ganslandt 2009)

3 Selecting Case Study

The UAE Space Agency building was selected as case study to assess the performance of office lighting in its interior workplace. The building is located in Masdar City, Khalifa City in Abu Dhabi, UAE as shown in Fig. 3. This building was constructed to meet high standards for Estidama Four Pearls rating and LEED Gold rating criteria for sustainable building design and construction of Core and Shell projects v.3-2009 BD+C.

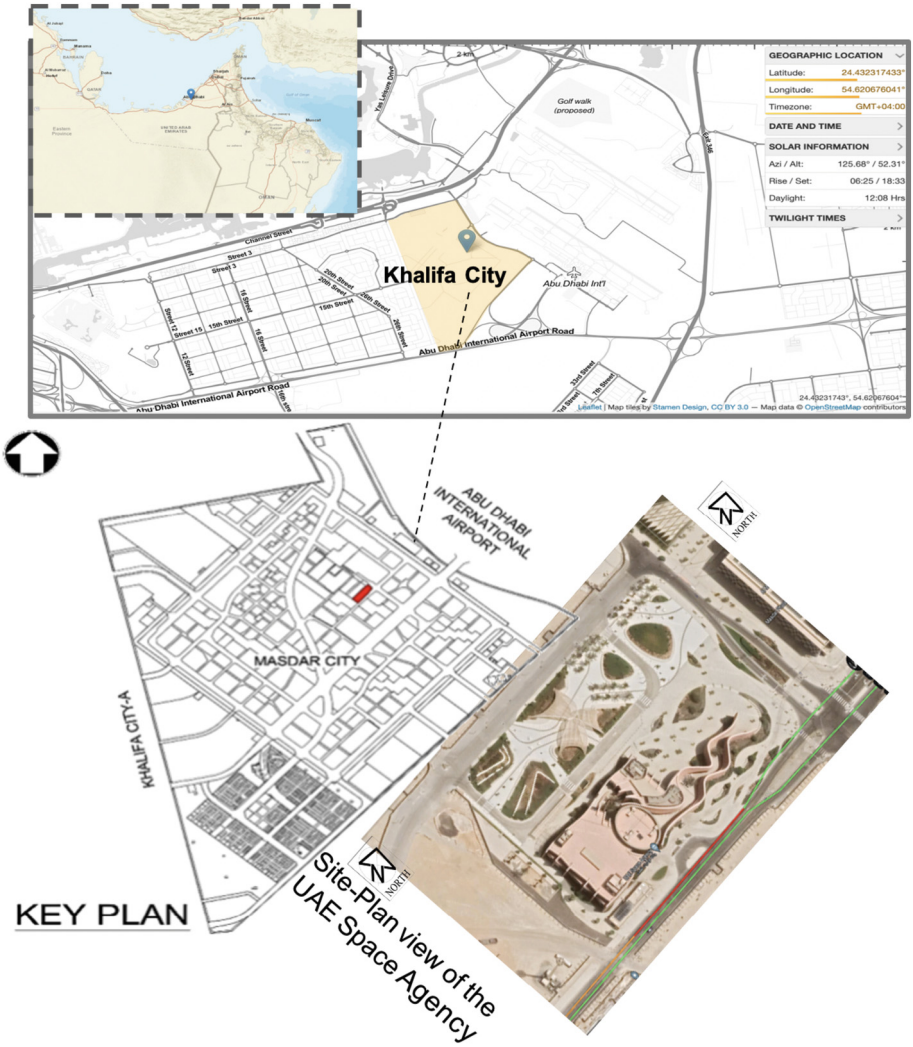


Fig. 3. Geographic location analysis of the selected case study (MVC) in Khalifa City, Abu Dhabi, the UAE

4 Methodology

This work combines modeling and calculation using DIALux-evo10 simulation software Fig. 4. The initial concept involves creating specific lighting layouts using different strategies and considering selected variables. The simulation process involved iterations starting with the tracing the office plan in DIALux's construction application and incorporating architectural details such as windows, doors, reflectance factor surfaces, and material properties. Architectural details, furniture, and electrical lighting plans from the current workspace were then added. Key step involved tracing the electrical lighting

plan, identifying the types of luminaires from a catalogue, rendering the layout model, and calculating the results. The process aimed to achieve optimal lighting scenarios, meeting target illuminance levels, uniform distribution, and acceptable ambient light throughout the office. Further investigation is carried out to achieve the optimal lighting scenario and realize the target level of illumination.

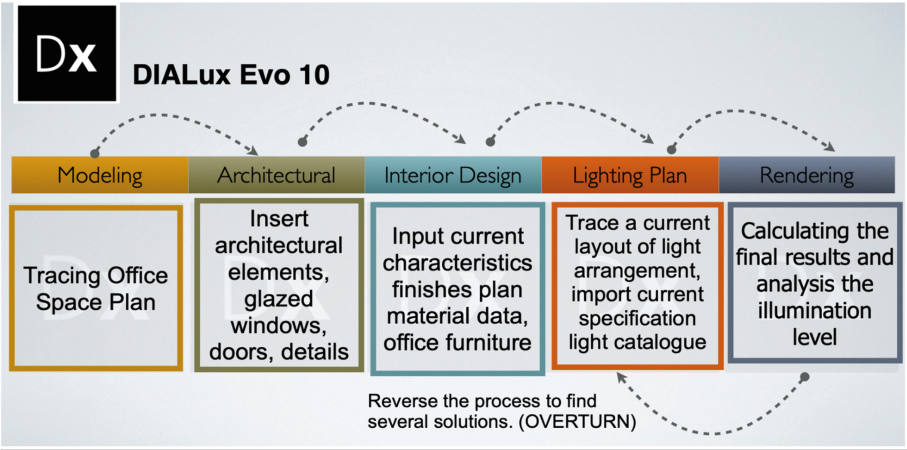


Fig. 4. FlowChart illustrating modeling simulation, & calculation of the Base Case using DiaLux-Evo10. Source: (author, 2023)

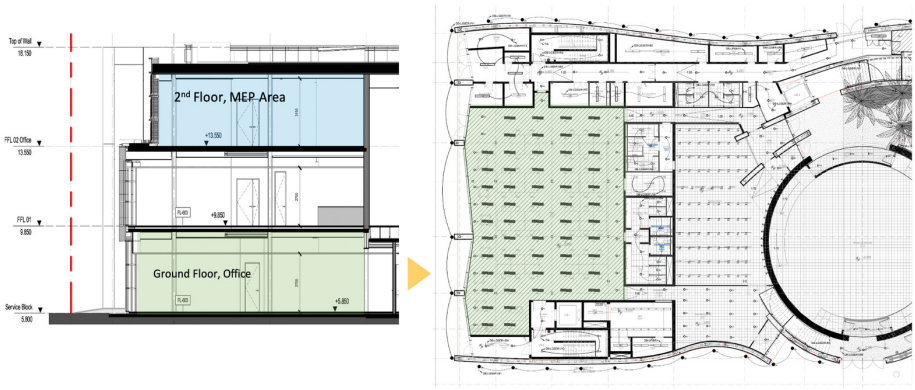


Fig. 5. (right) Ground floor workplace office plan, electrical lighting layout-green shade, (left) Long section of selected area

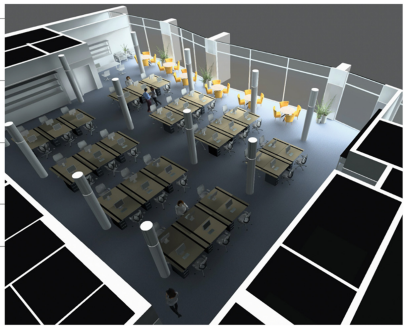
5 Modeling Set-Up

5.1 Current Lighting System Overview

The selected office area is situated on the ground floor spans 367.21 m^2. Figure 5 presents the architectural plans, showing the layout of electrical lighting and furniture distribution for the designated working area. The office has wide south-facing glazed opening for natural light and features 48-desks and 6-circular seating tables arranged uniformly throughout the space. The existing lighting system of the office incorporates LED-luminaires for enhanced indoor visual comfort. It adheres to IEASNA 90.1–2007 standards with a proposed lighting power density of 12 W/m^2, utilizing efficient luminaires such as CFLs or LEDs to reduce the number of fixtures required.

The current space has modular luminaires, including 20W LED downlights near windows and 39 W LED modular recessed luminaires. The recessed luminaires have a high efficiency of up to 130 lm/W, an 8 mm aluminum frame. The luminaires easily fit into modular ceilings and feature a dirt-resistant smooth optic design. They provide effective glare control with a wide angle of more than 65°. The main characteristics of the ground floor office summaries in Table 1. Considering the current furniture layout, the simulation accurately assessed the proposed lighting distribution.

Table 1. Interior design features & properties of the ground floor-office (workspace description)

ID Features	Characteristics	Interior shot of the workspace
Workspace area	367.21 m^2	
Height	Clearance height (floor-ceiling) 2.700 m-total story height 4.00 m	
Ceiling reflectance factor	70% -Metal Tile Ceiling	
Floor reflectance factor	20.2%-Carpet gray as specified	
Wall reflectance	56.4%-Painted Plasterboard Linings	
Glazed facing properties	Double glazed, 8mm SUNGUARD SNX 60/28 Tempered HST 22mm warm edge gab fill with 10% air, Argon 90%, 6mm FLOAT Tempered back painted, black-brown max 30% gloss	

5.2 Working Plane Configurations

The study identified the main working plane in certain criteria to meet the lighting target. The office area is divided into 7-zones Fig. 6, each with specific work-plane characteristics varying heights based on setting standards. Zones-A and B are the primary work areas, while the east corner zone and front sitting area have their own lighting requirements. The remaining spaces are classified as surrounding areas. Each zone must meet the minimum target illuminance level for uniform lighting distribution and acceptable ambient light levels. Following these standards ensures a comfortable and productive work environment for the office occupants.

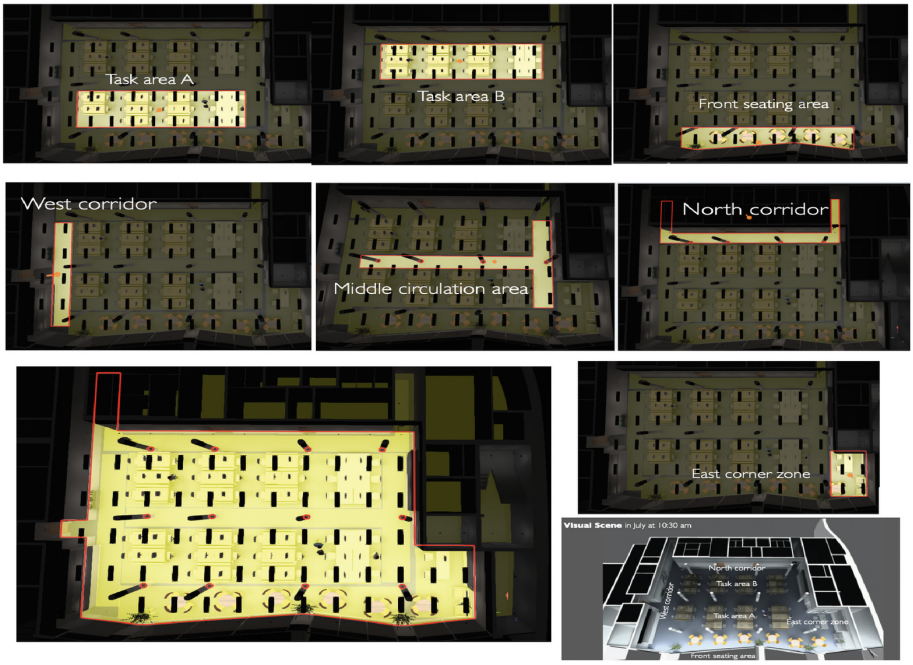


Fig. 6. Working-plane configurations of ground-floor office, Activate light scene perpendicular illuminance (WP42). Source: (author, 2023)

The study calculated illuminance values for each zone individually in the initial scenario and used an Adaptive Perpendicular illuminance with a working plane height of 0.80 m (WP42) was used as the active calculation area for the entire office space in subsequent scenarios. To meet the lighting needs of the open office space, the study considered the required illuminance values for different office tasks, such as writing and reading. It adhered to the Europe standard BS EN-12464-1 to select appropriate light fixtures for the open office space (Fig. 7). The study aimed to identify specific zones; the accent light seating zone, task area, and circulation zones, to optimize lighting conditions for visual comfort and productivity of the occupants.

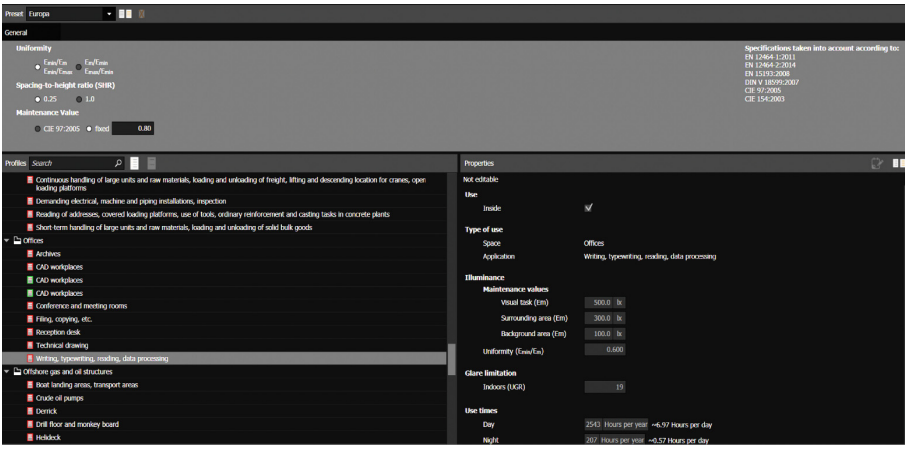


Fig. 7. Settings standards & specifications considering for lighting office requirements according to: BS EN-12464-1

6 Setup Strategies

This work established two strategies: the 1st-strategy is "Base-Case analysis," two scenarios were conducted. The first scenario evaluated the distribution of artificial lighting in the workspace under current conditions, while the second scenario involved adjusting the distribution of artificial lighting in the reference model. The 2nd-strategy is "New concept design," three scenarios were implemented. Each scenario focused on installing different types of artificial lighting and designing unique distribution layouts for each workspace independently. The study utilized the adaptive perpendicular illuminance (WP42) as the active working-plane for analyzing lighting performance in all scenarios. Detailed tables were provided, describing the selected luminaires based on manufacturer's catalog specifications. A mounting height of 2.70 m was used during the lighting design process.

6.1 Strategy One

The first strategy evaluates current lighting conditions and assesses the lighting performance of the reference model. Table 2 outlines the key features of both scenarios, including luminaire types, quantities, and distribution layouts for each type.

a. **Scenario-1 (Base Case):**
The lighting distribution design in the base-case is regular linear arrangement of two types of luminaires: recessed modular lights (57 pieces, 39 W) distributed across the entire ceiling and downlights (26 pieces, 10 W) installed in the north and front direction Table 2. This layout offers flexibility in office layout without changing the lighting design for individual workspaces, while providing even and uniform ambient lighting throughout the office space.
b. **Scenario-2 (Adjusting Base Case):**
The lighting design concept maintained similar luminaire properties to the base-case while reducing the total number of luminaires. The fixtures were relocated around the task area to achieve a different distribution layout. As shown in Table 2, scenario-2 includes 40 recessed modules (39 W) and 18 downlights.

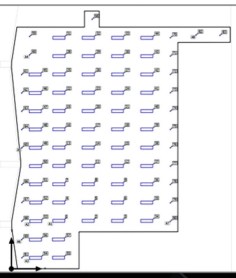
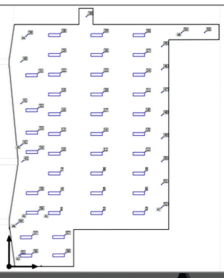
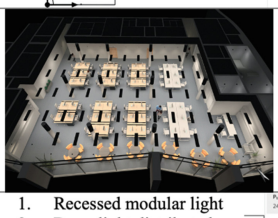
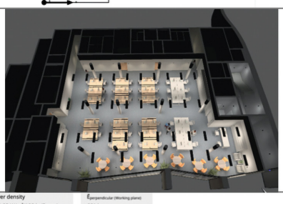
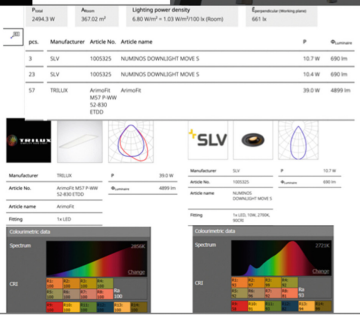
6.2 Strategy Two

The second strategy focuses on creating different zones of workspaces by installing flexible lighting for individual workspaces, known as the zoned concept. This concept aims to achieve effective lighting design by meeting minimum target illuminance levels and enhancing the ambient lighting distribution in the workspace. The strategy consists of three scenarios, each with different mounting heights based on the manufacturer's catalog. Table 3 provides an overview of each scenario, including information on the selected luminaires and their key characteristics as specified in the catalog.

Scenario-A
The lighting distribution concept includes a linear arrangement of merged linear pendant luminaires direct-indirect light fixtures mounted above the middle each task area shown in Table 3. This enhances the ambient lighting performance. There are 22 suspended luminaires with high luminous efficacy (135.6 lm/w) and a power consumption of 73 W. The front seating zones, 7 modern design Ridi spot lighting LED fixtures with a CRI of 100 and a CCT of 3000k were installed. The circulation area has 22 adjustable Endo Lighting downlights are distributed along the aisle, focusing on the accent wall.

Scenario-B
The lighting distribution aims to ensure a zonal concept, creating a modern office lighting design by combining 4-different light fixtures. Table 3 provides details on selected fixtures; minimalistic slim-line hanging lights to achieve compact groups of luminaires with flexible light types. Selected 4-types lights; linear hanged luminaires positioned at the track centered on the longitudinal axis of the desk for optimal workstation illumination. Each task area features two types of linear luminaires (Keyline and linear hanged luminaires) and a corner line light. Keyline, a Line light from Philips, offers

Table 2. Description Overview of Strategy-One

Features	Scenario-1	Scenario-2
Light Distribution Concept	A regular arrangement of recessed luminaire for ambient lighting, the lighting not related to individual workplaces, means that office layouts can be changed without changing the lighting.	Re-arrangement luminaire layout of scenario-1 & reducing the quantity of light fixtures.
Luminaires-Layout Plan		
Workplace Visualization Scene-Top view		
Luminaires Lists & Properties	1. Recessed modular light 2. Downlight distributed	

high efficiency (up to 130 lm/W), a slim minimalistic design, high lumen output, low glare, and compliance with UGR19. It is suitable for surface-mounted, suspended, and linear applications.

Scenario-C

The last scenario has different concept among other scenarios. It employs a linear arrangement of direct/indirect luminaires mounted on the edge of the task layout. The selected LED luminaires produce a batwing-shaped light distribution, increasing the ambient lighting over the task area while minimizing reflected glare and maintaining good CRI values throughout the space. The layout includes pendant direct/indirect light fixtures for the task area, spotlight LED luminaires (14 W) for the circulation area, hanging lights (15 W GULIA) for the seating area, and recessed-mounted lights (Airam 34 W) in 6-pieces for the east zone area.

Table 3. Description Overview of Strategy-2

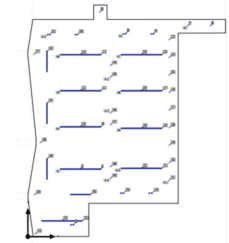
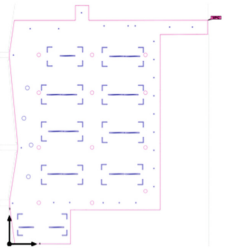
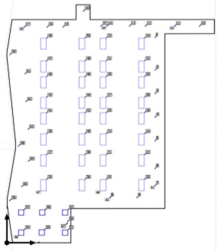
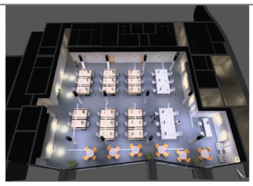
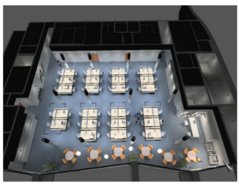
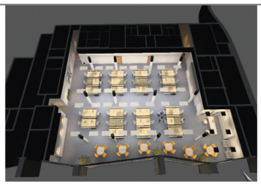
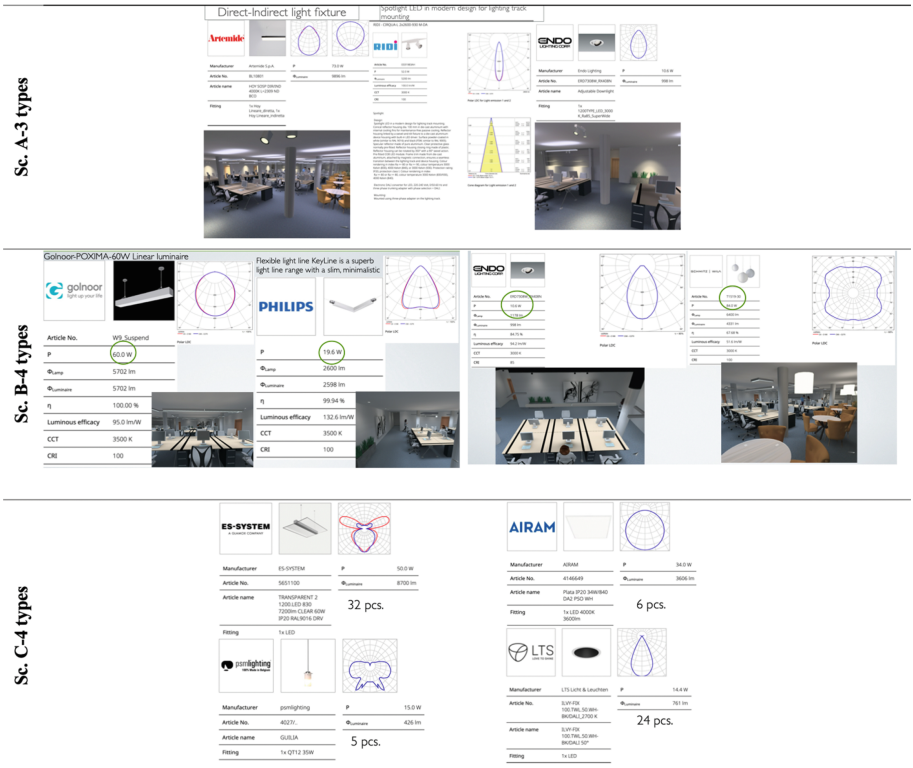
Features	Scenario-A	Scenario-B	Scenario-C
Light distribution concept	Linear arrangement luminaries layout with different luminaire types. (Linear concept)	A compact group of luminaires (zonal concept) with flexible different luminaire types	Linear positioned arrangement in the edge of task layout by using direct/indirect luminaire produces batwing-shaped light distribution which avoids reflected glare achieves good CRF values throughout the space
Luminaires Lists & Properties	1. Pendent suspended luminaire(Direct-indirect light fixture to enhance ambient lighting systems. 2. Spotlight LED in modern design for lighting track mounting 3. Adjustable Downlight	1. Linear hanged luminaire 2. Line light called Keyline, 3. Fluorescent Lamps TC-TEL(I) 4. Adjustable Downlight	1. 32 pcs. (Task luminaire) pendent luminaire(direct/indirect luminaire produces batwing-shaped light distribution 50W 2. 24 pcs. Spotlight LED 14W 3. 5 pcs. hanging light15W 4. 6 pcs. Recessed mounted 34W at (East zone area)
Luminaires-Layout Plan			
Workplace Visualization Scene - Top view			

Table 4 provides detailed information on the selected luminaires for each scenario, as specified in the manufacturer's catalog. Each scenario utilizes different lighting fixtures to enhance ambient lighting, increase illuminance levels, and create uniformity zones within the office space. Various factors such as (CRI), power (W), and luminous efficacy are considered. Direct/indirect luminaires are used in accordance with the (Guide 2019) to improve the overall ambient lighting system.

Table 4. Luminaires lists & properties catalogue-Strategy-1

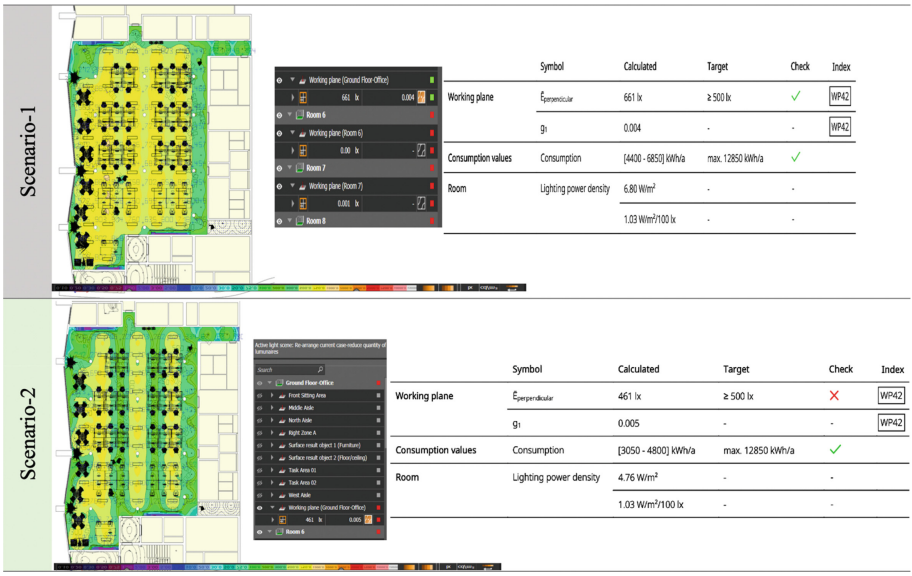


7 Simulation Results

7.1 Stratgy-1

Table 5 shows the simulation results for the base case scenarios, including the calculation of the working plane area and energy consumption values. The office lighting achieved the minimum illuminance target of (661 lx) while consuming 4400 kWh per year. The false color-contour distribution layout revealed the need to rearrange the existing light distribution to distinguish between different zones and achieve optimal illuminance levels in each zone. In Scenario-2, the lighting performance varies from the base case, simulation results indicates that the working plane does not meet the minimum lux target (461 lx) and energy consumption increased to 3050 kWh per year due to a reduction in task lighting.

Table 5. Simulation Results and Documentation for the Base-Case Strategy-1



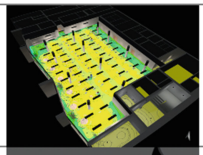
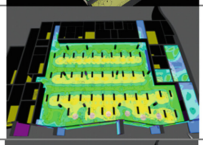
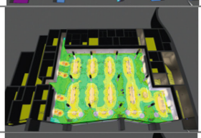
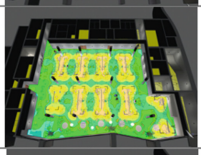
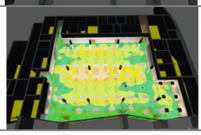
7.2 Stratgy-2

The working plane of Scenario-A meet the minimum lux target of (548 lx), with lower energy consumption of 3850 kWh per year compared to the reference case as shown in Table 6. The zoned concept over the task area is clearly noticeable, created a well-lit group work environment. Scenario-B also meet the minimum lux target of 516 lx, with lower energy consumption of 4100 kWh per year. The remaining circulation areas and seating areas were also well lit, as demonstrated by the false color scale. The contour false color of each zone complied with the illuminance level for circulation and task areas, with a different zoning layout distribution due to the different arrangement of compact line luminaires. Scenario-C features a wider and more expanded layout distribution of task lighting using flexible batwing luminaires. The working plane in Scenario-C achieves the minimum lux target (565 lx), with energy consumption of 3900 kWh per year, lower than the reference case.

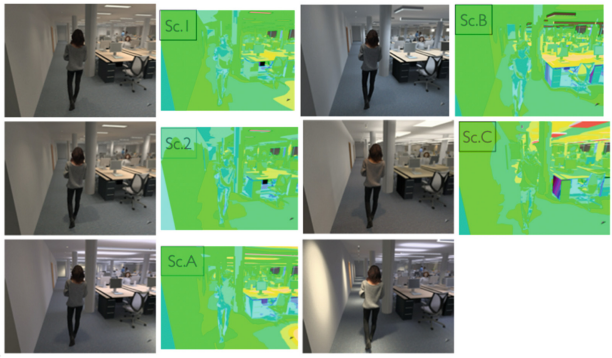
Table 6. Simulation Results and Documentation for Proposed Strategy-2 I Three-Scenarios

This study determined the most effective lighting solution for uniformity in workspace. Table 7 summarizes the final simulation results of entire scenarios. The research offers valuable insights for creating effective lighting strategies in offices, ensuring adequate illuminance, uniform lighting distribution, and acceptable ambient light levels to optimize lighting conditions in an open office.

Table 7. Final summary & comparison results

Strategy	Sscenario	Proposed Solutions Approaches	Illuminance Level (lx)	Consumption value (kwh/a)	Luminaires Types & Quantity	Lighting Layout & Distribution	Simulation work-plane result
Strategy-1	SC.1	Current condition-Base Case	661	4400-6850	Mounted recessed	Regular arrangment	
	SC.2	Adjusting SC.1	461	3050-4800	Mounted recessed	Regular arrangment	
Strategy-2	SC.A	SC-A- Regular Arrangment	548	3850-6050	Pendent direct/indirect suspended luminaires	Linear arrangment	
	SC.B	SC-B-Zonal Concept	516	4100-6400	Pendent line slim light	Compact groups of luminaire (Lines of light zonal concept)	
	SC.C	SC-C-Linear Arrangment	565	3900-6100	Pendent direct/indirect batwing dist. luminaires	Linear arrangment , batwing-shaped distributions	

"Comparing the Visual Scene and False-Contour Color Across Multiple Scenarios in the North Corridor Area"



8 Conclusions

Innovative lighting strategies enhance lighting performance, occupant well-being and efficient energy consumption in offices. Optimal artificial lighting design is crucial for achieving the desired illuminance levels. The study identified specific zones (accent

light seating zone, task area, and circulation zones) and ensuring minimum target illuminance levels, uniform lighting distribution, and acceptable ambient light levels to optimize lighting conditions in an open office space. Considering many factors such-as luminaire type, layout distribution, and quantity influence illuminance levels and visual quality. Different lights in open office layouts require various settings compared to typical small area. The comparison between the base case and proposed scenarios reveals significant differences in light distribution contour over the task area. Base case has the highest lux-level 661lx but accounts the highest energy consumption 4400–6850 kWh/year due to high quantity of luminaires with 39 W power for each, while Scenario-2 achieves the lowest energy consumption but failed to meet the required lux level by 461lx. The 2nd-strategy of 3-scenarios focused on choosing a flexible light generating different layouts distribution over the task workspace to enhance the overall results, light distribution and reduces energy consumption. Each alternative solution switched the current- recessed lights of the base case with new minimalist light type suspended lights varies in power, shape, CRI ranging (85–100) and high luminous efficacy. Task lighting was majority suspended at different heights with direct/indirect light and high efficiency up to 120 lm/W. The linear arrangement with batwing-shaped distribution Scenario-C achieves an acceptable illuminance level of 565lx, resulting in a reduction of approximately 10.9% compared to the regular arrangement of the base case.

Many factors such as luminaire type, mounted light approach, quantity, layout distribution, and luminance efficacy influence illuminance lx-level and visual quality. Higher luminance efficacy leads to better visual conditions, energy efficiency, and lower energy consumption. Considering multiple factors is crucial for designing lighting systems that achieve optimal energy consumption and visual performance. Noticeable differences appearance and visual impact of each scene are influenced by uniformity, color, distribution, and lighting. Key factors affecting overall visual scene outcomes are the type, number, arrangement, and layout distribution of luminaires. Final results revealed that various LED luminaires with different characteristics could create flexible lighting layouts. Designing a workspace lighting system involves considering illuminance, color temperature, CRI, and energy efficiency. Appropriate illuminance levels depend on function and area size. Color temperature affects the warmth or coolness of light; lower temperatures (2700 K–3000 K) create a warmer, yellowish light and higher temperatures (4000 K–5000 K) create a cooler, bluish light. A CRI of 80 or higher is preferred for accurate color representation.

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The Future of the Internet of Vehicles (IoV)

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Abstract. This paper examines the Internet of Things (IoT) and its application in the Internet of Vehicles (IoV). IoV combines AI and IoT for real-time monitoring and operation of vehicles. We discuss how the integration of AI and IoT enhances vehicle functionalities through the deployment of sensors, infrared gadgets, cameras, and heat detectors, facilitating advancements in autonomous vehicles. We explore the evolutionary trajectory of the IoV concept and its diverse applications, provide a structured progression of ideas, and shed light on the challenges and potential solutions for IoT. The final section projects the future landscape of IoV implementation, demonstrating how it can revolutionize business operations and management.so this paper aims to bridge current knowledge gaps, stimulate further research, and spark innovative applications of IoV.

Keywords: Internet of Things · IoT · Internet of Vehicles · IoV · Artificial intelligence · AI · future of IoV · Future of IoT · AIOT

1 Introduction

The rapid spread of digital connectivity has led to a new world where billions of devices are intertwined through the Internet of Things (IoT). This includes everyday devices such as smartphones, wearable technology, and vehicles (Kosmas, Papadopoulos, and Michalakelis 2021). This article will focus specifically on the Internet of Vehicles (IoV), a promising and transformative field within the extensive IoT landscape.

The IoV combines IoT and AI to collect and process real-time data from vehicular sensors, providing valuable insights into vehicle operations and affecting broader economic, social, and environmental aspects. IoV enables predictive analytics, enhancing transportation efficiency and safety globally and impacting urban planning and smart city initiatives. IoV has implications beyond transportation. It intersects IoT, AI, and transportation, creating opportunities for innovation in Healthcare, Robotics, Retail Supply, Pharmaceuticals, and more.

2 Artificial Intelligence and Internet of Things

2.1 AI and IoT

Both quantum computing and AI provide an excellent methodology to manage and handle big data generated from IoT devices connected to vehicles or any other tools and equipment. Applying computing everywhere concept will allow the computing and data

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analysis everywhere by sharing the computing ability between devices and benefiting from sharing the nearby devices' computing sources. That required a high level of security and supporting the latest technologies of BlockChain for ease of data sharing of all devices.

In general, AI can simulate human intelligence to make the necessary actions to operate vehicles and machines, depending on the collected data from sensors connected to them using IoT/ IoV concepts (Andås, 2020).

The evolving of IoT and AI increase dramatically recently, and the benefit of evolving business come by combining IoT and AI to introduce AIoT, that using the IoT as sensors to collect certain data for a specific domain and the AI used to analyze these data and generate business value, and increase the interaction between machines and human. AIoT can be designed as a smart system that can analyze the data and make the required decision without human interaction to empower real-time actions. Also, It could be considered as a decision support system for decision-makers. Additionally, there are many other benefits for AIoT, such as increasing the efficiency and productivity of machines, excellent monitoring for business risks, human language communication gadgets, increasing systems availability, and reducing operational costs (Revathy et al. 2020).

2.2 Applications of AI and IoT

Smart logistics depend on a smart transportation system that includes many systems that work together to manage and perform specific tasks. It required to use AI, IoT,and Industrial IoT (IIoT) (Woschank, Rauch, and Zsifkovits, 2020). There are many application of AIoT, such as.

1) Street supervision by drones: this considers part of the smart cities concept, as drones can monitor the road conditions and determine the necessary action that needs to be taken in specific scenarios, like changing the traffic light sequence in order to facilitate police or ambulance moves with a smooth flow (Fig. 1).

Fig. 1. Fleet management for Autonomous Vehicles (Revathy et al., 2020).

2) Fleet management and supervision: that helps maintain vehicle routes reduce fuel consumption and drive behavior. Additionally, AIoT essential for all self-driven cars as it uses sensors, cameras, and radars to provide all required data to the AI system, which considered as car brain; the AI part ensure smooth and safe driving for the driver, passengers, and road users and the road/city assets.
3) The futuristic of robot delivery: a specific purpose robot dedicated to delivering goods. These robots contain built-in AI systems that enable them to interact with the delivery location and environment to ensure efficient delivery with the shortest path.

IoT is used to gather information about many objects like tools, buildings, vehicles, pets, or humans automatically without human interference (AlGanem, and Abdallah, 2022). The collected data usually sent to one or more data collection stations to prepare it to be processed. One of the most critical challenges of IoT is security issues.

The main applications of IoT are:

1) Smart home: which include more than 500 gadgets connected to home appliances, furniture, doors locks, cameras, and many other devices that communicate with the primary system which provide knowledge about the home status and provide a better life for people, but at the same time having data security issue might lead to severe problems to home living people.
2) Smart Healthcare: in this domain, IoT plays for all patients and healthcare institutes, and insurance companies. Regarding patients, IoT gadgets can detect patient vital signs that can be wearable or fixed with a human body. For healthcare institutes, IoT can be connected to medical devices, Lab devices. Operations rooms and building facilities will give a better way to manage, operate, keep an eye on all changes, and get notified when needed to take the necessary action. Also, insurance companies benefit from employing IoT by making the automatic approval for an insurance health claim for patients based on IoT gadgets and IoT of connected devices in the healthcare institute.
3) Logistics and transportation: by the increasing demand for online trading and e-commerce, the need for logistic services increase dramatically, and there is a need to followup up shipping and goods delivery, which required better management for packaging and fleet of vehicles. By employing IoT and RFID, a better service is provided, for example, for checking the road and traffic conditions, make sure the temperature for goods required cooling during shipping. The use of AI and IoT is to detect the driver's behavior and expression and eye looking way to check the focus of the driver and notify/alert him to focus on the road, as a higher percentage of accidents on the road happened because drivers are not paying attention to the road (Uganya,and Baskar, 2020)

Besides vehicles, routing algorithms can also work for a fleet of robots to manage the logistics in general and specifically in the healthcare domain like hospitals, to deliver goods such as medicines for patients or medical tools and supplements. To enable fleet management system to manage the request and set the orders to robots within the required time. To manage all fleet operations, a set of systems need to collaborate: routing engine and traffic control, task scheduler and task assignment, supervision, and monitoring system, robots with IoT gadgets and sensors. Also, the same concept is used as shopping

assistance during customers visit big shops/malls so that robots can carry the goods during the shopping journey in the process (Ortiz et al. 2021). in addition to robots, drones are also utilized better when applying the AI to it and can be used in military uses having similar components of the robots such as routing system but for three dimensions positioning, and there are task management and scheduling to distribute the tasks between a fleet of drones (Johnson, 2020).

3 Internet of Vehicles (IoV)

Internet of Vehicles (IoV) is considered as employing smart system and IoT to vehicles using Artificial Intelligence (AI) and Machine Learning (ML), that enables the vehicles on the road to communicate with each another in order to avoid roads issues like a traffic jam, avoid accidents and self-breaking, self-driving, self-repair vehicles, fuel consumption. Additionally, communication with other objects like infrastructure, roadside, pedestrian, and the management application that communicate and coordinate between all vehicles and use AI and ML facilitates the use of the vehicles and road for all road users. IoV is considered a complex system consisting of multiple systems that integrate and collaborate in real-time and give alerts notification, decision support for vehicle drivers or road users, such as people who walk on the sidewalk or bike riders are wearing smartwatches. As the system come complex, this makes a lot of issues and challenges such as:

The storage of all the collected data from all entities, the unexpected behavior of drivers routs, network coverage in all areas and locations, the load on the network, sensors' reliability and calibration, safety, and privacy. In general, IoV works better when using AI and ML to achieve better networking, better results, and business value (Kumar, and Singh, 2020).

Fleet management systems help manage the fleet operation to operate within all areas of fleet management, including planning, maintenance, and retirement. A framework to manage all these areas comes into two parts. The first part covers solution architecture considering future growth of the fleet, deploying, and maintaining the system. While the second part focuses on the best AI algorithms that fit each used tool within the framework, it also determines when required to retrain the AI algorithms. As managing big-size fleets for 1000 + vehicles come as mission-critical for organizations that depend on delivering their services or goods to their customers, predicting failure before it happens increases availability, efficiency, and productivity. The provided framework's main actors are Data scientists, Sustenance engineers, Organization Data Lake, end-user/ end product (Thomas et al. 2020).

One of the main challenges for the transportation domain is the car accidents that happened due to insufficient knowledge of driving or driver gets distracted by vehicles, entertainment systems, food, or mobile usage. To overcome this issue and increase driving Welfare, some companies invented self-driving vehicles by using IoT sensors, radars, and cameras and connected them to AI systems that can analyze and take the necessary action to drive safely. This concept reduces the injuries and loss of lives and financial loss by avoiding drivers' mistakes and destruction that lead to accidents. In general, a car can be said it is autonomous vehicles if it can do some of the human

driving actions, and fully autonomous vehicles mean a vehicle can operate fully without any human interaction. There are five levels of vehicle categorization depending on the autonomous level:

Level 0: means there are no autonomous at all and driver action required all the time
Level 1: minimal help for the driver like speed control
Level 2: Vehicle can maintain speed control and path position
Level 3: self-driven car in a specific condition and notify the driver to take control when needed.
Level 4: fully self-driven car in a specific area like a city.
Level 5: fully self-driven car in all areas under all conditions. (AGENMONMEN, 2020)

Self-driven vehicles can detect and interact with the surrounded environment using sensors and cameras by applying computer vision algorithms and signal analysis. To recognize the objects and trace the path lanes, all of them become a source of data to reinforce the training for AI logic within the vehicle, so the vehicle can decide the way, speed, and the lanes to be used, and how to react to all changing conditions on the road, including other vehicles people on the sidewalk, traffic lights, accidents, traffic jam, weather conditions, and limited sight visibility.

Many challenges face autonomous vehicles, like dealing with unknown objects or environment, defect or poor working conditions for IoT Gadgets(cameras or sensors)due to many weather conditions, manufacturing defect, or tear and wear, which lead to a faulty alarm. Another challenge is to keep the evaluation of the current status of the vehicle and the surrounded objects. As a complex environment, many AI algorithm needs to work together to achieve a high level of self-driven vehicles. To simplify the complexity, a map is created to track the destination and determine the environment's objects that surround the vehicles.

Using perception process by using a variety of AI technologies like support victors machine (SVM), Multi-view Stereo, Visual SLAM, Tracking filters, Signal processing techniques, Supervised learning networks, Unsupervised learning (clustering, decision trees, Bayesian networks), Deep neural networks (Convolutional neural networks, RBM and deep belief networks, Generative adversarial network), Reinforcement Learning, and many other techniques.

There is an excellent benefit for logistics companies in increase their efficiency/productivity and reduce the cost of their services. Using Google maps, historical data of the fleet of vehicles, IoV, and AI algorithms, namely Dijkstra, build a perception model that determines the best route for multi destinations depending on traffic conditions and vehicles' s considering the current location of the vehicles and new orders come across during the journey.

Currently, autonomous vehicles are used in military services by making cheap foldable self-driving cars that imitate the shape and sound of tunks to distract the enemies and trick them. The future of vehicles, tools, and equipment will be a self-driven vehicle and self-repair and self-assembly, which will help many domains improve the availability level, especially for vehicles working away from maintenance stations like vehicles in war scenarios. All these features can be developed using self-checking sensors (IoV) and AI methods that can check the current situation of the vehicle and find the defective parts and replace it to continue its operation with minimal downtime; furthermore, these

vehicles can predict the failure before it happens; so this minimizes downtime near to zero.

Additionally, in the future, there will be a swarm of self-driving flight fighters that can fly in groups and interact with each other independently to organize the attacks and distributes the targets between them based on war and flight conditions (Torossian, 2020).

4 Challenges

The future of the IoT comes as improvement of many sub-areas within the IoT like improving 1) the hardware by using a mix of a very tiny chipset, nanotechnology, and minimal electricity usage for the components. 2) sensors, by providing small sensors and lower power use and high accuracy 3)communication, besides the standard communication channels a new communication way to interact with other devices to use the concept of computing everywhere. 4) software provides specific mission software within a domain perspective. 5) data are analyzing, having a built-in data processing, analyzing, and visualizing within the same device. 6) security, provide a highly secure data transmission mechanism, and use of secure protocols (Aqeel, 2020).

IoT is used to generate new knowledge about the machine connected to it and generate a bid data pool about all actions and changes to that machine. Fleet management can benefit from the IoT and use it specifically for vehicles IoV, to better manage the maintenance for a fleet of vehicles by predicting the failure before it happens and do the required prevention action. There are challenges regarding IoT regarding data ownership, is the one who uses the sensor or device, is the data collection and analysis, or the manufacturer of the devices. Another challenge is determining the party that he/she should get the financial benefits of these data. Finally, there is no international standard for IoT devices to connect with each other (Killeen, 2020).

Recently, there have been significant improvements in IoT and IIoT concepts, including smart sensors, connectivity devices, RFID, and many other gadgets. Additional to cameras, radars, ultrasounds sensors, heat sensors that combined to gather and assembled within vehicles to produce autonomous vehicles that apply the concept of the Internet of Vehicles (IoV) which use AI to analyze all collected data with a realtime to make a smart decision without human interaction (Vermesan, 2020).

5 Future of IoV

Transportation is considered one of the most critical domains to develop urban cities and smart cities. There are many attractive functionalities to build smart cities, such as self-driven vehicles and smart transportation in general. Regarding future cities, futuristic technology can implement connected autonomous vehicles, personal self-driven vehicles, flying vehicles, and transportation as a service; all that mentioned before come as an application of IoT, IoV, and AI algorithms such as Fuzzy logic model, Artificial immune system, Genetic Algorithms, and Artificial Neural Networks. Soon the vehicles in the city will be connected to each other through a network called an Intelligent transport system that enables all vehicles to collaborate and share their data about the

traffic/roads conditions to benefit other vehicles using recent technologies of BlockChain and intelligent vehicle trust point (IVTP) to apply the IoV concept. Currently, Google and Tesla provide vehicles with fully self-driving features that can communicate with other vehicles and road facilities and units. Many issues will be solved using blockchain technology as it provides a decentralization datastore, high security/ encryption, and privacy (Mujtaba, and Javaid, 2020).

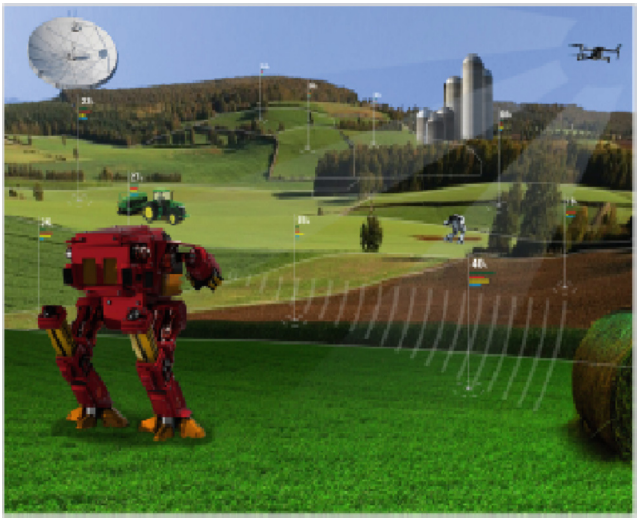

Fig. 2. A futuristic expectation of high tech field (Fountas et al. 2020)

Figure 2 above show a common vision of futuristic field that supported by IoT in many applications of Equipment, vehicles, robots, drones, satellite, and many other sensors. That all work to gather to collect data about the plants' soil and weather, then they interact with each other to decide what is the required action need to be taken for the good of plants and soil. The task then delivered to the concerned equipment such as a tractor, robot, or drone to put more fertilizer, watering, spraying bugs, or start harvesting (Fountas et al. 2020). IoV will help build smart cities and make them more connected to vehicles and collect data from autonomous vehicles that required a new robust network like 5G or better in the future, enabling vehicles to communicate in real-time with other vehicles and roadside infrastructure. In the future flying vehicles will be available for commercial use and will be by all people, as IoV will playing a significant role in managing flying autonomous vehicles. Finally, regulations, policies, and strategies should be placed to govern the wok of autonomous vehicles.

6 Conclusion

There is a continuous improvement of IoV technology, including hardware, software, and network, and lead to better-provided services. Improving on IoV will lead to better results in the number of accidents, time and cost-saving, reducing co_2 emissions and

better transport experience, in addition to the contribution of the smart city. in this paper, we explorer many technologies that support IoV, such as IoT, AIot, and AI. in future we expect more advanced autonomous vehicles including transportation system and flying vehicles.

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A Framework for Developing Information Requirements for Built Asset Management Based on Organisational Sustainability Objectives

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Abstract. Purpose- In recent years, digital transformation using Building Information Modelling (BIM) systems has reshaped asset management. This process involves systematically maintaining and improving assets throughout an organization's lifecycle, with a focus on sustainability objectives. However, the current asset management process often wastes time and resources searching for asset information. This research aims to create a BIM-based framework, address the disconnection between asset management models and key indicators of sustainability, and help achieve the organisation's sustainability objectives.

Methodology- This paper explores the relationship between asset management and sustainability objectives, establishing an integrated framework from existing literature. A seven-step approach to developing information needs is also proposed.

Findings- It was found that asset information requirements are often formed without a direct link to the organisational objectives they are intended to achieve or are difficult to detect adequately. Recognising the cyclical nature of asset management and BIM and generating a framework.

Implications- The framework will help address the disconnection between design aspirations and key indicators of sustainability.

Originality value- The framework aligns asset management with sustainability objectives and integrates with BIM for a unified asset management platform.

Keywords: Building Information Modelling (BIM) · Organisational Sustainability Objectives · Building Asset Management (AM)

1 Introduction

Asset information management throughout the lifecycle of built assets is gaining importance in both industrial applications and academic literature. Building Asset Management (AM) is guided by a series of industry standards that play an important role in all phases of the asset lifecycle (design, construction, operations and maintenance (O&M), disposal

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and renewal) (ISO 2014). The widespread use of Building Information Modelling (BIM) has led to significant improved project management during the design and construction phases, and there is a wealth of evidence that BIM increases productivity, reduces design and construction costs and improves risk management (Azhar 2011; Bryde et al. 2014; RIBA 2017). However, the use of BIM in O&M is relatively limited, and asset managers still face many challenges. For example, how to achieve sustainable development objectives (from three perspectives: social, economic and environmental), as well as more traditional technical and economic objectives, and how to obtain data and information that will contribute to the effective management of built assets and how to communicate them accurately and efficiently to asset managers (Kishawy et al. 2018). Exploring how to quickly and accurately communicate the information needed to achieve organisational objectives to asset managers will therefore be important in aligning asset management with organisational objectives.

From a social, economic, and environmental perspective there is a strong link between the long-term sustainability of buildings and effective built asset management (ISO 2014). It is therefore essential that organisational sustainability objectives are used as a key indicator for asset management. Therefore, organisational objectives (e.g. sustainability objectives) are translated into Asset Information Requirements (AIR), which means identify all required assets and their management and maintenance procedures (ISO 2014). The basis for AIR is Organisational Information Requirements (OIR). The OIR can clarify the organisation's needs, necessities and objectives, and organisational sustainability objectives are often included in the OIR (CDBB 2020). OIR is often in the form of a technical document and does not consider the changing environment. For this reason, the Centre for Digital Built Britain (2020) first introduced the Sustainability Information Requirement (SIR) to help achieve organisational sustainability objectives.

These information requirements are all part of the BIM process, defining the data, information and documentation required to operate and manage building assets throughout their lifecycle. Despite this, there are still complex challenges to adopting BIM in the O&M phase, which are currently highlighted in the literature as follows:

The value of BIM in asset operations and maintenance is fundamentally poorly understood. The O&M industry is less receptive to emerging technological processes and practitioners still have a relative lack of data management skills (Ashworth et al. 2019).

Much of the research on achieving organisational sustainability objectives has focused on the planning and construction period, with the role of asset management often overlooked (Xu 2011).

Based on the challenges in the current literature, the following research question is proposed: 'How can BIM, asset management and requirements engineering be used to help set organisational sustainability objectives for asset information requirements?'.

Overall, there are several challenges in the application of BIM in built asset management. The asset management process encompasses many activities, and these activities are accompanied by a wide range of information requirements. A standardized framework could simplify generating asset information requirements, aligning them with organizational objectives.

Therefore, this paper investigates an organisational sustainability objectives-led Asset Information Requirement (AIR) that will support BIM in the O&M phase of a built asset. The organisational key objective of sustainability in three dimensions - social, economic, and environmental - extends BIM as defined in ISO 19650-1 with the key element of an asset management system as given in ISO 55000. It also considers the addition of a sustainability objective as an intermediate step to assist in the development of the Sustainability Information Requirements (SIR) from OIR to AIR.

The paper is structured as follows. Section 2 reviews the literature and industry standards in the field of built asset management and organisational sustainability. Section 3 describes how to develop a sustainability information requirement framework for asset management to align organisational sustainability objectives and asset information requirements. Section 4 summarises the findings of future research opportunities and challenges.

2 Background

2.1 Standardisation of Built Asset Management

Standardisation is important for organisations to strategically manage their assets. Such as ISO 55000 (ISO 2014) is considered the primary international standard for asset management. ISO 19650 (2018) is a specific standard for BIM in asset management, and there are other standards that do not directly describe the use of BIM in asset management but indirectly support information management in asset management. Other covering the maintenance and management of built assets include the Industry Foundation Class (IFC) standard ISO 16739 (ISO 2013). There are also ISO:29481, (BIM information manuals) PAS 1192:1-5, (data format specification) ect. Figure 1 demonstrates asset management's progression with standards towards clearer, more standardized practices. The study aims to forge a common framework that aligns AM, BIM, and sustainability objectives, establishing these standards as pivotal references.

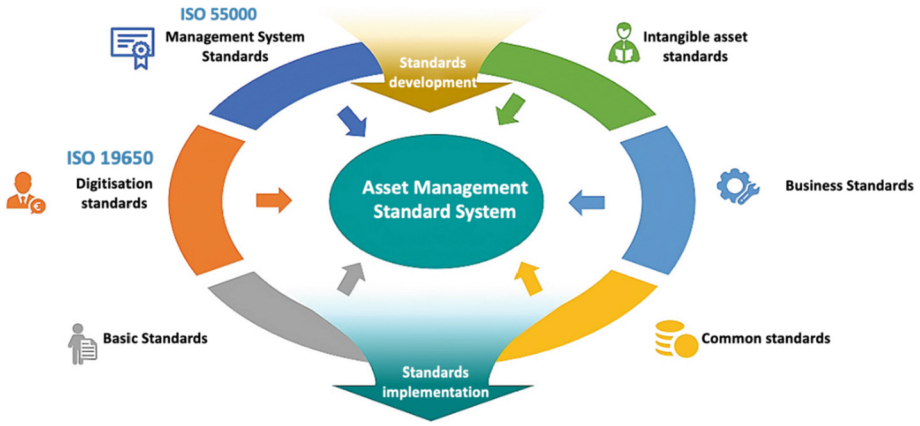

Fig. 1. The development of asset management standard system, Source: (author)

2.2 Built Asset Life Cycle Management

ISO 19650 (2020) defines a built asset as a 'building, multiple buildings (e.g., a site or campus) or built infrastructure (e.g., roads, railways, pipelines, dams, docks, etc.) that is the subject of a construction project or where the asset information is held in a digital format'. These assets are typically complex, necessitating comprehensive management for optimal operation and upkeep. Asset management is crucial for enhancing and adapting assets to support an organization's primary objectives (Atkin and Brooks 2009). The RIBA Plan of Work (2020) characterizes it as efficiently and effectively handling the entire lifecycle of assets.

The UK government's 2016 construction strategy references BIM and full lifecycle will provide a platform for smart city development and are key factors in increasing productivity and reducing operational costs (The Infrastructure and Projects Authority 2016). But most of the asset's life cycle is spent in the operations and maintenance phase, so the client and end-user are the ultimate beneficiaries of asset management (Eastman et al. 2008). Figure 2 shows BIM's application through all project stages.

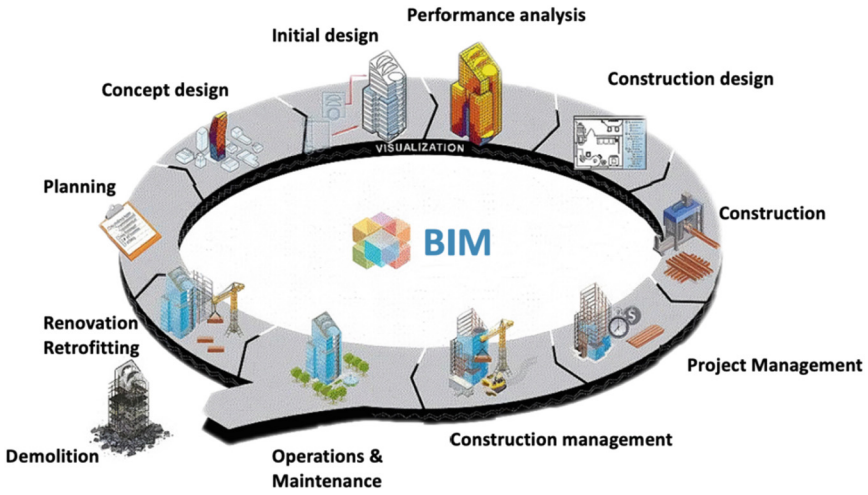

Fig. 2. Building Information Modelling (BIM) in building lifecycle, Source: (author)

To achieve efficient asset management during operations and maintenance, early consideration of space, occupancy, and maintenance requirements is crucial. In this phase, asset management teams spend significant time and effort gathering information from various sources, leading to redundant tasks that reduce productivity. While asset management is most pronounced during O&M, a holistic lifecycle approach is essential for enhanced efficiency.

Asset management during a building's lifecycle accounts for 60% of total lifecycle costs (Akofio-Sowah et al. 2014), making it a challenging and pivotal task. It impacts various operational measures from an asset lifecycle perspective. Asset design affects productivity and organizational goals (Haider et al. 2006). Lu et al. (2018) advocate considering sustainability throughout the built asset's lifecycle to gain a sustained competitive advantage. These studies imply that managing assets throughout the life cycle can help achieve the organisation's sustainability objectives.

2.3 Information Management in Built Asset Management

Information Management System (IMS)

Information Management Systems (IMS) have become increasingly user-centric, with a focus on understanding users' requirements (Maguire and Bevan 2002). This has led to the emergence of Requirements Engineering (RE) for IMS development. Information management is crucial for effective built asset management, with BIM facilitating information development and requirements generation (Parn et al. 2017). ISO 19650 (2018) outlines a structured approach to information requirements in BIM-enabled asset management, with Fig. 3 showing the hierarchy of Organizational Information Requirements (OIR) and its impact on information deliverables in the asset delivery phase, detailed further in Table 1.

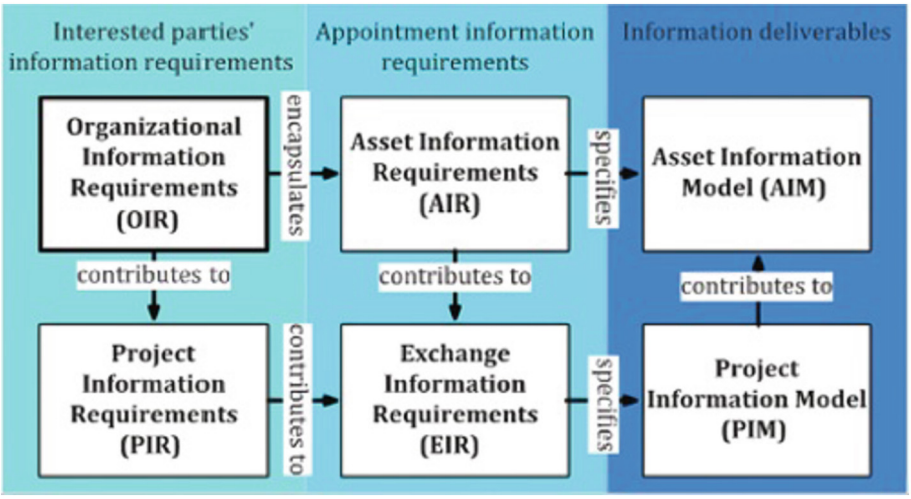

Fig. 3. Hierarchy of information requirement, Source: (ISO 19650)

Table 1. Explanatory table for Fig. 3, Source: (author)

OIR	To clarify the organisation's objectives
AIR	To be clear of all required assets, their management and O&M
PIR	What asset information should be provided for each project?
EIR	Establishing a clear agreement among stakeholders
AIM	Provide all data and information relevant or required for the operation of the asset
PIM	Information models developed during the design and construction phases of projects

Information Requirement

ISO 19650 (2018) defines OIR as the information required to respond to high-level strategic objectives. Asset Information Requirements (AIR) are divided into three aspects:

management, commercial and technical. The management and commercial aspects include information standards and production methods. The technical aspects answer the detailed information required for OIR. All AIRs should form a single coherent and coordinated set of information requirements. This study will focus on sustainability related OIRs and AIRs. Project Information Requirements (PIR) are the information requirements contained in the high-level strategic objectives of a project related to a built asset. The Exchange of Information Request (EIR) is like the AIR as a process of responding to and answering the PIR. All EIRs should also form a coordinated and coherent set of information requirements to address the PIR together.

Asset Information Modelling (AIM) is intended to be the single information source validated and approved associated with a particular asset. The main challenge is the complexity of capturing the OIR at the initial stage. Moreover, if AIR is not guided by organizational objectives, it will not be suitable for use in processes such as capital investment decisions, operations, and maintenance due to the diversity and uncertainty of asset management (Kiviniemi & Codinhoto 2014). The main challenge faced in making the jump from OIR to AIR is the organisation's objectives and requirements were not specific and quantifiable; the management team was not well versed in the technical aspects of operating and maintaining the assets; and AIR was developed from a technical perspective that did not fit well with risk management and asset management. (Heaton & Parlikad 2020). Heaton et al. (2019) first established an explicit link between AIR (operational level) and OIR (strategic level) by proposing Functional Information Requirement (FIR). This is to consider how to link organisational and asset management objectives so that asset management can efficiently serve organisational objectives. Ashworth (2019) argues that developing OIR and AIR will help asset managers improve asset management efficiency. But in fact, will lead to more serious problems where the ideas of the asset manager will override the organizational objectives. Patacas (2020) suggests the adoption of the Information Delivery Manual (IDM) approach proposed by BuildingSMART (2018). IDM, as an ISO standard, emphasises information, data and models between different stakeholders at a given lifecycle stage, based on process mapping defined in the Business Process Modelling Notation (BPMN). While this approach integrates stakeholders and lifecycles, it may miss organizational objectives that are not explicitly reflected in specific activities. Therefore, it is necessary to find a standardized and common approach to fully integrate organizational objectives with AIR.

Sustainability Information Requirements

Organisational objectives determine the strategic need to acquire, maintain and use information related to assets. These objectives may be, sustainability objectives, profit objectives, technology objectives, etc. These objectives often change depending on the project and the organisation (Guo & Zhang 2022). This study focuses on sustainability objectives, which may be achieving net zero carbon emissions by 2030; reducing building costs by 20% by 2025; reducing reactive maintenance activities per asset by 5% by 2025, etc. (Lima et al. 2021). This again changes with organisations and assets.

The Centre for Digital Buildings UK (CDBB) (2020) proposes Sustainability Information Requirements (SIR) and defines them as information that contributes to the organisation's sustainability objectives. In the same way that sustainability objectives are sub-objectives of organisational objectives, SIRs are part of OIRs.

Figure 4 exemplifies SIR for environmental objectives, with specifics like performance data varying with different sustainability targets. Despite SIR's potential in reaching sustainability goals, literature on this is sparse.

Operation activity	Policy or external influencer	Information requirement	Information container	Exceptions	Acceptance criteria
Energy usage monitoring	• {Client's name} energy policy	• Actual building energy consumption (kWh/m2) • Building emission rate (kgCO2/m2) • Annual energy consumption (kWh per annum per m2 gross internal floor area) • Operational carbon dioxide emissions (tonnes per annum CO2) • Annual water consumption (litres per annum per m2 gross internal floor area or by per occupant) • Waste (tonnes per annum m2 gross internal floor area)	A spreadsheet (.xlsx)	N/A	Must adhere to standards.
Sustainability KPI	• {Client's name} energy policy	• Code performance • Sustainability performance • System specifications	• A spreadsheet (.xlsx) • Specifications in PDF	N/A	Must adhere to standards.

Fig. 4. Sustainability information requirements, Source: (CDBB)

IMS adoption in asset management, particularly for sustainability, is nascent with research gaps in Sustainability Information Requirements. Aligning asset information with organizational sustainability is tough due to:

Difficulty in integrating Sustainable Development Objectives into O&M phases.

Challenges in quantifying organizational requirements to inform AIR.

Technical support is still immature.

This study aims to overcome these by infusing Sustainability Information Requirements (SIR) and Sustainability Functional Information Requirements (SFIR) into the information hierarchy outlined in Fig. 3.

3 Sustainable Requirement Development Methodology

3.1 Establishing the Framework

The process starts with organisational objectives, identifies asset management objectives, and then helps with asset management, and the logical relationship matches that of Fig. 3. Therefore, if Fig. 5 can be combined with Fig. 3 and considers sustainability objectives, it will effectively address the aim of this study.

A comprehensive literature review methodology was used and identified a knowledge gap in forming information requirements for organizational sustainability in asset management. Transitioning from OIR to AIR is a substantial step for many organizations, highlighting the need for an inclusive framework. To bridge this gap, a systematic method for producing sustainability asset information requirements is suggested, integrating SIR and SFIR for organizational alignment. Figure 6 presents the expanded framework.

The extended framework outlines a concise seven-step approach for information requirement development.

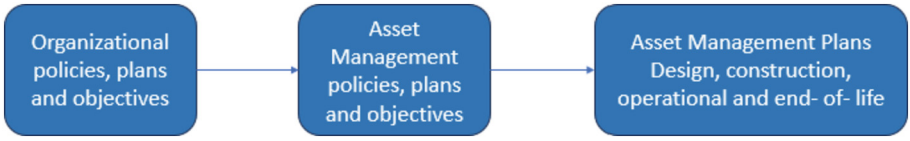

Fig. 5. General asset management process, Source: (ISO 55000)

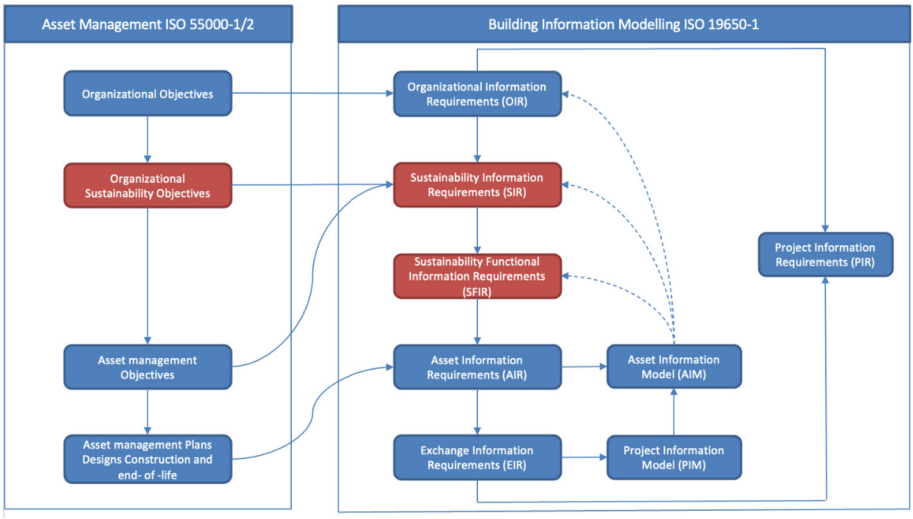

Fig. 6. Proposed framework for the information management relationships adopted from ISO 55000–1/2 and ISO 19650- 1, Source: (author)

Step 1- Identify, Extract, and Classify Sustainability Objectives.
Step 2- Develop Functional Information for Sustainability Assets.
Step 3- Create Organizational Information Requirements (OIR) and derive Sustainability Information Requirements (SIR) aligned with objectives.
Step 4- Establish Sustainability Functional Information Requirements (SFIR) to address OIR and SIR questions.
Step 5- Develop Asset Information Requirements (AIR) and a complete AIR flow chart.
Step 6- Validate Information Requirements through stakeholder surveys.
Step 7- Document the developed information requirements.

3.2 Proposed Research Approach- Next Steps for Data Collection

In this framework, organizational sustainability objectives should rely on primary data and adapt as needed, possibly through a questionnaire.

Questionnaire Design

Given the sustainability focus, the questionnaire should cover economic, social, and environmental aspects. Use the Likert scale for assigning values based on observable indicators. A standardized questionnaire serves as the foundation, with the first part collecting general respondent information (excluding personal data). The second part

lists organizational sustainability objectives from literature, policy documents, and interviews, asking respondents to rate importance on a five-point scale (1 to 5) based on their experience. Sustainability objectives are selected based on collected data.

Sample

Administer the questionnaire through web surveys, emails, and telephone interviews, targeting asset management stakeholders and researchers. Three methods identify the sample: 1) Literature Analysis: Initial stakeholder identification through relevant studies and reports. 2) Expert Judgment: Experts interview and screen the initial results. 3) Case-Specific Application: Apply the framework to specific building assets, involving academic discussions to determine the final sample.

4 Conclusion and Future Research

4.1 Conclusion

This research introduces an information requirement development process guided by traditional Requirements Engineering and the emerging BIM information system, focusing on organizational sustainability objectives. Early IMS often overlooked this aspect, leading to operational performance decline. The adoption of IMS in building asset management lags other areas, with limited research on sustainability objectives. However, industry standards offer inspiration.

This research extends the information management relationship between asset management and BIM (see Fig. 3). It aligns OIR with organizational objectives, introduces SIR and SFIR to integrate sustainability objectives into asset management, and proposes a seven-step approach for information requirement development.

The framework bridges the gap between design aspirations and sustainability indicators, aligns asset management with organizational objectives, and is standardized and repeatable. It not only integrates AM and sustainability objectives, aiding AIM development but also incorporates lifecycle concepts to support information requirement development throughout the lifecycle.

4.2 Future Research

Future research could focus on whether the framework can be linked to BIM models to provide an integrated asset management platform and on the feasibility of interoperability in terms of how information is stored throughout the process.

4.3 Limitation

Although the research provides an overall framework for the development of AIR. However, it still has limitations in its implementation. Organisational objectives are often dynamic, and the framework does not consider changes in policy and environment. So further consideration is still needed in the future.

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Establishing a Guideline and Decision-Making Approach for UAE Solar Assets Waste Management by Utilizing PVsyst

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Abstract. This research studies the PV solar panels waste with respect to their end-of-life EOL management for PV assets installed in a solar park in the UAE. The lack of thorough worldwide rules and frameworks that direct decision-making in connection to the disposal of photovoltaic (PV) panel waste, as well as the insufficient research on the management of such waste, are the driving forces behind this study. The study aims to address this gap by identifying the factors affecting the performance and efficiency of PV systems, specifically in UAE, a country known for its extremely hot and dry climate, and establish an evaluation approach and guidelines. PVsyst simulation software was utilized for the purpose of system performance analysis and to provide support in the decision-making process by adhering to specifically designed technical flowcharts. The fundamental performance-related parameters of the PV panels, coupled with meteorological information, were determined as important elements for assessing the general performance. The study also identified the main instruments used to make end-of-life (EOL) decisions. The results reveal that the photovoltaic (PV) system at the UAE solar park completed its end of life coupled with an 80% PR ratio sooner than anticipated, with 22 years as compared to the manufacturer's expected 25 years. This leads to the conclusion that installing photovoltaic (PV) panels in hot climates regions accelerates the degradation of the PV panels. The study provides a clear understanding of the circumstances that cause PV systems to fail earlier than expected and consequently introduce more waste to the environment.

1 Introduction

Electricity is an essential component of any country's infrastructure that contributes to its long-term development. Solar photovoltaic panels (PV) are frequently acknowledged as one of the world's top renewable energy sources (Papamichael et al. 2022). The United Arab Emirates and Dubai, in particular, are concentrating their investments in technology and initiatives related to renewable energy (RE), and by being chosen to house the International Renewable Energy Agency's headquarters (IRENA), the UAE has established itself as a global leader (Obaideen et al. 2021). In this context, Dubai set up policies and mechanisms to ensure the availability and reliability of power supply for current and future generations by implementing best practices to ensure effective operations while conserving the environment and ensuring resource sustainability.

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One of the crucial initiatives of HH Sheikh Mohammed bin Rashid Al Maktoum's ambition to create a green economy in the United Arab Emirates and achieve sustainable development goals (SDGs) is the creation of Mohammed bin Rashid Al Maktoum Solar Park. The MBR Solar Park, the world's largest renewable energy project on a single site with a projected production capacity of 5,000 MW upon completion in 2030, is committed to meeting the UAE Energy Strategy 2050, the Dubai Clean Energy Strategy 2050, and the Dubai Net Zero Emissions Strategy 2050 by producing 100% of its energy from clean sources by 2050 (Obaideen et al. 2021 and DEWA 2019).

It is essential to understand the significance of end-of-life management in the context of sustainable development, mainly when dealing with PV assets. To address the gap in existing research works in the field and build on the need for further empirical investigation, this study explores the most significant variables that affect PV asset performance in UAE and utilises a technical method and approach to provide a proper guide for End-of-life EOL decisions related to PV solar panels.

Although solar panels are designed to withstand environmental pressures and have a lifespan of around 20–30 years (Oteng et al. 2022; IRENA 2021, European-Ukrainian 2021, Parliament et al. 2020 and Sharma et al. 2019), there is a lack of end-of-life management area in existing studies. Most countries need more regulations regarding the proper disposal of solar panels, resulting in the likelihood of many panels being discarded in landfills, which can have harmful environmental effects.

This research paper aims to provide a clear and systematic approach to evaluating the efficiency and performance of PV panels by utilising PV simulation software analysis tools (PVsyst) to investigate system performance which will support the decision-making process regarding the PV asset waste at the mid-life or End-life cycle.

1.1 Problem Statement

The solar asset management sector is developing and maturing at a new level. Power utilities are looking to shift their assets from fossil fuels to cleaner and renewable energy assets to keep up with new chances and challenges. One of the concerns is how to manage solar PV waste after it has served its purpose. End-of-life PV panels are made of high-quality components and provide an excellent opportunity to develop a strategy or framework for managing a significant amount of its produced waste. There needs to be a globally documented framework, process, or mechanism for effectively handling such waste (Papamichael et al. 2022). EU is the only region that has proposed detailed legislation for the disposal and recycling of solar PV components.

1.2 Research Significance and Novelty

This research paper aims to outline the first guideline and decision-making process for the waste of solar assets at the level of Dubai, the UAE, the Arab Gulf, and the Middle East countries. Hence, its novelty by introducing a new approach and proposing a new pioneering solution in this field. The researcher's goal is to help, guide and encourage the stakeholders to set asset management plans in advance for the EOL End-of-life or Mid-of-life asset cycle of the solar panels considering a 25 to 30 years timeframe. For example, if a PV panel fails in the middle of its lifespan, it could be disposed of

or repaired earlier than predicted by the manufacturer. By identifying clear objectives and creating a comprehensive plan for solar assets, the project's sustainability can be improved, and solar stakeholders can also prevent or avoid unexpected situations.

1.3 Research Questions

The author aims to answer and achieve the following research questions and objectives.

1. What are the primary parameters of PV modules for evaluating performance?
2. What is the most effective approach to evaluating PV panel performance to inform end-of-life (EOL) decisions?

1.4 Research Objectives

1. Maximize the production efficiency and performance of PV systems by adopting asset performance analysis software & tools to support decision-making and evaluate the impact of waste generated by PV assets.
2. Provide guidelines & decision-making procedures during and after solar assets' lifecycle.
3. Identify effective criteria and parameters for the decision-making process.

2 Literature Review

The use of PV solar panels as a sustainable power source is increasing rapidly. Consequently, a significant amount of annual waste is expected to be produced by the early 2030s, assuming the panels have a lifespan of 20 to 30 years. Hence, it is important to put in place proper guidelines and policies to regulate and manage these systems at their End-of-life stage (IRENA 2021, Papamichael et al. 2022, and Sharma et al. 2019). Several studies (Obaideen et al. 2021, IRENA 2021, Curtis et al. 2021) emphasize the importance of conducting a comprehensive evaluation to understand what actually happens to a PV panel once it reaches its end-of-life. According to (Huxley et al. 2022), there are three main factors to be considered when predicting and evaluating the efficiency of PV panel energy generation, weather data, electrical measurements of energy output, and system technical specification. The Netherlands were pioneering in establishing a model that studies the significant factors affecting PV energy generation, such as dirt, shading, sunlight, system efficiency, panel surface reflectivity, and module temperature. Adopting these models and actual weather data, help in estimating the performance and efficiency of the PV systems.

Several methodologies and tools are commonly presented under the efficiency and performance evaluation of the solar asset that will support future decision-making at the EOL phase such as I-V curve testing, Performance Ratio PR calculation, and PV laboratory flash tests. The I-V curve test helps in understanding and assessing the efficiency and performance by providing valuable information on the panel's electrical data collected in the site under different operational environments. Moreover, temperature and radiation are two main variables being measured during the test as they can impact panel efficiency. On the other hand, PR calculation indicates the ratio of the actual energy

production of the system to its expected energy production under standardized test conditions. A high PR indicates an efficient system, while a low PR indicates functioning issues or inefficiencies. The PR allows efficient system operation and maintenance over time. Whereas the flash test is conducted in a laboratory under a controlled environment and testing conditions, and using specialized software, & equipment for accurate results. The test is recognized globally by PV manufacturers and used to validate performance, quality, and warranty claims. Furthermore, as per (Agyekum et al. 2022) one of the commonly used simulation software in designing power plants optimisation projects and evaluating and investigating the performance and energy production of the plant to assist the site engineers and manufacturer in improving the system design or efficiency is the PVsyst simulation tool. This tool needs specific meteorological data, such as the effect of solar irradiation, temperature, and local environmental conditions, and the electrical specifications of the PV system components for the simulation. The use of PV technology and extensive knowledge is essential for the accurate prediction of system output. Various recent research papers supported the use of this tool (Ahmad and Ahmad 2019; Agyekum et al. 2022; Belmahdi and Al Bouardi 2020; Al-Zoubi et al. 2021; Ahmed et al. 2021).

3 Research Methodology

I–V curve test, Flash Test, Performance Ratio PR calculation, and PVsyst simulation software are considered the most effective tools in recent studies to evaluate PV performance. PVsyst is a widely used tool known for its convenience and reliability in serving this purpose. Due to the limitations researcher faced to obtain actual I-V site data from organizations since these data are highly confidential, and the Flash Test was not feasible since it requires special laboratories and qualified experts to execute the test. Therefore, the researcher will rely on using the PVsyst simulation software which is a highly reliable and effective tool to indicate PV system performance.

PVsyst simulation software requires specific data (Site Location, Meteorological data, Module Technical Specifications), which are gathered from several sources and used as the input variables. The parameters are classified into two categories: electrical and meteorological. The inclusion of these parameters is crucial for the analysis, as they have a significant impact on the overall performance of each system:

1. **Site Location & Meteorological data**: The data include average Temperature, Humidity, Wind Speed, and Solar Radiation in specific locations. To compare the effect of UAE's extremely hot and dry weather on the efficiency and performance of the PV panel in Solar Park in UAE; it was significant to perform a comprehensive investigation of the actual energy performance and losses. Data were obtained from the NASA Meteorological database (Nasa.gov, 2023) for the duration from Jan 2000 – Dec 2021 (22 years).
2. **PV Module Technical Specifications** (Mechanical Characteristics and Electrical Specification) are gathered directly from the actual site of a solar park located in UAE and from the Technical Specifications datasheet provided by the PV module Manufacturer (Table 1).

Table 1. UAE Average Meteorological and Solar Data (January 2000 - December 2021)

	Temperature (°C)	Humidity (%)	Wind speed 2 m (m/s)	Irradiance (kW-hr/m^2/day)
JAN	20.2	60.94	3.06	3.98
FEB	21.18	59.56	3.21	4.77
MAR	23.73	57.23	3.38	5.64
APR	27.64	52.45	3.2	6.39
MAY	31.57	49.99	3.2	7.19
JUN	34.15	51.41	3.07	7.27
JUL	35.77	50.36	3.05	6.76
AUG	35.68	48.56	2.99	6.52
SEP	33.68	51.63	2.64	6.13
OCT	30.78	53.14	2.47	5.36
NOV	26.42	54.69	2.71	4.33
DEC	22.44	59.17	2.77	3.77
ANN	28.64	54.06	2.98	5.68

4 Results and Discussion

The software provided several charts and tables to reflect the main performance indicators and metrics.

4.1 Grid-Connected PV System Production and Performance Analysis (Dubai-UAE)

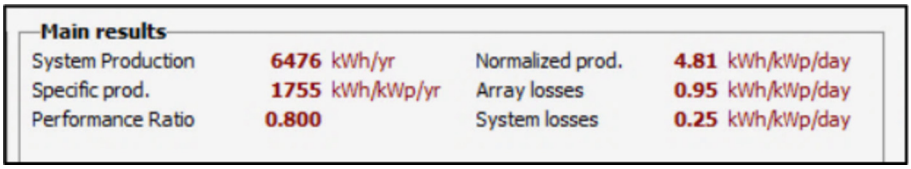

Fig. 1. System Production in Grid-Connected System (Dubai-UAE)

Figure 1 shows system production in the grid-connected system per year equal to **6476 kWh/yr** with Performance Ration (PR) = **80%** and System loses = **0.25 kWh/kWp/day**. This will be discussed further in the upcoming losses diagram.

In the PV industry, PR is a significant measure that is frequently used for warranty claims of PV systems and the validation of the guaranteed power performance provided by the manufacturer/contractor. It is specified in the norm IEC EN 61724 (Pvsyst,

2022). As defined by PVsyst software, performance ratio PR is the overall efficiency of the system when it is measured compared to the nominal commissioned power (at STC as given by the manufacturer of the PV module) and the incident energy. STC (Pvsyst, 2022) is a standardised set of conditions used in the solar industry to assess and evaluate the performance of solar photovoltaic systems. Typically, it identifies three specific groups of parameters that serve as a reference point for testing and rating PV modules as follows:

1. Irradiance: The irradiance level is set to 1,000 watts per square meter (W/m^2) that the panels are exposed to consistently.
2. Temperature: The module temperature is set to be tested at 25 °C.
3. Air Mass: The air mass factor is set to AM 1.5. When the sun is at a specific angle of 48.2 degrees from the zenith, the sunlight passing through the Earth's atmosphere is modified to match the spectral content and path length.

PV panel manufacturers and testing laboratories can confirm reliable and consistent measurements of module performance using STC, which allows for fair evaluations between different solar modules or systems, providing a common reference point for assessing and evaluating their electrical production.

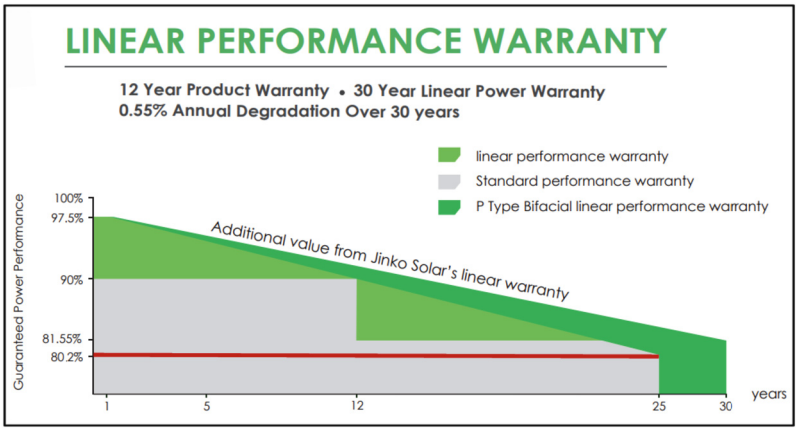

Fig. 2. Guaranteed Power Performance by manufacturer *(Source:* www.jinkosolar.com*)*

Table 2 illustrates how well the specified solar panel system performed in generating energy over the year (E_Gird) and reflects the performance ratio (PR), which is how efficiently the system converted the solar irradiation into energy in the grid. These PR values range from **77.5%** to **83.9%.** This indicates that the system reached the cut-off in 22 years which is earlier than anticipated. The manufacturers guarantee a power performance of up to **80.2%** until reaching **25** years (Fig. 2). Hence, the researcher can conclude that the panels reached the time for decommissioning and shall be removed from the power system. Furthermore, it is noticeable that the performance ratio was higher in winter rather than the summer, with less shade and more sunlight; this may be credited to the high temperatures observed and experienced during those months,

which have an opposing impact on the efficiency of the solar cells. A drop below **78%** in June, July, & August, indicating that there might be issues with system components overheating or it could be due to extreme weather conditions such as a rise in temperature or sand storms and dust (Ahmad and Ahmad 2019, Agyekum et al. 2022, Conde at el. 2023). According to (Satya et al. 2021), there is a direct relationship between temperature and solar PV module cell efficiency, where the PV cell's performance tends to decrease when temperature rise (Conde et al.2023). This happens because of disrupted internal transmission of PV cells leading to problems with the energy movement within the panel which make it work and function less efficiently. Hence, the temperature is a crucial factor in the power-generating process affecting the overall performance. Figure 3 is an illustration of the PR of the given PV system, which is equal to = 80% in a Uniform shape.

Table 2. Energy and Performance Ratio (UAE-Dubai)

Energy use and User's needs		
	E_Grid kWh	PR ratio
January	509.4	0.838
February	494.8	0.833
March	538.2	0.820
April	566.9	0.797
May	576.3	0.779
June	546.6	0.777
July	537.5	0.775
August	537.1	0.775
September	556.6	0.780
October	570.8	0.792
November	542.6	0.818
December	499.0	0.839
Year	6475.7	0.800

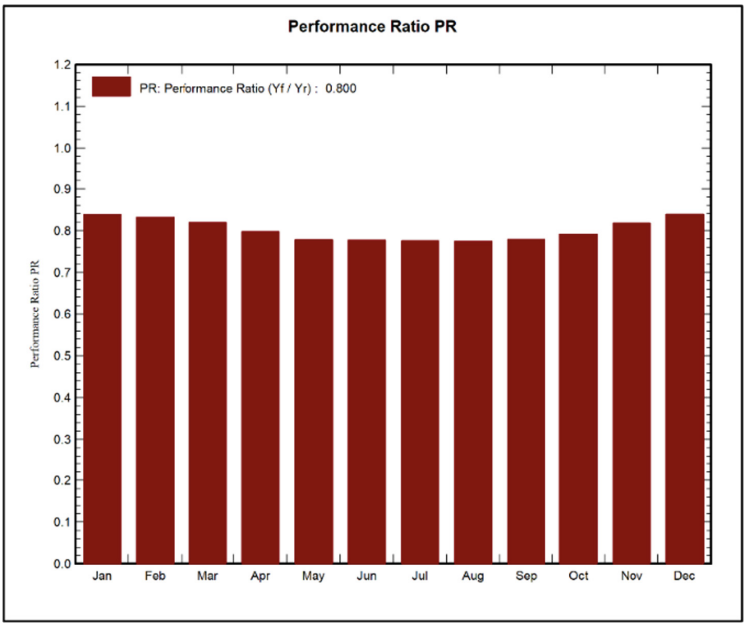

Fig. 3. Months Vs Performance Ratio PR (Dubai-UAE)

As shown, Table 3 represents the normalised performance coefficients which are equal to the daily energy of the system (Yf) over the daily output produced energy of the array plane (Yr) = **4.81/6.01 = 80%.**

Table 3. Normalized Performance Coefficients (Dubai-UAE)

Normalized Performance Coefficients

	Yr kWh/m²/day	Lc kWh/kWp/day	Ya kWh/kWp/day	Ls kWh/kWp/day	Yf kWh/kWp/day	Lcr ratio	Lsr ratio	PR ratio
January	5.31	0.63	4.68	0.23	4.45	0.118	0.043	0.838
February	5.75	0.72	5.03	0.24	4.79	0.125	0.042	0.833
March	5.74	0.80	4.94	0.24	4.71	0.139	0.041	0.820
April	6.42	1.04	5.39	0.26	5.12	0.161	0.041	0.797
May	6.47	1.17	5.30	0.26	5.04	0.181	0.040	0.779
June	6.35	1.16	5.19	0.25	4.94	0.183	0.040	0.777
July	6.06	1.12	4.94	0.24	4.70	0.184	0.040	0.775
August	6.06	1.12	4.94	0.24	4.70	0.185	0.040	0.775
September	6.45	1.16	5.29	0.26	5.03	0.180	0.041	0.780
October	6.30	1.05	5.25	0.26	4.99	0.167	0.041	0.792
November	5.99	0.85	5.15	0.24	4.90	0.142	0.041	0.818
December	5.20	0.62	4.58	0.22	4.36	0.119	0.042	0.839
Year	6.01	0.95	5.05	0.25	4.81	0.159	0.041	0.800

4.2 Performance Analysis and Energy Losses in (Dubai-UAE) PV System Simulation

The loss diagram shown in Fig. 4 is a key output of all simulations performed by PVsyst software. The figure provides a thorough overview of the energy flow during which the energy is produced and lost at different stages until it is connected to the grid (Ahmad and Ahmad 2019 and Agyekum et al. 2022). The energy flow starts at the stage of global horizontal irradiation; in this stage, it is equal to = 2042 kWh/m^2 for the region of Dubai (UAE). At the beginning of the energy flow, there is an increase in the energy equal to (+7.4%), which can be caused by the PV array being titled southward and thus collecting a more significant amount of energy than being horizontal. An important point to make regarding panel orientation is that according to (Tsoukp et al. 2022), the best and most efficient angle to position a solar panel is to rotate it in accordance with the latitude angle of the specific site location to collect the most sunlight and produce the most energy throughout the entire year. For locations with north latitude, the solar panel plate shall be facing south, while for locations with south latitude, it shall be facing south, toward and away from the equator, respectively.

After this rise, the (−1.8%) arrow shows a loss concerning the energy that remained present and active at the previous stage (Agyekum et al. 2022). Following that, the effective irradiation on the collector is determined and calculated by multiplying the final irradiation on the collector by the total collector area = 2145 kWh/m^2* 18 m^2 coll. This tells the total luminous energy available on the collector. Multiplying this value by the nominal efficiency of the PV module at STC = 20.06% to attain the nominal PV electrical energy = 7759.37 kWh, rounding it up to the nearest whole number will give 7960 kWh. This value will be developed every time the PV modules function at their nominal efficiency.

The following losses (−0.4% & −12.0%) are due to the fact that PV modules don't operate under STC at their maximum efficiency. In sunny weather conditions, the PV loss due to irradiance level may be lower, whereas, in very hot environments with poor airflow (like Dubai-UAE), the PV loss due to high temperature might be increased. Subsequently, there are losses on the inverter level (a device that converts DC to AC to be injected in the grid), as shown in the diagram; the inverter has operational losses, which are indicated as efficiency loss = − 49%. Other losses are null. Since there are no further losses considered, the output of the inverter is equal to the generated power, which is shown at the bottom of the diagram. The output energy is equivalent to = 6476 kWh, which is the electrical energy injected into the grid.

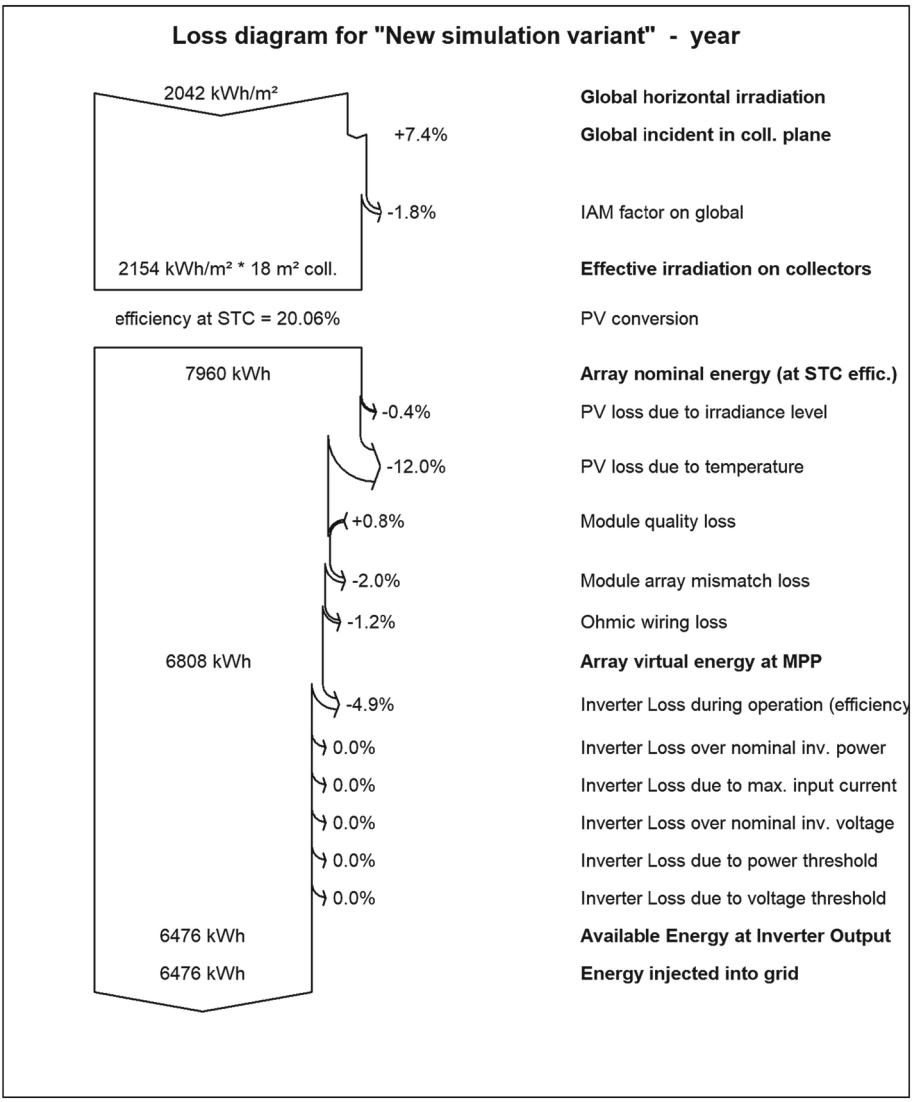

Fig. 4. Loss diagram (Dubai-UAE)

4.3 Energy Production and System Output Assessment (Dubai-UAE)

The above two figures are significant in assessing the performance of the PV module. Figure 5 indicates the normalised energy production and losses generated annually in the PV system and helps evaluate the system's efficiency. Normalised power, collection loss (PV-array losses), and System loss values = are equal to 4.81, 0.95, and 0.25 kWh/kWp/day, respectively. Figure 6 expresses the amount of sunlight reaching the collector, which is relatively stable over the year. Analysing and assessing the reference incident energy in the collector plane support the site engineers and operators in

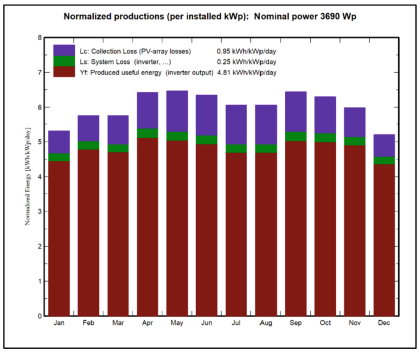

Fig. 5. Months Vs Normalized Energy (Dubai-UAE)

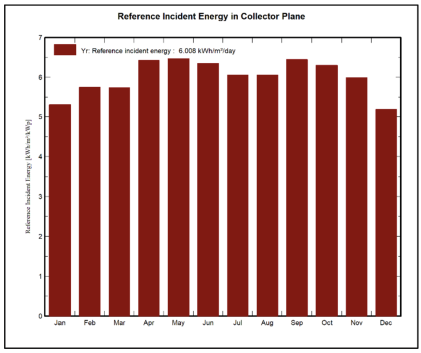

Fig. 6. Months Vs Reference Incident Energy (Dubai-UAE)

optimising the PV system position and configuration and then maximising the system performance (Agyekum et al. 2022 Tsoukpoe, 2022).

The above two figures discuss the energy generation and injection into the grid by the PV system. The daily system produced energy injected into the grid from the PV system is displayed in Fig. 7. It is noticed that values are less fluctuating between April-August and virtually inconsistent in winter (December- March), which proves that during summer, the grid is getting the greatest energy injection due to the extended time & greater intensity of solar radiation during summertime (Agyekum et al. 2022). However, there is a significant drop in March that requires further investigation. It might be due to inaccurate weather data values that affected the simulation or due to the overload on the inverter during this time (Agyekum et al. 2022). Figure 8 draw the distribution of the produced power injected into the grid concerning the energy injected into the grid over the year. It is negatively skewed to the left, which means most of the power output takes values between 1500–2500 (W). Figures highlight the seasonal variations and issues the grid exposed, and analysing them asses in improving system performance.

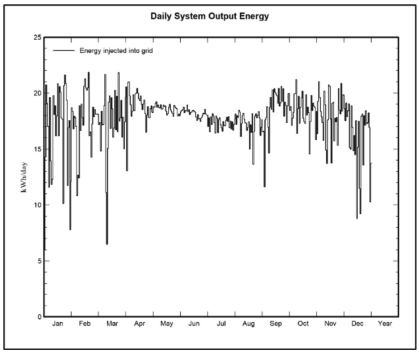

Fig. 7. Months Vs Energy injected into grid (Dubai-UAE)

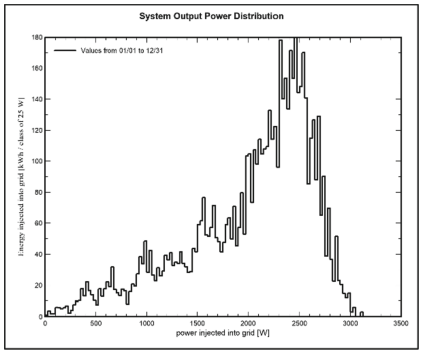

Fig. 8. Power injected into grid Vs Energy injected into grid (Dubai-UAE)

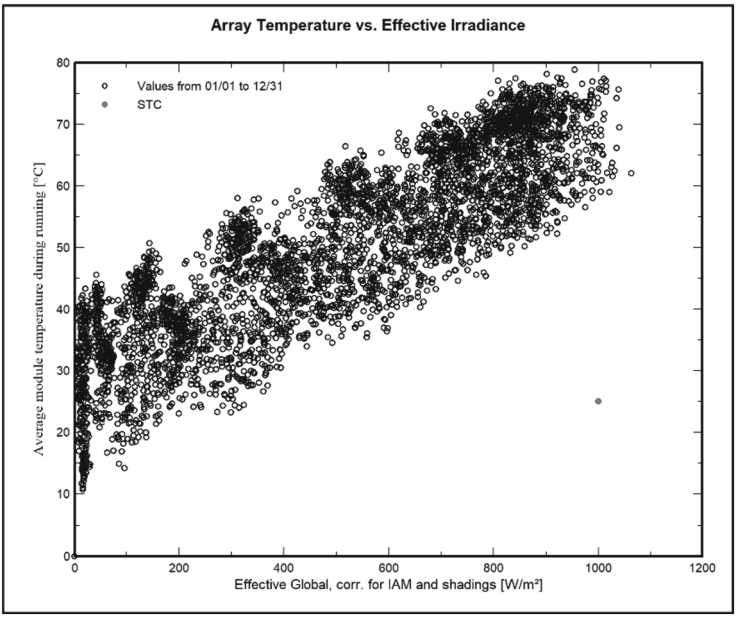

Fig. 9. Effective Global corr. For IAM and shadings vs Average module temperature during running (Dubai-UAE)

Figure 9 shows how the array's temperature is changing with varying effective irradiance. The temperature of the collection fluctuated from as low as 11 °C throughout the winter to as high as near 79 °C in the summer, which is too far from STC values (25 °C at 1000 W/m^2).

4.4 Technical Evaluation Flowcharts:

Based on the PVsyst results, the researcher propose utilizing Technical Evaluation Flowcharts as valuable tools for confirming that all important factors related to the panel performance is considered and evaluated in the decision-making process. Figures 10 and 11 illustrate a suggested decision-making process for PV panel waste, based on the obtained simulation results of panel efficiency and performance. If panel still functioning efficiently as guaranteed by the manufacturer, asset owner to decide if it shall stay in service, reused, resold, or repaired. Otherwise, if it reached the cut-off limit they may be decommissioned and recycled as per city regulations. This ensures that the best decision is selected based on complete evaluation of all key factors (Figs. 10 and 11).

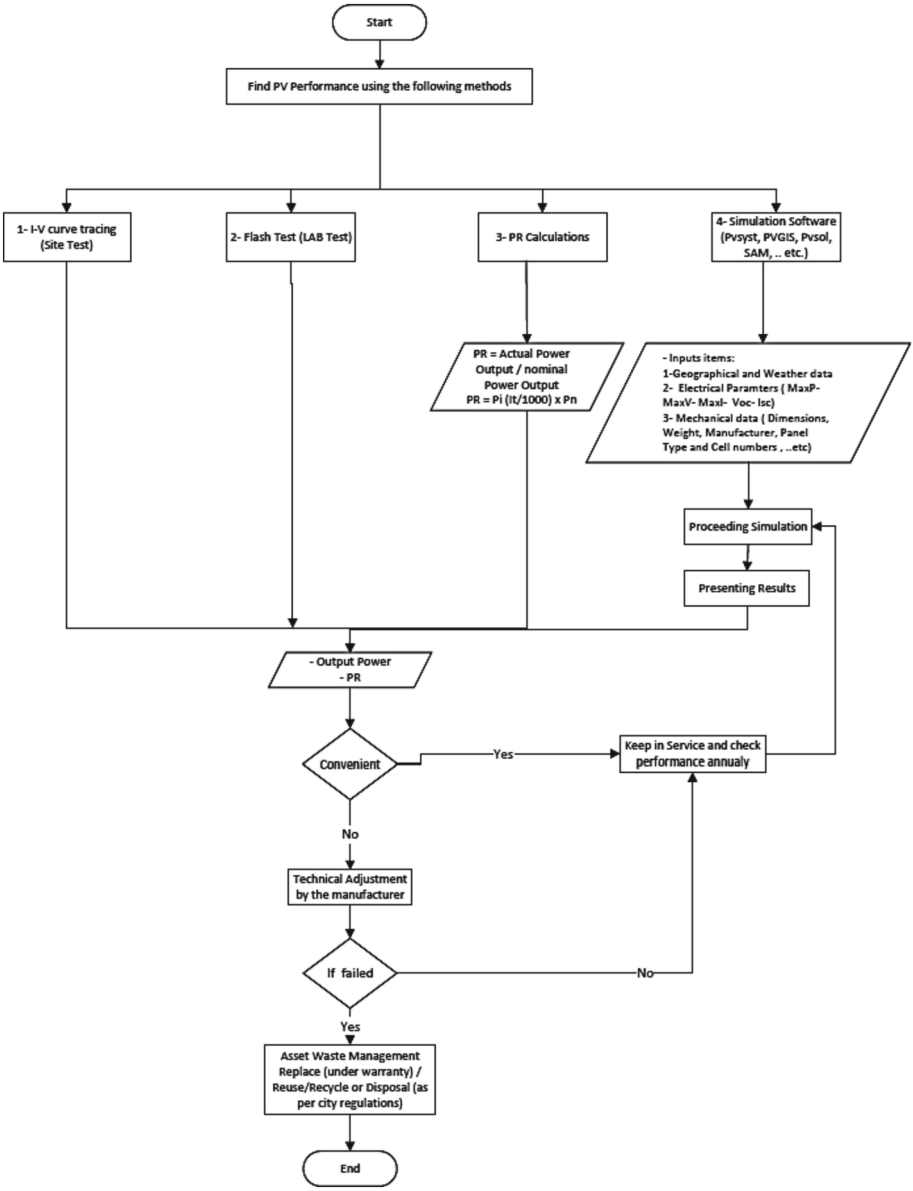

Fig. 10. Proposed process flowchart for PV performance Evaluation at EOL

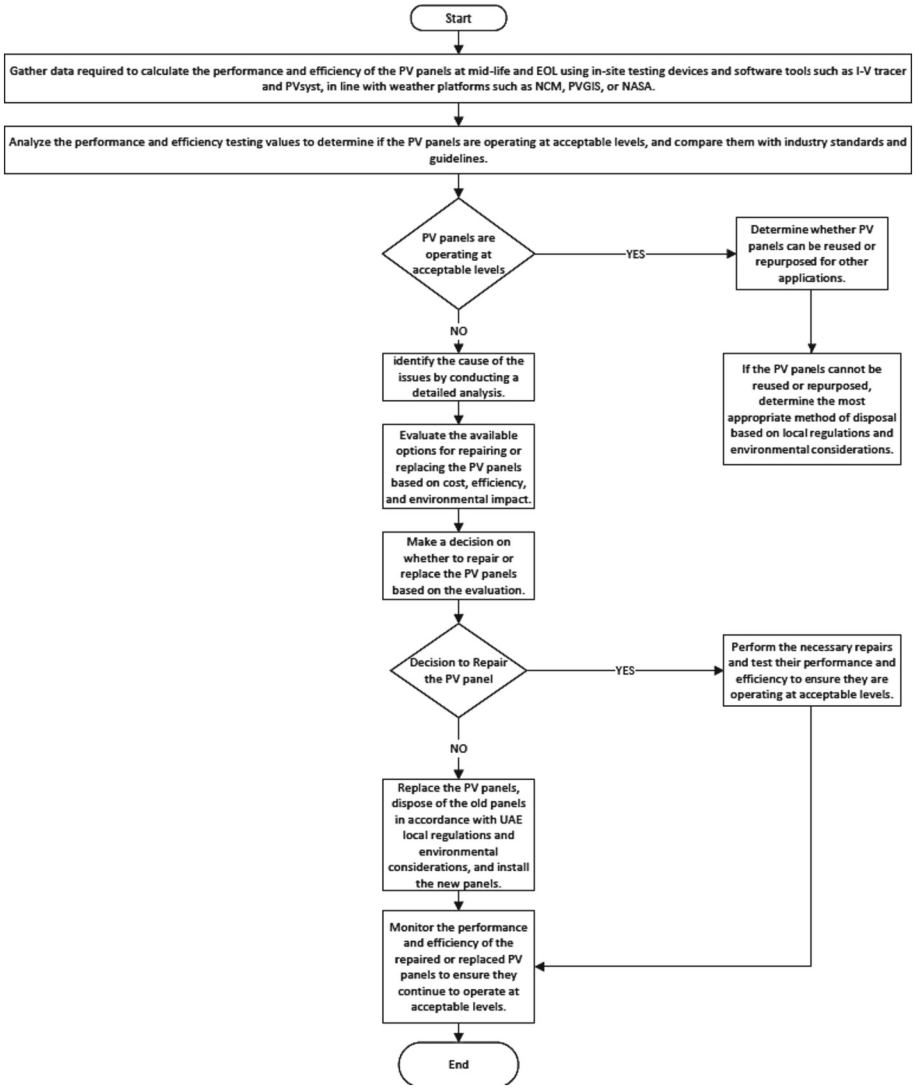

Fig. 11. Proposed process flowchart for PV Decision-Making at EOL

5 Conclusion

This study examined the energy production efficiency, system performance, and losses of PV systems in a Solar Park in UAE. The researcher presented through the discussion the most common and effective methodologies used for evaluating PV panel performance to support decisions related to panels reaching the end-of-life (EOL). However, due to limitations, PVsyst software & technical flowcharts were utilised. The findings and analysis allowed for broader assumptions about the system conditions and variations

observed and indicated by the researcher. The research objectives were achieved successfully as the critical parameters of the PV module were identified and utilised using the simulation software and were supported by the flowcharts Fig. 34 & Figure-35 for evaluating the performance and reinforcing the final decision.

In summary, the operating temperature plays a vital role in the energy production process using photovoltaic solar panels. High temperatures do affect the efficiency and physical conditions of PV panels. High-temperature weather leads to an increase in the cell's heat that ruin or burns the cell's components, reducing its expected lifetime and lowering its performance while operating. This assumption is proved by the result of the UAE solar park simulation that indicated the system reached the cut-off in 22 years with a performance of 80.0%, which is earlier than anticipated. The manufacturers guarantee a power performance of up to 80.2% until reaching 25 years. Accordingly, it is preferred that Solar panels that are less sensitive to temperature are installed in areas with hot climates, as considered in UAE. These factors are to be considered when deciding where to install the solar panels due to their impact on the efficiency and healthiness of the panels.

To summarise the findings:

- Efficiency of solar panels operating in hot environments is lower due to the heat effect on destroying or burning the internal PV cells components, making it function less efficiently.

After evaluating the PV system's efficiency in generating energy and power performance, and using the manufacturer's performance warranty as the benchmark, 80.2% PR after 25 years, for condition monitoring and evaluation, it is suggested to use the provided technical flowcharts (Fig. 34 & 35) to make an adequately evaluated decision for UAE solar park PV system, which might recommend decommissioning the panels since their validity or usefulness reached its end earlier than anticipated. These two tools are significant to support the site engineers, system operators, and manufacturers in optimising the PV system's healthiness and configuration to maximise the system performance and extend the lifespan, to delay reaching the End-of-life stage.

The following recommendations are proposed to be incorporated into future studies:

- Manufacturers, clean energy companies, and PV asset owners are encouraged to participate in real data collection through I-V site testing, which will provide an accurate indication of PV system performance and behaviour under real-world conditions. Furthermore, performing laboratory tests can strongly validate and reinforce the results. Overall, it will be a win-win situation for the participating companies to develop and enhance their assets.
- Economic assessment of PV panels waste management:

  To assess the health of PV assets and determine the optimal point at which maintenance is no longer cost-effective, future researchers to consider specific criteria like tracking the decrease in performance ratio (PR) and decrease in energy yield in accordance with the cost assessment of operation and maintenance (O&M). Hence, making better decisions about when it is economically reasonable to decommission the assets by evaluating these criteria over time.

- Future research can include the assessment of carbon footprint and CO2 emissions reduction of the in-service PV panels.

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The Role of UK Universities' Reputation on Economic Recovery in the Crisis Time

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Abstract. This article discusses the role of university reputation in economic recovery, particularly in crisis situations. It highlights the importance of maintaining a good reputation for universities. Especially after Brexit, and during the covid pandemic, the burden of compensating the detrimental effects of existing from European Union has been on HE industries' shoulder. However, the role of HE industry in helping UK to bolster up the economy has been ignored. However, 'Regional Disparity' could limit the impact of high-reputed universities.

Keywords: UK Higher Education · higher education reputation · university reputation · economic recovery · crisis response

1 Introduction

During 2020, the total gross domestic product (GDP) for the entire globe decreased by 3.4% (Statista, 2023). According to a report by the UK parliament, the COVID-19 pandemic has caused a severe economic downturn in the country, with GDP dropping by 11% in 2020 during the first national lockdown, the largest decline since records began in 1709 (Philip Brien et al. 2022). This unprecedented situation has presented challenges for many businesses (Kapucu and Hu, 2022; Rodrigues et al. 2021; Siddique et al. 2021; Yang, 2020).

Biggest Exporting Industries in the UK in 2023, are respectively, Precious Metals Production in the UK ($61.9B), Aircraft, Engine & Parts Manufacturing in the UK ($23.4B), Motor Vehicle Manufacturing in the UK ($18.8B), Pharmaceutical Preparations Manufacturing in the UK ($16.5B), while according to UK government website, in 2010, the revenue from education-related exports and transnational education (TNE) activity was 9.53 billion pounds, followed by an increasing trend reached to 25.6 billion pounds in 2020 (The most recent statistics published by UK government, which cover the time period until 2020). So, UK politicians are totally aware of the significant role of HE industry in economic like providing cheap labour, high quality experts, solving issues regarding Brexit, etc. make them to support internalisation.

In HE industry, universities need to fulfill the roles of teaching and research, knowledge transfer, employability, and community outreach but also, social and economic mission (Schlesinger et al. 2015). Moreover, satisfying stakeholders' expectations (Agrey

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and Lampadan, 2014; Angulo-Ruiz et al. 2016; Broekemier and Seshadri, 2000; El Nemar et al. 2020; Germeijs, 2012) is another requirement for universities. Furthermore, these expectations have been risen by globalization, advent of technologies (Nielsen and Thomsen, 2018), degree of internationalization, and changes in the market (Del-Castillo-Feito et al. 2019).

However, the HE industry in the UK has performed differently, making a significant economic contribution. In 2018–19, the HE industry in England contributed £95 billion to the economy and grew by around a quarter between 2014–15 and 2018–19, supporting over 815,000 jobs across the country (Economics, 2021). According to data from the National Centre for Entrepreneurship in Education, partnerships with universities in the UK can play a significant role in accelerating the country's post- pandemic recovery (West, 2021) by creating jobs and boosting economic prosperity. For instance, the University of Oxford (The University of Oxford, 2021), University of Cambridge, and University of Manchester contribute significantly to the UK economy and support thousands of jobs (28,790, 24,700 and 13,970 jobs subsequently) (University and College Union, 2020).

Based on a report by the UK parliament (UK Parliament, Hansard, 2022), universities in the country are significant contributors to the economy, as they attract a large number of international students and contribute £25.9 billion to education export earnings. In addition, the Department for Education and Department for International Trade have launched a new International Education strategy to increase education exports to £35 billion per year and raise the total number of international students to 600,000 by 2030 (Government, 2019; Hubble and Bolton, 2021; O'Malley, 2019). However, UK higher education institutions (HEIs) are facing crises like the COVID-19 pandemic, which are leading to disengagement (Burkinshaw et al. 2018; Burns et al. 2020; Hazelkorn, 2020) and de-globalization (Allen et al. 2020; Mok et al. 2021; Pan, 2021) through restricting international mobility (Bilecen, 2020; Guruz, 2011; Marginson, 2017; Zotti, 2021) leading in several challenges like funding problems (Corbett and Gordon, 2018; Marginson, 2017; McKinny, 2020), fall in student numbers from the EU (Mathies and Weimer, 2018; Mayhew, 2022; Thompson and Johnson, 2023; Tsiligiris and de Ruyter, 2018), the shaky future of the Erasmus scheme (Brøgger and Moscovitz, 2022; Brooks and Waters, 2023; Kleibert, 2023), etc.

According to oxford dictionary, reputation is the *opinion* that people have about what somebody/something is like, based on what has happened in the past. Reputation is derived from one's *expectations* and *beliefs* about how they have been treated by other entities in the past (Mui et al. 2002). It seems that definition of reputation by (Fombrun, 1996) as a perceptive representation of an organization's past behaviours as well as an estimate of its future behaviours, or as the universal appeal that an organisation has for its key constituents in comparison to others, is most frequently used today.

The gap of neglecting the role of university reputation in the context of economic recovery in a crisis situation is significant since, as numerous scholars studied the impact of crisis and economic or financial matters on performance or efficiency of universities. Therefore, the results of previous research like studying the effects of economic crisis on universities (Harvey Chaputula, 2011; Lee, 1999; Okpala et al. 2011), the economic crisis effect (the financial crisis in 2008) on Italian and German university efficiency

(Lehmann et al. 2018), the economic crisis effect (the 2008 economic crisis) on the (in)efficiency of Spanish public Higher Education institutions (Martínez-Campillo and Fernández-Santos, 2020), US seven economic crises effect (1953, 1957, 1990, 1973, 1980, 2001, 2008) on university research and development investments (Daim and Ozdemir, 2015), east Asian economic crisis (1997) on Indonesian HE (Purwadi, 2001) showed the significant negative role of crisis on the efficiency of universities.

However, the statistics mentioned earlier revealed despite these obstacles, not only UK universities have passed challenges (Hilman, 2021) but also, the UK has achieved its international student target a decade early, allowing the government to establish a more discerning and smart approach (Holmes and Partners LTD Immigration consultants, 2022). The focus now is on how HE industry could boost economy and help to recover it while facing several crises. Whether British universities' reputation plays a role in economic recovery which in the following, by using traditional literature review will be discussed. Therefore, the research question is:

What is the role of UK universities' reputation in the economic recovery during times of crisis?

2 Method

The study used a traditional literature review design to identify, screen, and eligibility keywords related to British universities and their reputation. It found no relevant resources for the keyword 'university reputation'. Secondary data analysis revealed a gap in understanding the relationship between university reputation and economic recovery.

3 Theoretical Underpinning

3.1 UK's Higher Education Reputation and Crisis Response

The UK's higher education sector is globally renowned for its top-tier research and top-ranking in field-weighted citation impact. With numerous universities in the top 10, the UK attracts international students and staff, producing globally recognized, world-leading research and highly cited articles. Despite contributing to over 80% of revenue, reputation is often overlooked (Moberly, 2014). Organizations face reputational threats in crises, with the public often holding institutions responsible for certain issues (Kumar et al. 2020). In the HE industry, the pandemic has affected on HE systems as well (Huang et al. 2022), which has led the World Bank, UNESCO, and UNICEF to dub it the worst education crisis on record. Activities connected to the basic missions of HE have also been disturbed and rearranged by the pandemic.

3.2 Economic Recovery

Disaster resilience and recovery are complex concepts involving various disciplines. Recovery indicators include social, economic, environmental, and infrastructure. Economic recovery refers to the process of resuming stable conditions after a crisis (Jordan and Javernick-Will, 2012). Economic recovery pertains to the process by which

businesses and local economies resume stable conditions following a crisis. Economic recovery and economic impact are distinct terms as they refer to different aspects of disasters. Economic impact focuses on the consequences of a disaster, usually measured in monetary terms, while economic recovery encompasses the process of overcoming those consequences, often measured in time (Chang and Rose, 2012). To test whether something affects on the economic recovery, first we should know the signs or indicators of recovery. Jordan and Javernick-Will, (2012) in their article titled measuring community resilience and recovery through a content analysis of indicators, classified the indicators of community resilience into infrastructure, social, economic, and institutional categories. They mentioned that across all article types, there is an interest in economic recovery with various indicators to measure economic recovery. These indicators include Employment rates, income levels, Gross national income (GNP), Government Revenue, number of businesses, Housing Values, funds distributed through loans, enterprises aided or founded and training programs (Jordan and Javernick-Will, 2012).

4 Results

Comparing to other organisations, HE relies heavily on reputation which could strengthen its strategic plans for educational, economic, and other development. Also, maintaining the UK's reputation for excellence in education could help UK to defeat crises, promote economic growth, cultural exchange, and innovation, cementing UK status as a global leader in this sector (Molavi, 2023). Regarding the role of universities in the economy, natural resources and labor-intensive industries which were once the main sources of wealth creation and economic growth have been repleced by universities as knowledge factories (Drucker, 1993; Florida, 1995; Leonard, 1995; Nonaka and Takeuchi, 1995; Romer, 1993). Thus, universities, by generating knowledge and ideas, have become a crucial factor in gaining economic advantages (Edvinsson and Malone, 1997; Stewart, 2010).

The UK government is utilizing the reputation of its universities to promote economic growth in a planned manner. As a result, universities and colleges are vital to the UK's economy. Therefore, university reputation has an impact on the economic recovery in either the normal or crisis situation. Finally, this article suggests that there is the relationship between university pre-reputation and economic recovery while being mediated by marketisation, education export and better performance in crisis (see Fig. 1).

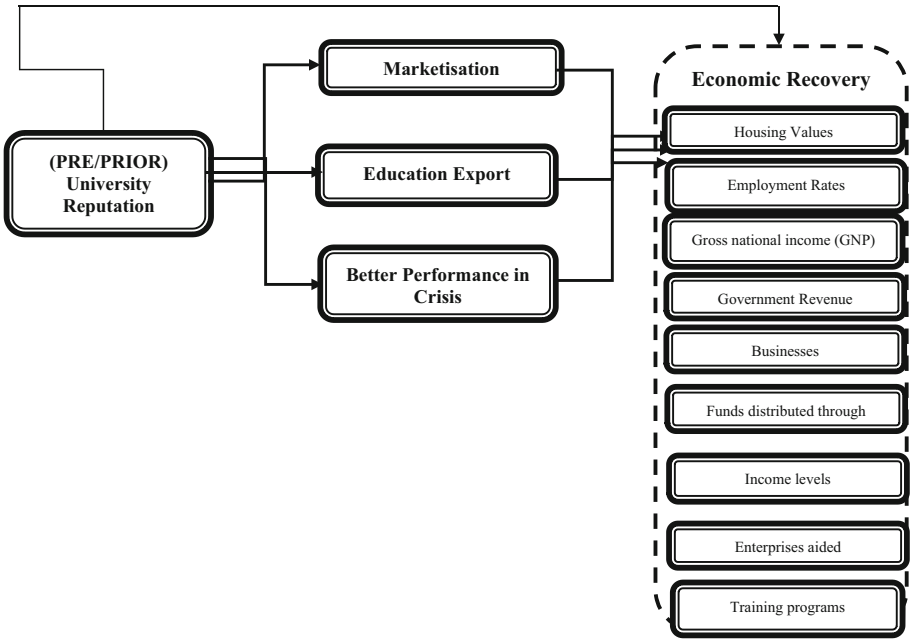

Fig. 1. Research outcome (author)

5 Conclusions

Successful crisis response for countries dealing with crises like the pandemic involves investing in building reputation recognition before the crisis hits. Being proactive and anticipating potential crises and their impact on the organization, particularly on its reputation, is crucial for surviving such situations. This research suggests that the reputation of UK higher education institutions has helped in managing crises. The UK's higher education reputation has been instrumental in retaining its competitiveness and attracting international students. Additionally, the reputation of the UK higher education system has played a role in mitigating the economic impact of crises, especially the pandemic.

While university reputation can play a role in economic recovery (Molavi, 2023), 'Regional Disparity' could be a potential limitation associated with high-reputed universities' impact. The disparity refers to resource inequalities between the various regions, with some being characterised by sparsity or prosperity (Rice and Venables, 2003; Öberg and Aronsson, 2022). Universities with strong reputations are often concentrated in specific regions or countries. This concentration can exacerbate regional disparities in economic recovery, as areas without renowned universities may struggle to attract investment or develop skilled workforces. Consequently, the university reputation may not uniformly benefit all regions, potentially leaving some areas lagging behind in the recovery process. Also, local businesses may be received insufficient support. Universities with strong reputations often have close ties to industries and businesses, attracting research partnerships, talent recruitment, and entrepreneurial activities. However, this focus on established industries and companies can overshadow support for local startups,

small businesses, and emerging sectors. Neglecting the development and nurturing of local businesses can hinder economic diversification and limit job creation opportunities in innovative and entrepreneurial endeavours.

To address such regional disparities, policymakers may need to consider strategies like investing in satellite campuses, establishing research partnerships with neighbouring universities, or promoting online education and remote learning opportunities. These measures can help bridge the gap and provide access to educational resources and expertise, enabling the region to better participate in economic recovery efforts.

Recommendations have been made for the UK government and higher education institutions to prioritize investment in reputation management for the sustainable growth of the country's higher education sector. The reputation of UK higher education has become essential in the current global crisis as it can attract foreign students, investors, and partners while increasing visibility for the institutions and the country as a whole. Making brand recognition is a crucial factor for universities to attract mega projects to boost economic growth or recovery.

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A Systematic Review of Conversational AI Chatbots in Academic Advising

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Abstract. Purpose – This paper aims to review several studies published between 2018 to 2022 about advising chatbots in schools and universities as well as evaluating the state-of-the-art machine learning models that are deployed into these models.
Methodology – This paper follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), it demonstrated the main phases of the systematic review, it starts with screening 128 articles and then including 11 articles for systematic review which focused on the current services of the advising chatbots in schools and universities, as well the artificial models that are embedded into the chatbots.
Findings – Two main dimensions with other sub-dimensions are extracted from the 11 included studies as it shows the following: 1- Advising chatbots AI Architecture which includes other sub-dimensions on identifying the deep learning based chatbots, hybrid chatbots and other open-resources for customizing chatbots; 2- The goals of the advising chatbot as it includes both the admission advising and academic advising.
Conclusion – Most of studies shows that advising chatbots are developed for admission and academic advising. Few researchers who study the chatbots in high schools, there is a lack of studies in developing chatbots for students advising in high schools.
Limitations and future work – This study is constrained to review the studies from 2018–2022, and it is not exposed to the chatbots artifacts, even though, the human-chatbot interaction has an essential impact on students' experiences. Future research should include the impact of chatbots interactive design and students' experiences.

Keywords: Artificial Intelligence · Chatbot · Conversational AI · Machine Learning · Student · Systematic Literature Review

1 Introduction

Artificial Intelligence plays an essential role in developing a chatbot that can learn how to understand human and making a decision. The most important components of the artificial intelligence that can make a successful chatbot are the natural language processing

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(NLP) and machine Learning (ML) (Khan & Rabbani, 2021; Bird et al., 2021). In general, the chatbot works by taking the natural language instructions as input and the output is expected to be very relevant to the user's input (Caldarini et al., 2022). Interestingly this is explained the reason behind that machine learning is becoming increasingly ubiquitous across different industries including education, finance, healthcare, etc. Hence, the researchers and developers around the world are inspired to develop the state of-the-art chatbots by embedding different machine learning algorithms such as naïve Bayes algorithm and support vector machine (SVM) (Bird et al., 2021; Tamizharasi et al., 2020; Kushwaha & Kar, 2020; Assayed et al. 2022) and other deep learning algorithms mainly the convolutional neural network (CNN), long short term memory network (LSTM) and recurrent neural network (RNN) (Dhyani et al., 2021; Sperlí, 2021; Prasetyo & Santoso, 2021; Kliestik et al., 2022; Assayed et al., 2023). Accordingly, several authors conducted different reviews about state-of the-art chatbots in education and learning. Ji et al. (2023) conducted a review about learning classes and subjects in schools without comparing the state-of-the-art chatbots technology and applications. On the other hand, Nee et al. (2023) conducted another systematic review to define the potential contribution between educational tools in elementary, middle, high school and universities, with no details about the models or algorithms that are deployed in these chatbots. Furthermore, Assiri et al. (2020) proposed a review of academic advising computer systems in undergraduate education without focusing on chatbots. Despite the importance of readers and developers to evaluate the architecture as well as the performance of advising chatbots but few authors who defined the novelty in chatbots applications. For instance, developers need to know the number layers that used in deep learning model, the type of machine learning that deployed into the system, and etc. Therefore, this study aims to close this gap by conducting a systematic literature review (SLR) to propose the students advising chatbots for particularly students in high schools or prospective students in higher education. Accordingly, this paper reviewed several studies by considering chatbots for students advising and evaluating the AI and machine learning models that are deployed into these agents. Three research questions will be formulated in this paper:

RQ1: What are the current AI models and algorithms that deployed into the Advising chatbots?
RQ2: What are the current Advising chatbots services at universities?
RQ3: How do AI conversational advisers support high school students?

The SLR in this paper will provide numerous state-of-the-art academic advising chatbots' architectures as well as exposing the developers and researchers to the main goals and services that can be used to enhance the students' services into different educational institutions. This study organized as follows: Sect. 2 explains the methodology and the approach that adopted in this paper, while Sect. 3 presents the discussions and results, finally the conclusion and limitation are both presented in Sect. 4.

2 Methodology

2.1 Approach

This paper follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), it demonstrated the main phases of the systematic review, it identifies the number of study articles that are explored, identifying the excluded and included articles with stating the reasons. The main advantage of using PRIMSA is to improve the transparency for this review and providing a clear analysis for all the eligible study articles (Selçuk, 2019). Figure 1 illustrates the entire approach and it shows more details in each single stage.

2.2 Resources

The below Table 1 and Table 2 show the databases & journals that were used in exploring the articles and other references.

Table 1. The Databases and Journals that used in this study

Database	Number of Studies
WorldCat.org	87
Academic Search Complete	10
Computers & Applied Sciences Complete	12
ScienceDirect	2
ProQuest Central	13
ABI/INFORM Global	4
Electronic Books (27)	27
SAGE Journals (1)	1
Total	156

Table 2. Google Scholar search criteria

Google Scholar	6
All Articles	162

2.3 Search Criteria

The search strategy conducted by using the resources that are mentioned in previous Sect. 2.2. The search implemented by using Boolean operators (AND, OR). The criteria include three categories and it's defined in three statements as explained in Table 3. However, in this study the authors adopted the search criteria to retrieve publications between 2018–2022, in order to study the state-of-the-art advising chatbots.

Table 3. The search categories and criterias.

code	Search Category	Criteria
A	Chatbot	(chatbot OR dialogue OR "conversational AI" OR "conversational agent" OR "digital assistant" OR "Virtual Assistant")
B	AI-based Approach	("Machine Learning" OR "Deep Learning" OR "Neural network" OR "Artificial Intelligence")
C	Education	(education OR academic OR adviser OR advisor OR advising OR school OR "high school" or "college" OR "university" OR "Universities" OR "students" OR "students")
	Formula=	"A" AND "B" AND "C" ti:(chatbot OR dialogue OR "conversational AI" OR "conversational agent" OR "digital assistant" OR "Virtual Assistant") AND ti:("Machine Learning" OR "Deep Learning" OR "Neural network" OR "Artificial Intelligence") AND ti:(education OR academic OR adviser OR advisor OR advising OR school OR "high school" or "college" OR "university" OR "Universities" OR "students")

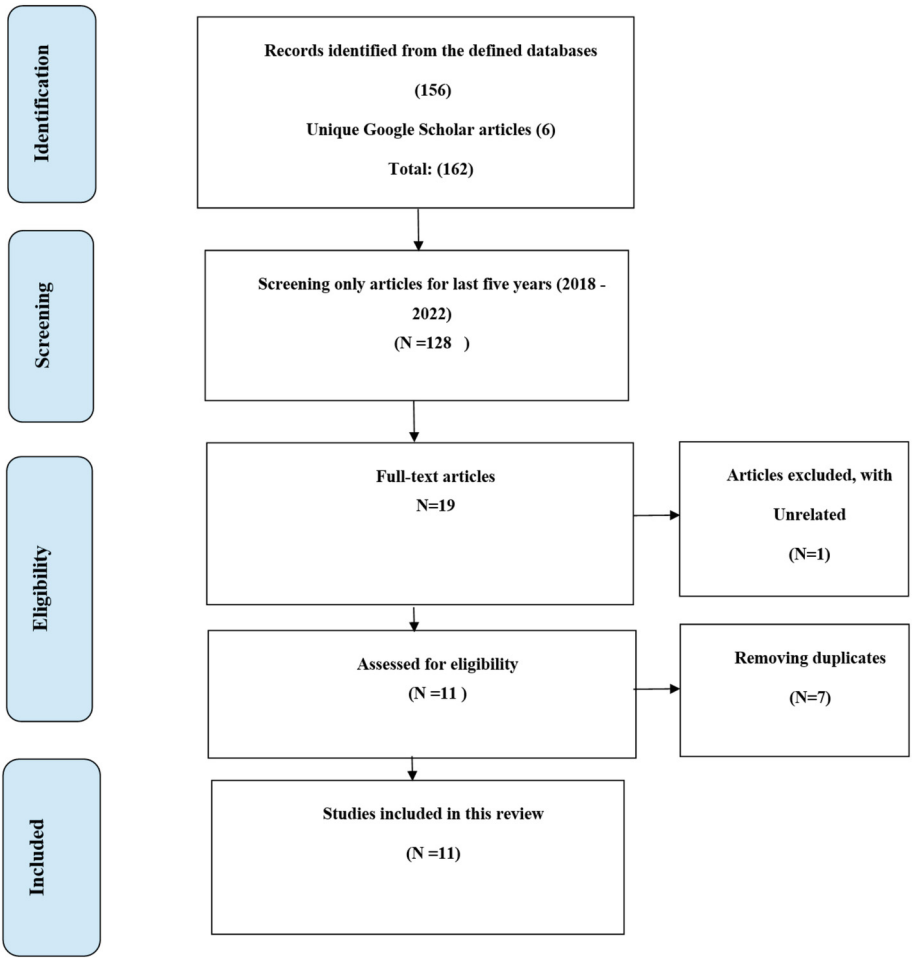

Fig. 1. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). It demonstrates the main phases of the systematic review.

2.4 Identification

The articles are collected based on the defined criteria in Sect. 2.3 and the number of articles that are retrieved from the databases that mentioned in Sect. 2.2 are (N = 162).

2.5 Screening and Eligibility

The number of records are limited to the five years (2018–2022) with total number (n = 128), afterward we select only the full-text documents, with total number is (N = 19).

2.6 Excluded Strategy

Some documents are excluded from the screening list, the article from Suárez et al. (2022) is excluded from the list, the title met all the predefined search criteria the title: "Using a Virtual Patient via an Artificial Intelligence chatbot to Develop Dental Students' Diagnostic Skills", the context is about the dental's students satisfactions with AI chatbot that enhance interacting with virtual patients.

2.7 Included Strategy

The number of studies that are considered in the literature review are (N = 11), these articles are all about using the chatbot or conversational AI in assisting and supporting students at universities, students are the targeted audience in all studies. Table 4 shows these studies.

2.8 Literature Taxonomy

According to Randolph (2009) the effective literature review should begin with matching the proposed thesis's review with cooper's taxonomy of literature reviews. Cooper's (1985) proposed to have a taxonomy for the scope of literature review which includes the following: The focus of the research, the goal, the perspective of the reviewers, coverage, organization and the audience. According to our selected (11) studies, we can construct the taxonomy of the literature review from the authors perspectives toward the main topics of their articles. The taxonomy in this literature is constructed into two main categories, the first one is academic chatbot's AI architecture, the second category is the goals of academic chatbots and the. Each particular category explored the contributions of students advising and counseling. However, the majority of the studies are focused on the deep learning algorithms and basically in seq2seq architecture such as BRNN, BLSTM, and attention models in benefiting particularly the admission department at universities. Figure 2 illustrates the taxonomy of the selected articles.

3 Results and Discussion

This reviews investigates the state-of the-art advising chatbots from 2018 to 2022 and two main dimensions with other sub-dimensions are extracted from the 11 included studies as it shows the following: 1- Advising chatbots AI Architecture which includes other sub-dimensions on identifying the deep learning based chatbots, hybrid chatbots and other open-resources for customizing chatbots; 2- The goals of the advising chatbot as it includes both the admission advising and academic advising.

The below findings are answered to the research questions that are highlighted in the introduction section.

Table 4. The included studies in the systematic review

Article Name	Author	Result	Goal	Evaluation/Dev	Academic Service	Target audience	AI-Approach
Artificial Intelligence Based University Chatbot using Machine Learning	Khan et al. (2021)	The results show that the Random Forest is outperform for the proposed study	Supporting people which are visiting the admission office this will also decrease the traffic of the admission office	Evaluating the Models	University Admission	Parents and Prospected students at universities	Supervised Machine Learning (DT, RF, SVM)
Implementation of a Virtual Assistant for the Academic Management of a University with the Use of Artificial Intelligence	Villegas-Ch et al. (2021)	The results show an increasing number of the enrolled students in the training program since students they have more knowledge about the program	Providing more information on an academic courses at universities and reducing the administrative budgets	Evaluated by using the survey to the training programs students	Admission section-training programs offered by the university	College students	Language Understanding (LUIS) is a cloud-based conversational AI
Engaging Students With a Chatbot-Based Academic Advising System	Kuhail et al. (2022)		that helps students with prescriptive academic inquiries		Academic Advising	Current university students	
A Chatbot to Support Basic Students Questions	Santana et al. (2021)	Delivering a high accuracy in the classification of enquiries intention The chatbot is able to answer the most FAQ	Helping new students in the general administrative procedures and processes	Developing a new model (chatbot)	Academic Advising-	Freshmen students	NLP and Machine Learning
Artificial Intelligence based Chatbot for Placement Activity at College Using DialogFlow	Ranavare & Kamath (2020)	This Chatbot is integrated to institute's website by clicking the Integrations choice in the left panel to generate a web demo for present agent and then press the Web Demo tile button	This agent provides information about placement activities to students	Developing a model/Integration	Internship (placement activites) service	Current students in universities (Internship)	DialogFlow and Natural Language Processing (NLP)
Jooka: A Bilingual Chatbot for University Admission	El Hefny et al. (2021)	The System Usability Scale (SUS) and Chatbot Usability Questionn (CUQ) were used to evaluate it terms of usability acceptable value is <62.6"	A bilingual chatbot for supporting students and German University in Cairo (GUC)' staff to enhance their admission process	Developing a chatbot	University Admission	Prospected Students (High School)	(Dialogflow ES) and Amazon Web Services (AWS)

(*continued*)

Table 4. (*continued*)

Article Name	Author	Result	Goal	Evaluation/Dev	Academic Service	Target audience	AI-Approach
College Enquiry Chatbot using Rasa Framework	Meshram et al. (2021)	It's done by having a confusion matrix and performance measures like Precision, Accuracy & F1 Score and the results 0.628, 0.725 and 0.669	Answering students queries about any admissions-related question	Developing a chatbot	University Admission	New students at Universities and prospected Students	Natural Language Understanding with RSA NLU-Open Resource Technology
CollegeBot: A Conversational AI Approach to Help Students Navigate College	Daswani et al. (2020)	The semantic (similarity mode) outperforms seq2seq model even though the seq2seq model is faster than semantic similarity	To assist visitors of a university's web site to locate answers to their queries	Evaluating two algorithms for training Chatbot & model proof-of-concept prototype to demonstrate adopted by other colleges	Students orientations	Prospected and current students (All university's website visitors)	NLP (Semantic Similarity) and RNN-based Sequence-to-Sequence (seq2seq)
Bilingual AI-Driven Chatbot for Academic Advising	Bilquise et al. (2022)	The chatbot engine determines the user's intent by processing the input and retrieving the most correct response that matches the intent with an accuracy of 80% in English and 75% in Arabic	Supporting current students in universities by answering to their academic questions such as the requirement courses, electives and GPA	Developing a bilingual chatbot (Arabic/ English)	Academic Advising-College students	Current students in Colleges	Neural network and Natural Language (NLP) technologies
Indonesian chatbot of university admission using a question answering system based on sequence-to-sequence model	Chandra, Y. W., & Suyanto, S. (2019)	Using the Metric of BLUE score: 44.6	Customer service-Admission office by integrating it with Whatsapp instant messaging	Developing a chatbot in Telekom University in Indonesia	Students Admission	New Students	Seq2Seq-bidirectional LSTM with Attention in the Encoder-Decoder-
Developing a Chatbot system using Deep Learning based for Universities consultancy	Le-Tien et al. (2022)	The results achieve 89% F1-score of 3 classes of the Text Classification in Deep Learning	Advising the current students toward their academic plan	A Proof of Concept to the Ho Chi Minh City University of Technology (HC-MUT)	Academic Advising	Current Students	Bidirectional-LSTM with Attention mechanism

3.1 Advising Chatbots AI Architecture

This section answers the below research question:

RQ1: What are the current AI models and algorithms that deployed into the Advising chatbot?

Haristiani (2019) views the chatbot as one the advanced technologies that can be applied in education, inspiring researchers to explore different aspects of chatbots. The performance and the efficiencies of the AI chabots depend basically on the state-of-the-art algorithms that are selected to use it (Santana et al., 2021). There are multiple types

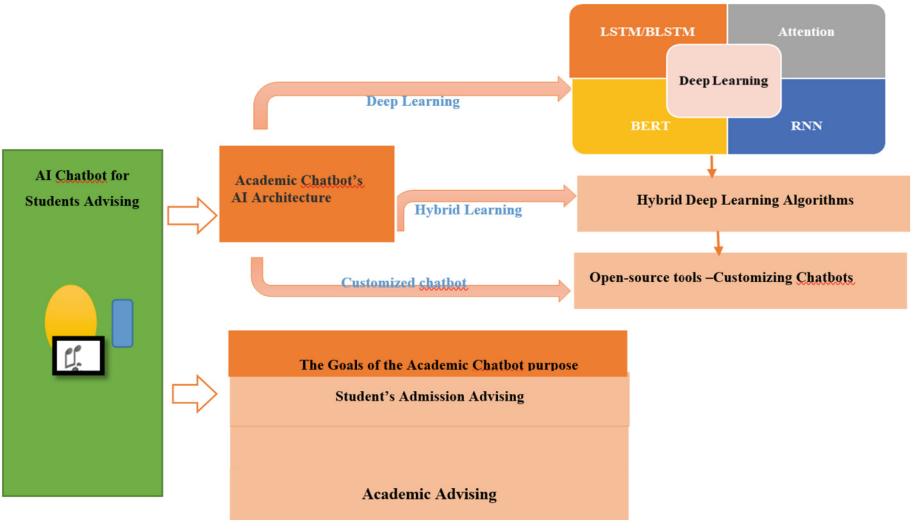

Fig. 2. The Taxonomy of the Selected Articles

of machine learning that are used in the models, However, Fig. 3 depicts the revealed studies based on AI architecture.

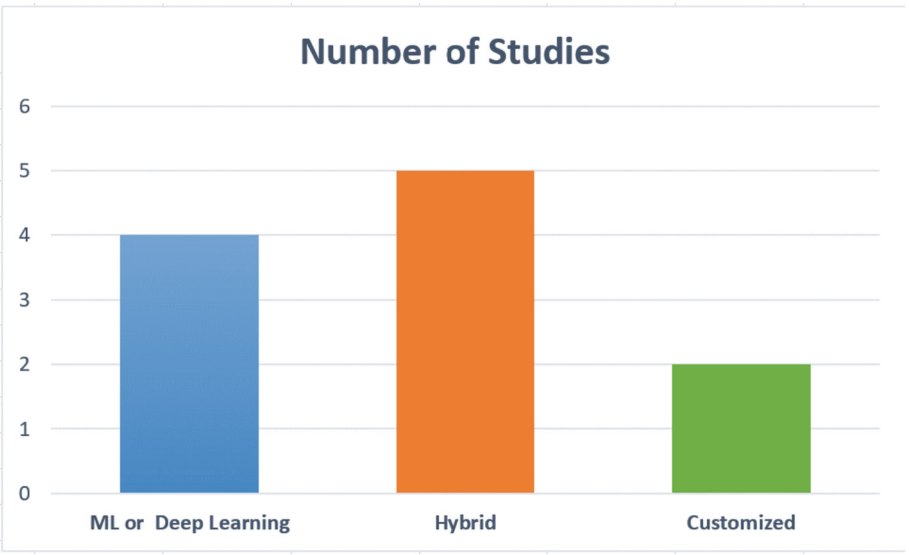

Fig. 3. The AI based chatbots architecture

3.1.1 Deep Learning

Khan et al. (2021) proposed the random forest algorithm, decision tree and support vector machine for supporting students and parents who visit the campus. The authors started with preprocessing the dataset by using the features engineering such as TFIDF with adding the Ngram feature and the results shows that Decision Tree algorithms and Support Vector Machine are not responding well like Random Forest algorithm, thus, the RF model is adopted in the system as an effective approach for assisting students in universities. In fact, the result of any model depends on the validation that are accepted Recently many developers are inspired in using the seq-2seq model by adding more layers such as attention layers and LSTM/ BLSTM. Chandra & Suyanto (2019) developed a chatbot in one of the Indonesian universities by using a small dataset which collected from the admission office. The system developed by using seq2seq model, since the data is basically a conversation between the admission officers and the students, however, the authors added BLSTM layers as well as attention layer in order to improve the accuracy of the chatbot. Furthermore, another deep learning chatbot is implemented as a proof of Concept in Ho Chi Minh City University of Technology (HC-MUT) by combining the Embedding layer and the Bidirectional-LSTM with the Attention mechanism for solving the classification tasks from students' majors-degree requests (Le-Tien et al., 2022).

3.1.2 Hybrid Learning

There are several authors conducted studies in the hybrid learning, which can vary in the complexities of the model, some models might have a combination between the supervised machine learning and deep learning, and others might have a combination between different deep learning models together. For example, Yu et al. (2020) developed a hybrid model for wearable inertial sensor-based systems in order to prevent older people falls that can cause them injuries, this model called ConvLSTM which outperformed the both CNN and LSTM individually. However, In reference to the literature in this study, a few studies focused on the hybrid learning, Chandra & Suyanto (2019) developed a chatbot as customer service in the Telekom University in Indonesia for assisting students in the admission processes, the authors adopted the Seq2Seq approach with combining both the BI-LSTM and Attention models together.

3.1.3 Open-Source Tools for Customizing AI Chatbots

Some authors design the chatbots by using AI packages such as Rasa Natural Language Understanding (NLU) which is an open source framework for NLP solution that take user's input and try to extract the intent, Meshram et al. (2021) adopted this configuration in the proposed chatbot, after the data is trained, they fed it into the NLU model pipeline, however they used the Anaconda platform and python language in order to deploy the required packages.

3.2 The Goals of the Advising Chatbots.

In this section the below research questions are answered:

RQ2: What are the current Advising chatbots services at universities?
RQ3: How do AI conversational advisers support high school students?

Several researchers studied the dialogue systems and advising chatbots in schools and universities. However, few of them who investigated the advising chatbots in high schools. Assayed et al. [23] developed a machine learning chatbot called "HSchatbot" to assist students in some of high schools to classify their enquiries based on type of their questions, nevertheless, most of the authors focused on studying the impacts of chatbots on students' admission at universities. Since most universities and colleges around the world receive thousands of applications yearly during a limited time and as a result the admission officers would receive many calls from students and parents (Fig. 4).

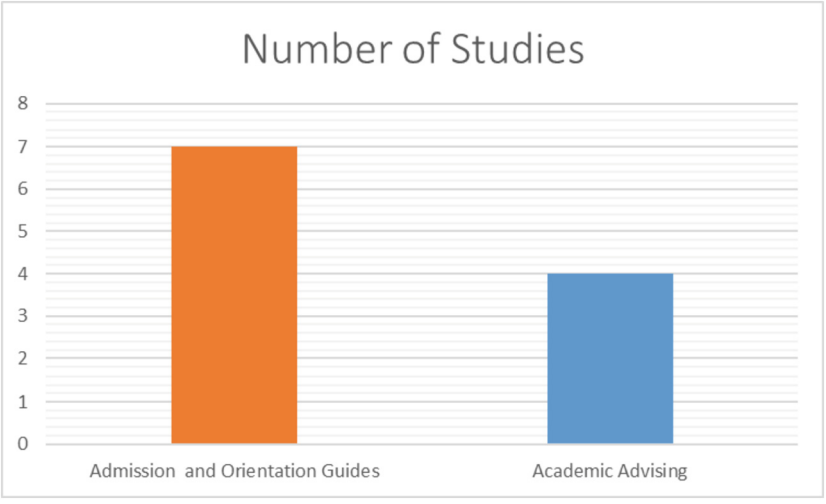

Fig. 4. The distribution of academic chatbots based on goals

3.2.1 Students Admission Advising

El Hefny et al. (2021) developed a chatbot called "Jooka" for supporting prospected students who are targeting the German University in Cairo (GUC), which can answer to their admission enquiries. Jooka enhances the advising process by providing instant responses to the both students and parents in both languages (English and Arabic). Moreover, Khan et al. (2021) proposed a model for supporting students and parents to provider in 24/7 services by answering any question that are related to registration and admission. Another chatbot called "CollegeBot" that developed by Daswani et al. (2020) to assist the university's website's visitors to navigate the website effectively, however, the authors in this study present a proof-of–concept model for the CollegeBot to the San Jose State University. Moreover, Meshram et al. (2021) developed a chatbot called "college enquiry chatbot" that aims to answer any admission-related questions.

3.2.2 Academic Advising

Students-faculty advising play avital role on students' success (Sneyers, & De Witte, 2018), advisers can assist the students in making the right decision in selecting the courses as well as monitoring the progress of students in order to be sure to graduate on-time. Bilquise et al. (2022) developed a bilingual chatbot for supporting the current students academically in order to be sure that are following the academic plan as well as to graduate on-time and it supports both languages the Arabic and English. Another novel chatbot is developed by Le-Tien et al. (2022) for advising the current students in Vietnamese universities to select the appropriate courses that match with their academic plan and accordingly students would be able to declare their major successfully.

4 Conclusion

This review investigates the current state-of-the-art advising chatbots in schools and universities. Most of studies shows that advising chatbots are developed for admission and universities academic advising. Despite the vital role of academic advisers in high schools where students' future careers are shaped by choosing the best fit majors and universities, few studies conducted on chatbots that focused on this stage, resulting in the gap in the development chatbots for student advising in high schools.

4.1 Limitations and Future Work

This study is constrained to review the studies from 2018–2022 utilizing specific accessible databases, moreover, the taxonomy used in this SLR does not cover the chatbots artifacts, even though, the human-chatbot interaction have an essential impact on students' experience. Future research should include the impact of chatbots design and students' experiences while also exposing to other familiar databases such as Web of Science and Scopus.

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Chatbots: Can They Satisfy Customers in the Banking Sector?

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Abstract. Purpose – The purpose of this research was to investigate and explore the influence of chatbots service quality on customer satisfaction in the banking sector.
Methodology – The sample size for this research was determined to be 25, sufficient to achieve data saturation. This research utilised qualitative inductive research approach, exploratory in nature, implementing non-probability, stratified purposeful sampling technique, based on the age category of commercial bank consumers.
Findings – Overall, a total of eleven themes and sub-themes emerged from the gathered data, resulting in three aggregate dimensions, which were "perceived chatbot service quality", "customer satisfaction" and "responses and intentions".
Practical implications – The study could be extended for different target market, creative strategy, other media and more countries. The findings of this research aimed to help banks further understand customer satisfaction, along with their responses and intentions, when it comes to interacting with chatbots.
Originality/value – This research added value to customer experience, which mattered the most, when it comes to them being satisfied with their interaction with chatbot. The output of this research developed a conceptual framework which identified the factors causing customer dissatisfaction once they interacted with chatbots.

Keywords: Chatbots · Artificial Intelligence · Customer Satisfaction · Intentions · Word of Mouth (WOM) · Technology Acceptance Model 2 (TAM 2)

1 Introduction

Technology has overtaken the world through artificial intelligence (AI) in this digital era (Letheren, Russell-Bennett & Whittaker 2020). With rigorous developments in AI, chatbots have taken the centre stage transforming the customer service profession, and its interaction with the users (Wirtz et al. 2018). Currently, chatbots are utilised to provide

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24/7 support service specifically in the fields of marketing, sales and support, where on average it has helped increase sales by 67% (Press 2019; Ashfaq et al. 2020). Przegalinska et al. (2019) discussed that chatbots are the form of AI technology, that interact and engage with humans verbally, or through texts. Interestingly, many firms and industries are utilizing, and depending heavily on using chatbots as virtual agents to assist them in their business. With the assistance of these virtual agents, users can acquire the required information, place an order, or purchase at their convenience (Sivaramakrishnan, Wan & Tang 2007).

With the inception of chatbots in different business sectors, the market size is growing exponentially, from $250 million (in 2017), to almost $1.34 billion, by the year 2024 (Luo et al. 2019). The focus of this study was on the banking sector, utilising chatbots, as their representatives to communicate with their customers. Trivedi (2019) discussed that the banking industry has been the early adopter to implement the use of chatbots for providing information and interacting with the customers. Offering relevant information and providing a sound virtual experience leave the customers satisfied (Price 2018).

The purpose of this research was to investigate and explore the influence of chatbots' service quality on customer satisfaction in the banking sector. When talking about the various types and forms of AI, human-chatbot (virtual agents) interactions have been the most prominent ones. One such study published by Zarouali et al. (2018) stated that human-chatbot interaction needs further exploration, in order to have a better understanding about the chatbots' service quality, and the customers' satisfaction.

The research in point conducted an extensive investigation on this topic, which enables the readers to have a better understanding about the influence of chatbots on customer satisfaction, specifically in the banking sector of UAE, since there is a lack of published evidence in this area. Therefore, this research was the perfect platform to explore and learn about the influence of chatbots on customer satisfaction in the banking sector of United Arab Emirates (UAE).

Chatbots are also used extensively in other fields, such as hospitality, tourism, healthcare, and education, serving different purpose in each of these sectors. They differ from the banking sector in the way that chatbots are more customer-focused and sophisticated when compared to the other sectors, since the information provided by the banks is highly confidential. Thus, the study seeks to answer the following research questions:

- What is the influence of chatbot service quality in enhancing the customer experience in the banking sector?
- Can chatbot interaction be considered as the replacement for human interaction at the banks?
- Do the banks have the required infrastructure for implementing chatbot?
- Can chatbots be considered as good enough to connect with the customers on an emotional level?
- Can the human-chatbot interaction be considered safer as compared to human-human interaction at the banks?

Furthermore, to have more augmented quality of data, qualitative inductive research method was applied, being exploratory in nature, as it assisted in providing enriched data, with in-depth information and feedback from the participants. Data saturation was achieved by around 25 participants, adopting a cross-sectional research design,

investigating consumers' responses and intentions towards interacting with chatbots, by conducting interviews over a period of 3–4 months.

The outcome of this research developed a conceptual framework, which identified the factors causing customer dissatisfaction once they interacted with chatbots. Overall, a total of eleven themes and sub-themes emerged from the gathered data. This research further added value to customer experience, voluntariness to interact with chatbots, subjective norms, and the actual system usage. Additionally, certain practical implications were also discussed for the banks to consider and implement.

2 Literature Review

2.1 Artificial Intelligence in the Banking Sector

Chatbots, digital assistants, voice-activated services, concierge robots, and virtual assistants are all different terminologies used for similar type of AI-enabled systems (Prentice & Nguyen 2020). In this research, the focus is on the chatbots which are utilised by the banks, as a customer service representative.

Various authors and researchers have defined AI in different ways. From the time it was first discovered to the present time, the definitions have evolved as well, keeping in mind the various perspectives. To start with, in 1950, Turing (P. 435) defined it as "such a human interaction between another human and the machine where an individual is unable to differentiate between the human and the machine, hence the machine is termed to be intelligent". Haenlein and Kaplan (2019) stated that "such an ability of the system that can explain the external data accurately, that can learn from the same source, and by using and incorporating that data, specific tasks and goals can be achieved by being flexible".

2.2 Chatbots in the Banking Sector

Chatbot technology is being applied in various businesses and industries like banking, hospitality, tourism, and healthcare. With the help of these conversational chatbots, different businesses can collect and store larger sets of data in terms of variety, while assisting them to become more cost effective and sustainable (Campbell et al. 2020; Um, Kim & Chung 2020).

With the help of appropriate coding, programming, and algorithms, chatbots are trained to identify similar customer queries and respond to them in a specific pattern (Campbell et al. 2020). Belanche et al. (2020) highlighted that robots (chatbots) are being considered as frontline employees for most of the businesses, as they can easily communicate with the customers, receive and store larger data of information, and are cost effective. Chatbots are well-equipped with intuitive and empathetic skills, which is helping them in replacing all kinds of jobs performed by humans in various industries, particularly those of customer service representatives (Belanche et al. 2020; Huang & Rust 2020a, b). However, Um, Kim and Chung (2020) contended albeit chatbots make work easier for organisations to utilise them, they still have drawbacks; failure to understand and provide appropriate service to the customer, incur additional costs; maintenance, installation and training.

2.3 Extant Literature on Chatbots

John McCarthy; the father of "artificial intelligence" coined this term first in 1956 during a summer research project (Haenlein & Kaplan 2019). Since the research in the field of AI-enabled systems (chatbots) is still in its infancy stage, the following Table 1 is devised based on the key information provided by various journal articles.

2.4 Banking Sector of UAE

The world has witnessed substantial developments in AI-based innovations across the global banking sector, which serves customers that are using diverse banking networks (Kumar, Sujit & Charles 2018). There is still an impending need for research when it comes to the implementation of AI-based technologies in the banking sector of UAE. Hence, it was necessary to present a concise synopsis of UAE's banking sector.

Over the years, UAE has become a strong proponent and fore-bearer in introducing the latest technologies to its various sectors. Talking about the banking sector, nearly all the banks based in UAE have now implemented AI-enabled systems (chatbots and virtual assistants) (Mehta & Bhavani 2017). Al-Marri, Ahmed and Zairi (2007) signified the fact that when it comes to the perception of customer service quality, UAE's banking sector is large enough to cover this area with vast outreach and better outcome. Digitalisation of the banking sector backed by AI-enabled systems has given the UAE's banking sector a growth of 13.9% in terms of profitability (KPMG 2020).

While banks in UAE are making extensive efforts to retain and satisfy their customers, it is imperative to primarily satisfy their needs employing the cutting-edge technological innovations that are in place (Kumar, Sujit & Charles 2018). Alhosani *et al.* (2019) discussed the benefits and drawbacks of implementing the latest technologies. One of the major drawbacks faced by UAE's banking sector in implementing the latest innovations is that they have been the target of cybercrime attacks, resulting in data compromise of approximately 14 million records in the year 2018, whereas, UAE lost roughly $1.1 billion to cybercrime attacks in 2017 (Rosberg 2018; Alhosani *et al.* 2019). Another major reservation faced by the banks in UAE is the customer satisfaction, which is not earned easily in this part of the world (Sleimi, Musleh & Qubbaj 2020).

2.5 Customer Satisfaction

The word "satisfaction" is derived from Latin "satis" meaning "enough", and "facere" meaning "make or to do". Hence, the combined meaning of these words mean to provide the products and services which have the capacity to be "enough" (Oliver 2010). The meaning of the word satisfaction is also dependent on the context. For instance, if "satisfaction" is used in a marketing context, its meaning becomes more specific (Parker & Mathews 2001).

Söderlund (1998) defined customer satisfaction as, "the value one receives after purchasing or using a product or service". It is worth mentioning here that the context in which customer satisfaction is mentioned is very important, since the meaning changes from one context to another.

Table 1. Extant Research on Chatbots (Table Compiled by the Researcher)

No	Name of the Article	Methodology	Theory	Main findings	Author/s and Year
1	Exploring the nexus between financial sector reforms and the emergence of digital banking culture – Evidences from a developing country	Qualitative	–	This study highlights that since the inception of digital banking culture, things have become much easier for the customers to interact with the bank, improving their service quality. This further indicates that the acceptance of new technology by the customers in the banking sector can also be easily implemented	(Shaikh et al. 2017)
2	Artificial Intelligence for the Real World	Quantitative	–	This article suggests that even though AI is taking over many businesses and industries at a rapid pace, it does have its pitfalls where it fails to deliver. With the right planning and development, it could prove productive and satisfactory, achieveing overall prosperity	(Davenport & Ronanki 2018)
3	An Initial Model of Trust in Chatbots for Customer Service – Findings from a Questionnaire Study	Mixed method	Human-Computer Interaction Theory (HCI)	The authors proposed an intial model of trust in chatbots for customer service, including their perceived response and other environmental factors related to it	(Nordheim et al. 2019)
4	AI-based chatbots in customer service and their effects on user compliance	Quantitative	Social Response Theory; Commitment - Consistency Theory	The outcome of this research elaborates that the need to stay consistent and anthropomorphism enables the customers to comply with chatbot's request for service feedback	(Adam et al. 2020)

(*continued*)

2.6 Repurchase Intention

When someone mentions customer satisfaction, they cannot leave repurchase intention out of it, as they both go hand in hand. It will not be wrong to say that it is the customer satisfaction that leads to repurchase intention (Hellier et al. 2003). Repurchase intention is defined as, "the willingness to purchase something again" Dictionary (2021a).

Table 1. (*continued*)

No	Name of the Article	Methodology	Theory	Main findings	Author/s and Year
5	Customer service chatbots: Anthropomorphism and adoption	Quantitative	Three-Factor Theory of Anthropomorphism	AI-enabled Chatbots are more susceptible to communication errors than Self-Service Technologies (SST), which can be reduced simply by seeking clarification, provided that it will repair the potential miscommunication	(Sheehan et al. 2020)
6	How Do AI-driven Chatbots Impact User Experience? Examining Gratifications, Perceived Privacy Risk, Satisfaction, Loyalty, and Continued Use	Quantitative	Uses and Gratifications Theory (U&G)	This study illustrated that the customers are satisfied with the use of chatbots when it comes to service quality, but they are less satisfied when it comes to their perceived privacy risk, associated with the chatbots	(Cheng & Jiang 2020)
7	Robots or frontline employees? Exploring customers' attributions of responsibility and stability after service failure or success	Quantitative	Attribution Theory	The study found out that customers attributed responsibility for the service performance more with the humans than towards robots	(Belanche et al. 2020)
8	Emerging-Market Consumers' Interactions with Banking Chatbots	Qualitative	Unified theory of acceptance and use of technology (UTAUT)	This study concluded that while age and technological experience are significant components in facilitating the use of chatbots, perceived expertise, responsiveness and security were found to be particularly important to users, in the emerging markets	(Mogaji et al. 2021)

Suhaily and Soelasih (2017) mentioned that customer satisfaction is a compulsory factor when it comes to the repurchase intention towards a product or service, based on the overall quality provided to the customer. Furthermore, Mittal and Kamakura (2001) elaborated that once the customer reaches threshold or the tolerance level towards the repurchase, it may vary from person to person to display the repurchase intention, as not everyone have similar characteristics when it comes to repurchasing.

2.7 Word of Mouth (WOM)

Word of mouth (WOM) is another important factor that plays a vital role when it comes to customer satisfaction and repurchase intention. According to the Cambridge Dictionary (2021), WOM is defined as "such a process in which the information is being passed on from one person to another through the medium of verbal communication". WOM has developed into an important means of communication for the field of marketing, which is defined as "the conveyance of message from person to person using oral communication" (Matute, Polo-Redondo & Utrillas 2016).

Communication of information between customers about the products/services, or the company is considered crucial when it comes to the repurchase intention, as customer needs to be completely satisfied before making an informed decision to purchase a certain product/service (Litvin, Goldsmith & Pan 2006). WOM has also transformed over time into electronic word of mouth (eWOM) and algorithmic word of mouth (aWOM), where eWOM is electronic conveyance of message or information, and aWOM is the AI enabled word of mouth using all the sophisticated technology to communicate among people (Williams, Ferdinand & Bustard 2019).

2.8 Technology Acceptance Theories

Despite the ease and convenience provided by chatbots to the organisations, more attention needs to be paid to customer satisfaction, since chatbots are AI-enabled systems, programmed by humans, lacking flexibility (Prentice & Nguyen 2020). Various researchers have come up with different technology acceptance theories, where the most relevant ones are Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology Model (UTAUT), Unified Theory of Acceptance and Use of Technology Model 2(UTAUT 2), and Technology Acceptance model 2 (TAM 2).

2.9 Technology Acceptance Model 2 (TAM 2)

Technology Acceptance Model 2 or TAM 2 is an extension of the Technology Acceptance model, developed by Venkatesh and Davis (2000). TAM 2 integrated additional external constructs to the original TAM model (Venkatesh & Davis 2000). The objective of this theory was not only to contemplate on user acceptance of technology, but also to understand the user adoption behaviour through social influence and cognitive instrumental processes (Venkatesh & Davis 2000).

One such study published by Ali et al. (2021) argued that the extension of TAM can also be adopted when it comes to the use of cardless banking system. They further suggested that perceived risk plays a big role when it comes to consumers' intention of use, based on the extended TAM model (Ali et al. 2021). Hence, this theory was the perfect fit to be used and implemented for the purpose of this research.

3 Scope of the Study

The "scope of the study" for this research is shown above. As illustrated in Fig. 1, the focus was on achieving customer satisfaction while an individual uses the chatbot services in the banking sector. This led the customer towards deciding about their responses

Fig. 1. Scope of the Study

and intentions related to the chatbots and their service quality. The focus of this research was, (and not limited to) "Going with the same bank", "Changing bank", "Complaining to the bank (Does the complaints reach the responsible person/department?)", and "Word of Mouth (WOM)", respectively.

As elaborated in the literature review, the outcome of customer satisfaction helps the customer to decide about their responses and intentions. Since chatbots are relatively new in the banking sector, there have been mixed responses about the interaction between the chatbots and an individual, as highlighted in the recent research in different business areas. However, the influence of chatbots on customer satisfaction in the banking sector is novel.

4 Data and Methodology

The target population for this research were all the individuals who interacted with the bank directly or indirectly. The sample size for this research was determined based on reaching data saturation. To target the right participants, this research implemented a non-probability, stratified purposeful sampling technique, based on the age category. For this research, a total of 25 participants were interviewed, achieving data saturation. An expert interview, semi-structured survey instrument was employed with open-ended questions guided by the underpinned theory and literature.

4.1 Data Collection and Sample

For the data collection of this research, a face-to-face, semi-structured expert interview with open-ended questions was implemented. Non-probability, purposeful stratified sampling technique was used to collect the required number of participants for this research (until data saturation was achieved). The participants were contacted through emails, WhatsApp, and over the phone. Due to Covid-19 pandemic, online platforms; Zoom and Google meets were used to interview the participants, in lieu of interviewing them in-person. Moreover, interview guide was established to stay on track with the purpose of this research, along with the questions for this interview, which were guided by the theory and literature (Kvale 2007; Given & Saumure 2008; Creswell 2009a, b). For collecting audio records, two separate high-quality instruments were used; iPhone 12 Max Pro, and HP Pavillion laptop. The researchers used iPhone's "Notes" and Google Doc's "Dictation" function to transcribe the data.

4.2 Coding Procedure and Thematic Analysis Framework

NVivo12 software was used to describe and classify data to interpret into codes and themes. With the help of NVivo12 software, a large set of data gathered from interviews was analysed in a systematic way. Initial coding was carried out manually, and then all the coded data and themes were transferred to NVivo12 for further organisation and analysis. It also assisted in describing the essence of phenomenology for this research. Analysing the data using NVivo12 further assisted in enhancing the consistency, and validity of this research. According to Creswell and Poth (2018), it is duty of the researcher to write a detailed description of the themes, that are developed from the study. Once all the data was transcribed into Word document, it was then run through NVivo12 for further analysis into themes, and sub-themes. For this research, the data was coded using open coding, axial coding, and selective coding.

5 Findings

A total of 25 participants were interviewed, which was clearly sufficient to achieve data saturation, using open-ended semi-structured expert interview questions. Out of the 25 participants, 12 participants were expatriates with various nationalities (USA, UK, Spain, Australia, Pakistan, India, South Africa, Macedonia, Bangladesh), while 13 were GCC nationals from UAE, Oman and KSA. 23 participants were Male, whereas only 2 Females participated to answer the questions of this research. All the participants were from various age groups ranging from 18 to 56 and above. As for the educational background, the participants were fairly educated, ranging from holding Diploma to PhD, respectively. The researchers implemented the Five-step process in Framework Analysis based on Ritchie and Spencer (1994), and Ritchie, Spencer and O'Connor (2003).

Once familiarising with the data collected from the participants was completed, the researchers were then able to identify the initial emerging themes and sub-themes. All these themes and sub-themes were gathered within a framework to develop an initial conceptual thematic framework, as shown below in Table 2.

A total of seven major themes and four sub-themes were developed that were consequently linked with three aggregate dimensions. The finalised thematic framework was developed using the individual interviews (containing the 1st order concepts, 2nd order themes and sub-themes, and aggregate dimensions). The aggregate dimensions deducted from the thematic framework were "*Perceived Chatbot Service Quality*", "*Customer Satisfaction*", and "*Responses and Intentions*".

All the sub-themes that imitated related or parallel data gathered from the individual participants were recorded under the appropriate main themes. All the themes and sub-themes formulated the thematic framework based on the three-level framework suggested by Gioia, Corley and Hamilton (2012).

Table 2. Conceptual Thematic Framework of Initial Themes and Sub-themes

Initial Themes and Sub-themes	
Type	Name
Theme 1	Chatbot efficiency
Sub-theme 1.1	Service information and understanding
Theme 2	Chatbot Interaction
Sub-theme 2.1	Limited options and emotional aspect
Theme 3	Experience
Sub-theme 3.1	Urgent actions and problem solving
Theme 4	Participant's feedback
Theme 5	Human interaction
Sub-theme 5.1	Human representative and assistance
Theme 6	Suggestions from experience
Theme 7	Word of Mouth (WOM)

5.1 Aggregate Dimension One: Perceived Chatbot Service Quality

Perceived chatbot service quality was labelled as the first aggregate dimension. This dimension revealed how the customers perceived chatbot service quality of their bank. It comprised of the 1st major theme "chatbot efficiency" and its sub-theme "service information and understanding", 2nd major theme "chatbot interaction" and its sub-theme "limited options and emotional aspects", respectively. Almost all the participants agreed that chatbots are not very efficient when it comes to assisting or solving their problems, as depicted in the following excerpt from the interview of participant no. 12:

> *"I don't know how it would be better, or how people would get used to it, but it needs a lot of time to be more efficient. It is not that efficient nowadays unfortunately, with most of the places that I experienced." (P12)*

Another participant number 10 mentioned that chatbots require lengthy security information before it can verify the customer and proceed further with their request:

> *"…Some entities tend to make it as a basic and an easy system for the customers, while some provide a very complicated system. Like in the banking sector, they tend to put some restrictions on securities, and this makes it difficult for the client to get what they want as easily as possible. I think that is the downside of using a chatbot in bank. It further needs to consider the type of service. Some services are easy to use with the chatbot, while some of them like banks is a bit difficult because of the security issues." (P10)*

5.2 Aggregate Dimension Two: Customer Satisfaction

The second aggregate dimension was labelled as Customer satisfaction. This dimension revealed how satisfied the customers felt while interacting with the chatbot of their bank. It comprised of 3rd major theme "experience" and its sub-theme "urgent actions and problem solving", 4th major theme "participant's feedback", and the 5th major theme "human interaction" and its sub-theme "human representative and assistance", respectively. A few examples are portrayed below, from the excerpts of participant's interviews:

"…if you are in a hurry and you have some other work to do, it is extremely necessary for you to finish with the bank, but it takes 5 to 10 minutes, then that is very annoying. For me, I have been at both the ends, I mean I have experienced both; being satisfied with its service and annoyed with it at times." (P22)

"…it was very interesting because this is something all of us have experienced at some point, happily and unhappily. So, I also had mixed kind of reaction while interacting with a chatbot. However, I distinctly remember my first interaction. I was intrigued that how this was going to work. I wouldn't say it was too bad, but it was not the best experience that I had. I still remember my ATM card had gotten stuck in the ATM machine; it was not coming out. I was trying to reach the helpline, but I couldn't reach any helpline. So, that was the first time I interacted with a chatbot. Now the thing with the chatbot is that it gives you almost the perfect information that one could possibly be looking for, and it gives you all the details that you might find necessary for your need of the hour, but also it is limited in a way that it is a programmed machine." (P3)

5.3 Aggregate Dimension Three: Responses and Intentions

Responses and Intentions was labelled as the third aggregate dimension. This dimension revealed about the participants responses and intentions once they interacted with the chatbot of their bank. It comprised of 6th major theme "suggestions from experience" and 7th major theme "Word of Mouth (WOM)", respectively. The following examples illustrate participant's responses related to the aggregate dimension three:

"…the other one which I think is about the age factor especially the old people, I don't think that they are very technical people. Maybe out of 100, 2 or maximum 3 people will know or are familiar with chatbot. Other than that, I am sure they are avoiding it and prefer to interact directly with a human representative or visit the branch itself." (P1)

"I am a technology savvy person, but everyone is different than the other human, and let us not forget who hardly understand technology like aged people, labour class and uneducated people, for example. So, banks need to consider their situation as well to try and create a way for their easy access as well, because honestly, not everyone is willing to spend money on costly calls and end up with no result at the end." (P20)

6 Discussion

Analysis of stories and experiences shared by the 25 participants revealed that customers are hardly influenced by chatbots in the banking sector, resulting in their dissatisfaction with it. As mentioned in the extant literature on chatbots, Um, Kim and Chung (2020) suggested that self-service technology is much more efficient than AI-enabled systems like chatbots and virtual assistants. Participants highlighted the fact that chatbots are good and highly efficient in other sectors like hotels, hospitals, airlines etc. They feel that banks are not quite ready when it comes to chatbot's efficiency.

As emphasised by De Cicco, e Silva and Alparone (2020) that people need to connect on an emotional level when they interact with the bank. Unfortunately, that is not the case when it comes to interacting with the automated systems introduced by various banks. Sleimi, Musleh and Qubbaj (2020) also stated that not everyone is content with using the latest technology in the banking sector.

Additionally, the literature also predicted that customers need quality service based on their demands (Pakurár et al. 2019). Again, this is not what participants felt when they interacted with chatbot. It was due to poor chatbot quality in banks. Since no prior research has been conducted about the human interaction with chatbot, this research was able to discover that chatbots provide clear instructions on how to navigate or what options to choose, but for simpler requests only. On the contrary, when it comes to emergency situations, there is still no comparison with a human representative, as humans are much more understanding and cooperative.

Furthermore, in literature Moriuchi et al. (2020) also emphasised that organisations have started implementing chatbots as their customer representative, but they have neglected the customers' side whether they like interacting with them or not. As for the sub-theme, emotional unavailability and limited options were one of the most important findings of this study and the most reported concern by the participants. One such research published by Elsholz, Chamberlain and Kruschwitz (2019) mentioned that chatbots are limited when it comes to commands, languages and emotions.

Additionally, participants further revealed that human representatives are better at assisting and navigating through the offers and services, in a cost-effective manner. It was not the same case with chatbots, as there are different categories and sub-categories of options that take too much time to go through. As per Huang and Rust (2020a, b), AI-enabled systems are outperforming humans, hence a grave threat to their jobs.

Alternatively, a few participants had positive WOM about the influence of chatbots. Such experiences make up for the overall theme. However, a few participants were not bothered by others' opinion. They preferred visiting the bank personally to get their work done. According to the literature reviewed, negative WOM exerts far greater influence than the positive WOM, creating switching intentions (Um, Kim & Chung 2020).

7 Implications

Theoretically, this research supported the marketing literature in the fields of bank marketing, marketing communication, consumer behaviour, product development and relationship management, respectively. Furthermore, the findings of this research could easily be associated with the underpinned Technology Acceptance Model 2 (TAM 2),

as demonstrated in Fig. 2. All the black arrows indicate the original model suggested by Venkatesh and Davis (2000), whereas the orange arrows and boxes indicate the theoretical contributions of this research.

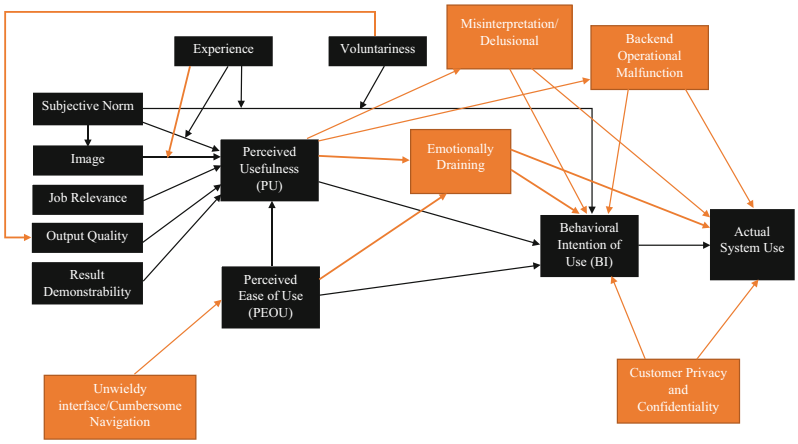

Fig. 2. Theoretical Contributions

The findings of this research could be considered as the variables of a new quantitative study. Hence, it could be used as an initial point of future studies associated with the influence of artificial intelligence (AI) on customer satisfaction. Moreover, the findings of this research further add value to customer experience, which matters the most when it comes to being satisfied with their interaction with chatbot. Based on what participants went through while interacting with chatbots, it was their experience which created a certain image of using such a system implemented by banks.

On the other hand, voluntariness of interacting with chatbots had an impact on the service quality. The more willing and volunteering the customers are to interact with chatbots, the better will be the service quality. There was also an addition of 5 new variables to TAM 2 model, namely emotionally draining, unwieldy interface/cumbersome navigation, misinterpretation/delusional, backend operational malfunction, and customer privacy and confidentiality. All these factors fall under the classification of customer satisfaction.

This research recognized and developed an understanding of the influence of chatbots on customer satisfaction in the banking sector of UAE. Therefore, based on the findings of this research, it could be linked to many aspects of banks' strategies related to customer satisfaction, responses and intentions, bank marketing, marketing communication, consumer behaviour, product development and relationship management, respectively.

Reflecting on the findings of this research, banks should develop new strategies to satisfy the customers by providing them easy to use services and improving chatbot service quality. Hence, this research would provide the banks with the knowledge of customer satisfaction, responses and intentions, drawbacks of chatbots' service quality, upgrading it to newer easier system, and devising new strategies to make the best out of implementing chatbots in banks in the United Arab Emirates.

The word "AI" or "chatbot" meant something very intelligent in people's perspective, which changed drastically once they interacted with it. Hence, it calls into account the banks' policies and strategies towards consumer behaviour and relationship management. By doing so, bankers will be able to understand better what is causing their customers' dissatisfaction, and how they need to adjust their strategies according to customers' demand. Therefore, the banks and marketing professionals need to understand that although banks are trying to adapt to new norms, technologies and policies followed globally, they need to devise a proper marketing strategy for it.

8 Limitations and Future Research

Firstly, the research was conducted within UAE during the time when COVID-19 was at its peak. Due to the nature of this research, the authors had to conduct semi-structured, open-ended, expert interviews. Inviting participants was not a big issue but agreeing to meet and sit for an interview was quite challenging.

Secondly, the time constraint for data collection was also very crucial, as the researchers had to reschedule many of the online interviews due to the pandemic situation. Hence it took 3–4 months to gather all the required data. Another limitation faced during the completion of this research was not to interview labour class individuals, as they are not able to withdraw their salary from the ATM machine, so interacting with chatbots was completely out of the question for them.

Considering the findings as the foundation to further enhance and develop studies accordingly, it is highly recommended for the future researchers to explore quantitatively the influence of chatbots on customer satisfaction in the banking sector in UAE, using the factors and the proposed conceptual model in this research. For example, if there is influence of hybrid systems on customer satisfaction, how would the customers perceive service quality of hybrid systems? Does interacting with hybrid systems impact customer loyalty? To what extent do customer experiences with hybrid systems influence their intentions?

Moreover, future researchers need to focus more on the ways marketing could minimise the negative consequences on the influence of chatbots on customer satisfaction in the banking sector in UAE, knowing how to manage different marketing and consumer behaviour aspects in predicting their behaviour. Also, cultural, and other environmental factors affecting the influence of chatbots on customer satisfaction in the marketing perspective need to be studied.

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The Challenges Facing Adopting Innovation Process in the Context of Project Management Performance in the Oil and Gas Sector

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Abstract. Purpose – This paper explores the challenges and enablers of diffusing innovation processes within the oil and gas industry and the impact on the project management process in improving project performance.
Methodology – This study employs a qualitative analysis methodology with a structured survey to provide the data for this study.
Findings – The anticipated study findings will aid in identifying the primary obstacles to and facilitators of implementing innovation systems within the ecosystem of the oil and gas sector.
Implications – It is crucial to carry out follow-up research on integrating the "green innovation" concept to confirm the viability of establishing a conceptual framework for critical variables affecting the adoption of the innovation process within the energy industry.
Originality – Discussing the innovation process concerning project management and performance contributes to a broader understanding of a sustainable innovation process that supports expanding the oil and gas industry.

Keywords: Innovation · Process · organization · Oil · Performance · Project

1 Introduction

Project managers often consider their projects' success to be met if they completed the project on time or even ahead of schedule, within budget, and fully compliant with set scope and quality. This has notably been referenced as project triple constraints: Time, Cost, and Scope. (Shenhar & Divr, 2007) (Fig. 1).

It is difficult to define "Innovation" as a management competency since, in business terms, innovation is the translation of an opportunity to a doable and feasible product. Conventional project management models concentrate on delivering projects and achieving set deliverables with a well-defined set of measurable execution strategies and success criteria. Unfortunately, this was considered with inadequate attention to creative thinking, where opportunities for innovation generally center on a reflexive problem-solving mode. For example, during the execution stage and when the project manager faced risks, he generated a mitigation plan to avoid the consequences of such risks or minimize the adverse impact generated in the project (Gallagher, 2015). The paper aims

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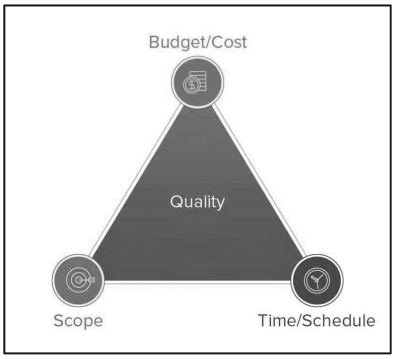


Fig. 1. Project Triple Constraints (Shenhar & Dvir, 2007)

to discuss the challenges and enablers that face diffusing innovation processes and measurements on performance and efficiency in the context of project management in the energy sector. The research aimed to answer the following question:

> *How does the Innovation Process contribution influence the performance and efficiency of the project management, considering the challenges and enablers for adopting innovation within the oil and gas sector*?

In subsequent sections, the study will explore two key areas: theoretical background and research framing. Theoretical background will comprise the literature review of the innovation theories, innovation process concepts and models, individual acceptance theories, project management, and critical enablers. The research framing will consist of theoretical framing, highlighting the existing researchers' studies concerning challenges and opportunities in adopting innovation systems within the oil and gas sector. Finally, the conceptual framework will be proposed for this paper, given the previous works conducted by introducing additional specific variables and dimensions related to the oil and gas sector.

2 Theoretical Background

The primary study dimensions to assess the key challenges facing the implementation of the "Innovation Process" within the ecosystem of the energy sector and the correlation between the adoption of "Innovation Processes" and "Individuals Acceptance" in the project management contribution.

2.1 Innovation Concept and Process

Innovation terminology creates something unique and valuable and adds new value to end users. Innovation is not synonymous with invention, which is related to generating new products; however, innovation is about creating value for customers. One interesting comparison of the two acronyms is that invention is the transformation of cash into

opportunities, while innovation is the conversion of ideas into revenue. (Burmester et.al, 2005).

The innovation process mainly consists of three main stages: the front end of innovation, product development, and implementation. The front end is a detailed stage focusing on several sub-elements in terms of problem definition, exploring ideas, scope generation, marketing assessment, and the final stage, resulting in building a feasible business case. The front-end phase is considered the most essential part of the innovation process for proceeding with options to be further considered in the following stages of development and commercialization.

2.2 Innovation Theories and Models

The field of innovation management is broad and has several facets. Although innovation is sometimes viewed as an ethereal idea, it is a diverse subject of study with many models, theories, and frameworks. One method to characterize innovation is to divide it into two groups depending on the market it serves and the technology it employs. The innovation matrix model allows us to see the most prevalent forms of innovation, as illustrated in Fig. 2. Incremental innovation only makes minor adjustments to an existing product formulation or service delivery strategy, making them marginally better than the prior iteration of the good or service. Disruptive innovation is widely used by various industries where a concept, product, or service establishes a new value network, either by upsetting an established or brand-new market (Christensen et al., 2013). On the other hand, sustaining innovation is market-based and, rather than developing new value networks by meeting consumer demands, enhances and expands existing ones. Finally, radical innovation is uncommon since it has traits of disruptive innovation but differs in that it utilizes both a novel business model and a revolutionary technology simultaneously (Linton, 2009).

Another critical theory that is considered the basis of establishing the conceptual framework of this paper is the diffusion of innovations theory (Fig. 3). It measures the flow of newly generated opportunities through an existing ecosystem. Initial research explored that diffusion ideas were widely spread within consistent social gatherings such as families and communities. The main drive of these early studies was to promote personal innovation by focusing on behavioral adoption. These studies were further developed to examine the diffusion of more complicated advanced technological innovation on a larger scale, such as business processes and information systems, such as the health sector and education organization (Ven et al., 1999).

Studies contended that the innovation adoption process is more complex in organizations than among individuals. The innovation process is categorized into five main phases, recognized in two leading platforms: initiation, which includes setting an outline, and implementation, which includes redefining/rearranging and clarifying. Given this theory, the new directives emphasized the recreation of the innovation tools to correlate to the organizational context to generate new practices for innovation that add value to the organization and contribute to success factors. However, recent research concerns the innovation process to cross firms' borders with a broader spectrum of external domains, including projects, markets, and environment (Rogers, 2010).

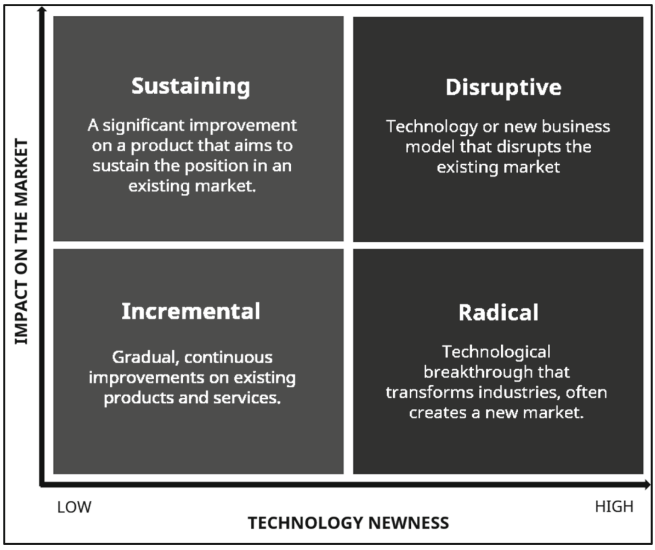


Fig. 2. Innovation Matrix (Linton, 2009)

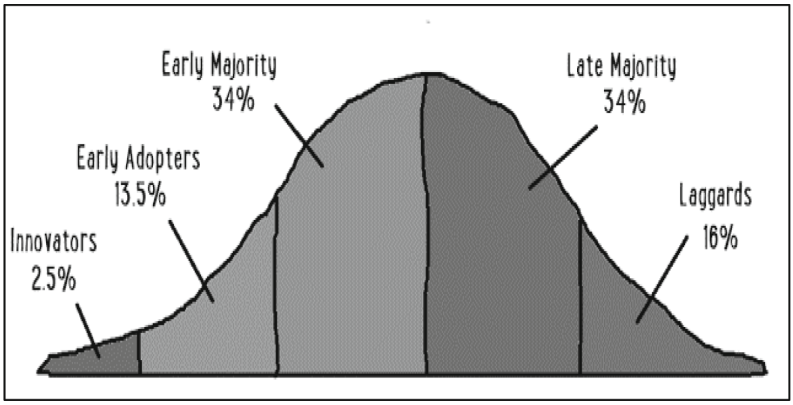


Fig. 3. Diffusion of Innovation Model (Rogers, 2010)

2.3 Individual Behavior Acceptance

The Theory of Planned Behaviour (TPB) has, since its development some 20 years ago, proved to be a powerful approach to explaining human behavior. It has been successfully applied to a wide range of behaviors. Interestingly, particularly complex behavior, such as managerial decision-making, saw only a few attempts to use TPB. Creativity thinking has been highly acknowledged as a primary component in driving employees' success and ensuring organizations' sustainable and viable advantage in fast-changing and challenging business environments (Anderson et al., 2014). Team climate for innovation is

considered one of the vital critical factors of employee creativity, emphasizing the support and reward of team efforts. However, earlier studies need more attention regarding the contribution of personality in influencing team climate for innovation.

3 Research Framing

3.1 Theoretical Framework

In several literature contexts, the emphasis on process innovation is characterized by two primary constructs: Technological and Organizational innovation. Technological process innovations are tangible outcomes, such as products enhanced through technical improvement processes with extra functionality and benefits. On the other hand, organizational process innovations are intangible strategies related to process establishment, work environment, cultural ecosystem, and creative thinking frameworks (Edquist et al. 2000). Theoretical framework formulation was conducted utilizing factor analysis and empirical research based on three main theories contributing to the influence of the Innovation process on project performance and success factors. This includes Institutional theory, behavioral theory, and attribution theory. The central underlying notion of institutional theory is that structures with formal procedures, standards, and regulations enforce an authoritative framework on social behavior and interactions where Organizational processes can either support or constrain innovation (DiMaggio and Powell, 2012). The behavioral theory emphasizes stability development by reducing misalignment and conflicts in achieving objectives by establishing strategies that comply with constraints. Companies' reaction to performance discrepancies is examined through attribution theory (Ford, 1985). The attribution theory arguments have shown a connection between the intensity of a problem-solving effort and the value and uncertainty of an output (Weiner, 1986). Senior managers should consider innovation a viable remedy in the event of organizational decline, provided causal attributions relating to the stability and controllability of the fundamental causes are made (Rahimi et al., 2018). During the project life cycle, from initiation to the completion and handover, the project manager will dynamically generate all possible opportunities and ideas that add value to ensure achieving the set targets and objectives results are achieved. Due to the fluctuation in the market condition, fast technological progress, population growth, and high resource demand, innovation has become a core competency for project managers.

On the other hand, organizations face challenges in developing and implementing a robust innovation process as part of their ecosystem, such as (Gallagher, 2015): Risk, resistance to implementing new ideas to avoid risks to the organization and maximize the utilization of proven practices. Lack of knowledge means that many organizations need the tools to be innovative, so they cannot develop new ideas. Time constraints, where organizations adopt "reaction mode" "troubleshooting" problems, leave an inadequate period for creative thinking, innovation, and root cause analysis. Creativity is time-consuming, where the mind should expand thinking about the problem and imagine solutions from a different dimension with proposed links for the final compelling idea for implementation. Organizational structure and size research has shown that once companies get large, they become less risk-tolerant and less willing to innovate (Deeb, 2014). Innovation mandates a culture of collaboration to be an organization's DNA,

enforces the importance of creative thinking, and is based on team skills and expertise rather than their positions and authority. Influencing and building trust from leadership must be conducive to encouraging the implementation of the innovation process within the organization (Larson, 2015). Figure 4 illustrates the summary of the theoretical framework.

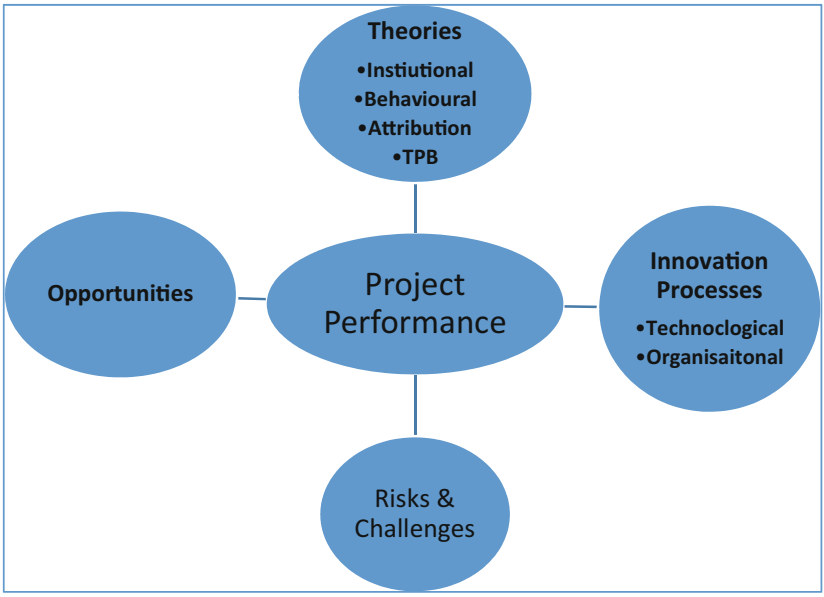


Fig. 4. Theoretical Framework for Project Performance in the context of Innovation Process, risks, opportunities, and theories.

3.2 Conceptual Framework

According to Rogers' theory of disseminating innovations, five factors—relative benefit compatibility, complexity, trial-ability, and observability—influence the acceptance rate. In this paper, we added a third attribute that needs to be tested: individual acceptance influence on the contribution of the innovation process. Thus, it is determined that the dependent variable is the performance defined in terms of financial performance, and the independent variables are a technological factor, organizational factor, and individual behavior factor. Four central hypotheses were developed as follows:

Technological Factor

O&G relies on proven technology to monitor and control process facilities and remotely develop large-scale database and security systems (Lappi et al., 2019). The smooth and effective integration of robust, high-speed, reliable, friendly use, and maintenance-free technology will strengthen the buy-in from all stakeholders in adopting the innovation

process within an existing business model. This will positively accelerate decision-making, expedite deliverables completion, faster communication, time-saving, high efficiency, and maximum productivity (Almarri K., 2023).

Therefore, the first hypothesis is speculated as follows:

H1: Technological factors will influence the adoption of the innovation process

Organisational Factor

Adopting an innovation process in the majority of an organization may lead to paired contrast impact, generating a motivation for innovation development, but on the other side, causing outrage in the business that could lead to risks. The continuous nature of innovative changes requires organizations to involve all available resources in the innovation process constantly. However, their size could be improved and sometimes needs to be improved to achieve consistent innovative transformations in the economic system. This causes the emergence of many stochastic processes that, due to their unpredictability and weak controllability, negatively affect the effectiveness of innovations (Zotov et al., 2020). Therefore, the second hypothesis is speculated as follows:

H2: Organisational factors will influence the adoption of the innovation process

Individual Behavior Factor

Personality differences are affecting the adoption of the innovation process. Individual willingness to try new things and risk aversion influenced the promotion of creative thinking. A positive attitude adds value to the business unit, company/firm, or industry. Individual behavior includes several factors such as motivation, trust, mindset, fear, social norms, self-image, risk perception, familiarity, acceptance, agility, etc. (Robert and Flin, 2019). Therefore, the third hypothesis is speculated as follows:

H3: Individual Behaviors influence the adoption of the innovation process

Project Performance

The hypotheses consider one of the two intellectual streams: essential (in need) and available. The essential stream claims that low-performance organizations or projects strive to implement innovation to improve adverse circumstances (Amabile & Conti, 1999). One of the primary project performance indicators is financial performance in terms of return on assets (ROA) as a profitability ratio to measure financial success. In contrast to, for example, return on equity, ROA is more relevant as a profitability indicator since it illustrates how assets or resources are used to create revenue instead of investments because oil and gas firms are often capital intensive (Merrow, 2012). Therefore, the fourth hypothesis is speculated as follows:

H4: Innovation Process will positively affect project performance (Fig. 5)

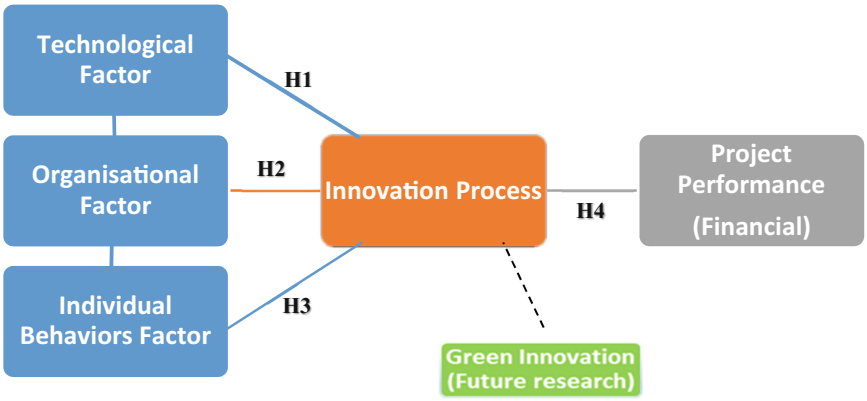


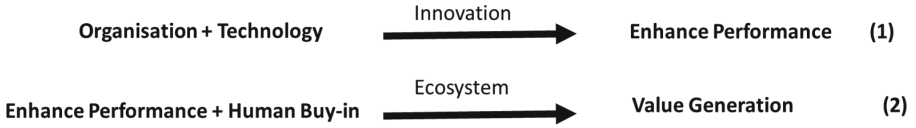
Fig. 5. Proposed Conceptual Framework

4 Discussion

Positive disruption is a crucial initiative for the organization to shift from a status quo slow position to a transformational era with high momentum in terms of productivity and efficiency. Despite the firm or organization scale, project practitioners are the engines of innovation. In the majority of organizations, the ideation process is the simple stage. However, converting those ideas and opportunities into feasible concepts and then upgrading them to the final product or service.

In order to manage a breakthrough or innovative project, it is essential to blend new ways of thinking with familiar processes. Oil and gas are innovation attraction sectors where critical businesses require safe and cost-effective solutions to meet the worldwide strategic growth plan. The research recognizes four opportunity stages to integrate the innovation process within significant projects, including the Bridging stage, an initiation stage consisting of preparation during front-end planning. It integrates innovative practices, technologies, and organizational processes to enhance project performance. The engaging stage focuses on creating an innovative incentive scheme for engaging stakeholders, establishing simplified tendering and contracting prices, and generating a reward scheme with creative thinking, crowdsourcing, and innovative solutions. The leveraging stage takes place post-contract award, and the entire supply chain is generated. Establish a platform with all stakeholders to develop new opportunities, improve practices, and enhance technologies. Finally, the exchanging stage falls after project completion, where lessons learned, and innovation history are communicated among the entire organization ecosystem to share experiences for future growth (Davies et al., 2014). The literature review observed a strong relationship between the organization, technology, and innovation in promoting digitalization and Artificial Intelligence as critical contributors to the firms' performance enhancement. With its iterative nature, the agile approach to project management could be ideal for creative projects with a high degree of uncertainty.

Other theories emphasize the level of acceptance and buy-in from the human factor, including leadership support and employee engagement to adopt innovation and technology within the ecosystem of the organization for value generation. The following relationships are:



One **limitation/gap analysis** in this study that needs further development and exploration is the correlation of "Green Innovation" within the Oil and gas sector on the company's performance. The link between green innovation and the market for energy-related products has drawn more attention as environmental consciousness has grown. Miao et al. (2017) state that green innovation can increase energy usage effectiveness. In addition, the transfer of advanced technology is advantageous for lowering total energy consumption and intensity (Waheed et al. 2021).

5 Conclusion

Researchers examine the diffusion results and implementation processes to understand better and increase the market acceptance rates of innovations. The majority of organizational innovation study has been on bureaucratic companies that are hierarchically constituted and competing in single marketplaces. Organizational climate, culture, and climate-related elements impact an organization's innovation ability. People are where innovation begins. They could be in management or professional employment. Thus, it is critical to maintain their innovation-related motivation. The culture of their workplace also impacts people. Workers' inventive behavior would also be influenced by how they feel about their organization's support for innovation. In order to implement the creative atmosphere, several aspects must be prioritized, including challenging work, freedom to think and adapt, time allotment, leadership support and encouragement, learning from errors, involvement, and trust-building (Prather, 2000).

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Soft Law in International Investment Law

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Abstract. This paper aims to analyze the concept of soft laws and its significance in international law with special emphasis on its effect on international investment law. In this paper, the authors have relied upon the works of legal scholars and arbitral jurisprudence to understand their observations about the role of soft laws and apply such observations to the present times to analyze the strengths and drawbacks of soft law in the current international investment law context. The paper argues that although formally non-binding, yet in practice soft law instruments do influence the behavior of states and foreign investors either directly or indirectly. They also play a significant role in the formulation of international law by serving as precursors to the formulation of binding rules by states or by developing the rights and obligations of the parties mainly through interpretation of vague or open-ended investment treaty provisions by arbitral tribunals.

Keywords: Soft Law · Hard Law · International Law · Non-Binding · Treaty · Investment Law · ICSID

1 Introduction

International investment law (hereinafter referred as "IIL") and Investment related dispute settlements have shifted from the periphery of international law to its core over the course of past few years. And in the process of becoming the epicentre of the international regime it has also actively shaped the international law while adapting to its predetermined structures and notions. There is an ongoing debate among scholars about the role of soft law in international investment law. The Authors in this paper argue that the importance of soft law in international investment law has grown exponentially and that states and international organisations frequently and purposefully select softer forms of legalization as superior institutional frameworks in today's day and age.

1.1 Research Objectives

- To examine the nature and characteristics of soft law instruments in international investment law.

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- To analyze the role of soft law instruments in promoting harmonization and cooperation among states in the field of investment.
- To assess the level of compliance and implementation of soft law instruments by states in international investment law.
- To identify the strengths and limitations of soft law instruments in addressing contemporary challenges in international investment law.

2 Research Methodology

The authors have conducted a thorough review of academic literature on the topic. This involved studying scholarly articles, books, and other publications that discussed the concept of soft law in the context of international investment law. Secondly, the authors engaged in the analysis of relevant case laws and regulations. This entailed examining judicial decisions and legal provisions that are related to soft law in international investment law.

Overall, by employing a doctrinal research methodology, the authors have gained comprehensive insights into the concept of soft law in international investment law, its sources and forms, and the challenges and limitations it poses in practice.

2.1 What are Soft Law Instruments?

There is no consensus on a standard definition of soft law. Lord Arnold McNair, first president of the European Court of Human Rights coined the term "soft law". (Fabián Augusto Cárdenas Castañeda 2013) Hard law refers to precise legally binding obligations and that can delegate authority for interpreting international law. From this perspective, hard law is considered as the sources of international law mentioned in Article 38 of the International Court of Justice (ICJ) Statute. The realm of "soft law" begins once legal arrangements are weakened along one or more of the dimensions of obligation, precision, and delegation. This softening can occur in varying degrees along each dimension and in different combinations across dimensions.

For example, in 2005, Michael Joachim (Joachim 2005) defined "Soft law" as the normative instruments of law that have virtually little to no legal obligation and are imposed due to voluntary acceptance of the states. In other words, Joachim ascribes no legal weight to soft law in the absence of voluntary acceptance of the instrument by states (Weil P. 1983). On other spectrum, Meyer (Meyer T, 2010), defines soft law as *"those international obligations that, while not legally binding themselves, are created with the expectation that they will be given some indirect legal effect through related binding obligations under either international or domestic law."* (Zimmermann A. 2021; Dinah 2009; Gabrielle Kaufmann-Kohler, 2010; Richard Baxter 1980).

For purposes of this paper, the authors use the shorthand term soft law to distinguish this broad class of deviations from hard law—and, at the other extreme, from purely political arrangements in which legalization is largely absent. Soft law comes in many varieties: the choice between hard law and soft law is not binary (K.W Abbott and Snidal 2000, pp. 54).

2.2 Characteristics of Soft Law

(i) Soft law is not legally binding: Against customary international law such as treaties, soft law is non-binding. It is not decisive like treaties. Soft law cannot be in a decisive form. Non-binding agreements such as the Helsinki accords will be considered soft law. The nonbinding character of soft law can be altered when it interacts with treaties.
(ii) Soft law will not contain rules: soft law will not create clear obligations such as rules. It will contain only principles and norms.
(iii) Soft law is not readily enforceable: soft law is not enforceable through binding dispute resolution (Kaufmann-Kohler, 2010).

The legal effect of different soft law instruments is not the same.

Even if these are the general characteristics of soft law at certain times, they acquire the characteristic of the hard law such as treaties while in an application. While the legal effect of different soft law instruments is not necessarily the same, it is characteristic of all of them that they are carefully negotiated and often carefully drafted statements, which are in some cases intended to have some normative significance despite their non-binding (Boyle A 1999, pp. 906).

3 Types of Soft Laws

Different forms of soft law can be used based different factors. Generally, based on the functions soft law may be categorized into two types primary and secondary (D. Shelton 2008).

Primary soft law addresses the international community as a whole adopting organization. Primary soft law often functions as an intended precursor to the adoption of a later treaty or a customary form. It includes Draft Multi-Lateral Treaties, Model Treaties, Model Laws.

Secondary Soft laws are instruments designed to fill the vacuum. These documents might from various groups such as governmental non-governmental or private parties. They might be used to fill the gaps deliberately left in hard law (D. Shelton 2008). It includes Resolutions, Principles and guidelines, Decisions of tribunals, Restatements of law institutes, annotations and commentaries on different treatise.

4 Functions of Soft Law

Due to technological changes and globalization, international law has become complex, and the traditional international hard law is not adequate to meet the requirements to accommodate the growing complexity of international relations. Soft law plays an important part in the international regime and it does so in a variety of forms (Jean d'Aspremont 2008 pg. 1081).

(i) **Functions as a guiding light to fill in the gap created as result of absence of treaty law**

Soft law is often used as a guiding light by international courts and tribunals when there is an absence of treaty law to guide their functions. Soft law tools provide for a compliance regime for both national and international players (D Shelton 2004). Soft law helps the players to adapt to the rapid changes in the international law, soft law instruments are therefore very malleable and useful to fill the gaps in the international law and often considered as a close substitute to the treaty law (F. Sindco 2006).

The changing attitude of the judiciary towards soft law instruments can be clearly observed in the case of Qatar-Bahrain Maritime Delimitation where the court was of the opinion that any soft law instrument can have a binding effect and, the classification between hard and soft law is not only on the basis of it being a treaty or not. (A. Boyle 1999) this view of the court was echoed in the case of Richardson v. Forestry Commission as well as the Common wealth vs. Tasmania (M. Chinkin 1989). Furthermore the Nicaragua Case, Gabickovo-Nagymaros Dam Case and the Nuclear Weapons Opinions are supplementary examples of how the judiciary has echoed the use of soft law instruments in forming a more binding effect by supporting the customary law (A. Boyle 1999). In the context of international investment law, tribunals have relied on soft law to fill-in gaps in procedural and substantive applicable laws.

The binding effect of these soft instruments varies in different cases, like in the case of Interocean Oil Development Company and Interocean Oil Exploration Company v. Federal Republic of Nigeria where the soft law instrument was given a full binding effect, or in the case of Fouad Alghanim & Sons Co. for General Trading & Contracting, W.L.L. and Fouad Mohammed Thunyan Alghanim v. Hashemite Kingdom of Jordan wherein soft law instruments were functioning in the role of guiding principles without completely binding the parties (A. Boyle 1999).

With changing times, the ICSID has also come to recognise the IBA guidelines as an essential reference and apparatus in implementation of international regime in the case of Total S.A. v. Argentine Republic (A. Boyle 1999). Total S.A. v. Argentine Republic and Alpha Projektholding GmbH v. Ukraine are examples of cases where procedural soft law was used in international investment law.

(ii) **Functions as an aid for interpreting and reinforcing treaty law**

Soft laws such as recommendations, resolutions, standards and decisions of other tribunals are used to interpret the meaning of terms used in treaty law (A Boyle 1999). Soft law explains and clarifies treaty law that is ambiguous in nature by either clearly ambiguous terms of the treaty or by providing the clear purpose for which the treaty is implemented, this supplementary nature of soft law is clearly visible in the rules for protection of foreign investment (J. Friedrich 2013).

In recognition of their limited legitimacy, investment tribunals would like to be seen to decide cases based commonly accepted principles rather than based on their idiosyncrasy or personal views. By demonstrating that their decisions are in accord with such principles, perhaps as elaborated by other tribunals, it helps enhance the legitimacy and credibility of the tribunal (Thomas Walde 2004; Moshe Hirsch, 2011; Zimmermann, 2021). This is illustrated in the observation by the tribunal in

Saipem SpAv. People's Republic of Bangladesh, ICSID Case No. ARB/05/07, 21 March 2007, para. 67:

Furthermore, substantive soft law can be used to guide interpretation of investment treaties, provide guidance on issues such as sustainable development and corporate social responsibility, and environmental protection. *Copper Mesa v. Ecuador* and *Philip Morris v. Uruguay* are examples of cases where substantive soft law was used in international investment law.

In *Copper Mesa v. Ecuador* (PCA Case No. 2012-2), The tribunal considered a range of soft law instruments to determine the content of the BIT's provisions on fair and equitable treatment and expropriation. In *Philip Morris v. Uruguay* (ICSID Case No. ARB/10/7), The tribunal considered a range of soft law instruments, to determine the legitimacy of Uruguay's measures under the BIT's provisions.

And in *Urbaser S.A and Consorcio de Aguas Bilboa Bizkaia Ur Partzuergoa v. The Argentine Republic,* ICSID Case No. ARB/07/30, Award of 8 December 2016, the tribunal relied on soft law instruments in holding that human right to water is an obligation that binds foreign investors as it does State actors.

The aforementioned cases demonstrate investment tribunals are used soft law for interpreting the investment treaty standards (Giovanna Adinolfi 2021).

(iii) **Functions as a precursor to treaty law**

The adoption of soft law instruments may serve as precursor to treaties or hard law. Soft laws such as conventions and resolutions can use as a tool for future negotiations. (A Boyle 1999, Zimmermann, 2021) Nonbinding documents are initially used as the first step for adopting treaty law. The reasons for that step include the state's freedom to adopt more progressive norms (AcKiss/D Shelton 2004).

In the context of international investment law, parties to some of the more recent bilateral and multilateral treaties have for example, incorporated some soft law standards. While some of these standards were incorporated in the Preamble of treaties, which suggests that they were probably meant to have non-binding effect rather than binding others were incorporated in the substantive parts of the treaties, which suggests that they were probably meant to be binding or serve as applicable law in the event of a dispute just as the other substantive standards except if the terms used by the State parties to the treaty are hortatory (Adinolfi 2021; Korzun 2023; Jean-Michel Marcoux, 2021).

(iv) **Functions as a collaborator with hard law to produce customary international law**

Soft law instruments collaborate with hard law to provide a foundation for creation of customary law in the international regime. Treaty law applying or referencing the soft law has increased the interaction between soft law and customary law (J. Charney 1993, Zimmermann 2021). In the recent times this interplay has been evident as not only the treaty law but the soft law instruments are used as well to establish the existence of law (T. Treves 2010; Adinolfi 2021; Korzun 2023). The decisions of the ICJ to rely on resolutions to support its decision are an example of the increased importance of soft law in the international customary law (A. Boyle 1999). The Court also upheld the role of soft law instruments in laying down the foundation of customary law in the Nicaragua Case m (M. Chinkin 1989).

5 Strengths and Weaknesses of Soft Law

5.1 Strengths of Soft Law Instruments

Soft law instruments are gaining prominence in the international legal regime as opposed to the more accepted treaty law because of the following reasons:

1. *Soft law is flexible* (C. Lipson, 1991): Soft law is flexible as it allows easy procedures for amendment to comply with the ever changing international legal regime (J. Smith 1984).
2. *Soft law enables quicker and more detailed agreement*: As compared to the binding treaty law, soft law enables the parties to reach to a quicker agreement. As it does not have to follow the legal, financial and procedural constraints and therefore the process of adopting soft law is swifter.
3. *Soft law enables the state players to collaborate on a deeper level*: soft law instruments enable the state players to keep the objective of collaboration at the forefront without worrying about the consequences.
4. *Soft law limits the consequences of non-compliance*: Soft law does not specify any requirement for obligation and therefore there are no consequences of non-compliance. (M. Chinkin, 1989).
5. *Soft law enables the state players to adopt the law while retaining their autonomy*
6. *Soft law is financially efficient*, as the cost of adopting it and the cost of amending or abrogating it is minimal as compared to the treaty law.

5.2 Weakness of Soft Law Instruments

Soft law is flexible in the sense that it allows easy procedures for its implementation and amendment, however this also means that they are a more informal instrument of law to and there are no harsh consequences to noncompliance. (M. Chinkin, 1989). As compared to the binding treaty law, soft law does not require the state players to incorporate the soft law into their domestic regimes, as a result the soft law may at times be conflicting to domestic laws of state players.

6 Conclusion

The international legal regime, is not a simple straightforward regime, there is no black and white when it comes to soft law. The International Legal Regime requires its instruments both soft and hard to adapt and provide solutions for the challenges that arise due to the ever-developing nature of the International Regime. Over the course of this article, the author has tried to establish that there is an emergence of shades of grey when it comes to the role of soft law instruments in the International Legal Regime, and that soft law is no longer classified only on the basis of it not being a treaty. The authors during the course of this study have highlighted the increasing importance of soft law instruments and our Analysis on the Role of soft Law instruments in the international Investment law has resulted in understanding that the effect of the traditional disadvantages of the soft law have subsided in that, soft law is no longer only a non-binding instrument which is

utilized by the state and international players to avoid the consequences of hard law as soft law generates binding effects on the key players in international investment process. Upon analysing the current situation of the soft law in the international investment context, we shall agree with the opinion of Irit Mevorach that traditional concepts of hard law and soft law regarding implementation are misleading and inaccurate. Our analysis suggests that the distinction between hard and soft law is more nuanced than binary.

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The Impact of Workforce Agile Behavior on Organizational Innovation Performance for Manufacturing Enterprises

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Abstract. Purpose - This paper intends to study the relationship between workforce agile behavior and organizational innovation in manufacturing enterprises. The research focuses on the impact of three characteristics of workforce agility (proactivity, flexibility, and resilience) on organizational innovation performance using the planned behavior theory (PBT), with a particular emphasis on product and process innovation.
Methodology - The research of this paper uses the theoretical background for the selected topic to propose a conceptual research framework to improve manufacturing enterprises' innovation performance by understating the significance of workforce agility.
Findings - The expected outcome of the paper is to understand the relationship between agility in the workforce and innovation performance in manufacturing organizations. It can show the positive impact of a proactive, flexible, and resilient workforce in manufacturing enterprises to guarantee continuous growth in the rapid market landscape.
Implications - This study can support leadership and employees in the manufacturing sector to understand the importance of providing agile capabilities in the work environment to improve innovative organizational performance, sustain competitive market advantage, and respond to internal and external changes.
Originality/value - The paper addresses the literature gap on how organizational innovation can be influenced by workforce agility behavior in the manufacturing sector and helps understand the significance of agility practices in sustaining competitive advantages.

Keywords: Organizational Agility · Workforce Agility · Agile Manufacturing · Organizational Innovation · Theory of Planned Behavior (TPB)

1 Introduction

Agility is becoming increasingly vital for all businesses in today's highly competitive and consistently changing economic landscape. Organizational agility (OA) has emerged as one of the valuable organizational paradigms managers should follow to generate sustainable competitive advantages and as a critical business success factor (Teece et al. 2016).

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An increasing number of researches show that business enterprise and R&D investments improve innovation; however, a recent study emphasizes the importance of OA in driving corporate innovation and competitiveness (Franco & Landini 2022). In addition, Sherehiy et al. (2014) address that for a few decades, academia and industry have been concerned with how organizations can effectively adapt to unpredictable, dynamic, and continually changing surroundings. Nevertheless, there were minimal empirical studies on the relationship between agile organizations and agile workforce behavior as drivers of innovation. According to Breu et al. (2002), the success of an agile organization results from the strategic application of individual competencies and behavior toward agility. Nevertheless, no studies have examined workforce agility (WA) from an attitude perspective, showing people's intention to behave agilely (Asari et al. 2014).

Moreover, there is less attention to the significance of WA as a driver of organizational innovation success, even though it is an essential organizational dimension (Franco & Landini, 2022). The impact of WA on organizational innovation performance has received less research attention in the manufacturing industry (Franco & Landini 2022). As a result, this study aims to view different frameworks related to agility and workforce behavior in originations. Also, to understand how organizational innovation performance in manufacturing enterprises correlates to WA. Studying the impact of WA in agile manufacturing on innovative organizational performance, it provides insights into how these enterprises' employees' capabilities may affect their agile behavior to remain competitive in the dynamic markets.

To address this gap, the paper investigates the relationship between workforce behavior toward agility as a critical component of OA to improve organizational innovation performance and sustain competitive advantage. Therefore, the paper attempts to address the below research questions:

(1) What are the different interrelated frameworks and research models related to agility in organizations, the workforce, and the manufacturing sector?
(2) What is the impact of workforce agile behavior in agile organizations on their innovative performance in the manufacturing sector?

The paper will review the literature on agility frameworks, OA, the agile behavior of the workforce, agile manufacturing, and organizational innovation performance. Then, the theoretical framework related to the topic will be explained and linked to the selected variables, followed by the hypothesis related to the research model.

2 Theoretical Background

2.1 Overview of Agility Frameworks, Agile Organizations, and Agile Manufacturing

Several academics established frameworks and models to examine agility and its features in various contexts to adapt to the market's quick change. As a result, these frameworks and models range in content and structure, which leads to organizationally distinct definitions of agility (Zitkiene & Deksnys 2018). According to the review of previous research on agility by Wendler (2013), it is claimed that there is no consensus regarding

this concept definition, which leads to limitations and challenges in executing large-scale empirical research concerning different contexts or fields. The scholar categorized agility frameworks into four domains. The first two can align with industry and technology (agile manufacturing, agile software). The second one is related to organization and human resource management (agile workforce and agile organization which receive less attention than the rest. Agility frameworks share important organization management concepts like organizational culture, workforce, capabilities, and technology.

However, there is less research on integrating and developing an integrated and holistic agile enterprise concept, including more than one domain. Although enterprise agility started with agile manufacturing idea creation, OA received the most interest lately once agile software development got recognition. Consequently, this illustrates the rising interest in agility's impacts on the entire organization, not just functional or structural areas (Wendler 2013). Zitkiene & Deksnys (2018) developed an OA model based on the most thorough and comprehensive framework of agile manufacturing proposed by Sharifi et al. (2001) to evaluate OA after intensive research and systematization of the literature on this topic. The framework combines agility drivers, enablers, capabilities, and practices sustaining competitive advantage in today's dynamic market. Organizational adaptability begins with identifying and implementing agility drivers. After recognizing the change, decision-makers should assess the situation. After creating the inventory, company decision-makers should use enablers and capabilities to adapt to environmental factors. The outcomes create new products and practices to alter operations for the best innovation and results.

Sherehiy et al. (2014) suggest more review and attention to organizational flexibility and workforce adaptability research in industrial and organizational mindset or organizational growth and behavior. So, the ability of an organization to quickly and effectively shift its resources to higher-yielding activities that create and protect value for environmental factors can describe OA (Teece et al. 2016). Therefore, the dynamic capabilities framework is frequently utilized in OA because it illustrates interrelationships that managers must understand to establish and maintain competitive advantage. It aids in setting priorities and ensures alignment between the organization's strategy, structure, and operating environment. Sensing, seizing, and transformation are the three essential dynamic characteristics that organizations need to be agile. Sensing entails recognizing changes in the market and environment, grabbing new possibilities, and transforming entails altering organizational procedures and structures to accommodate the shifting environment (Teece et al. 1997).

2.2 Workforce Agile Behavior and Manufacturing Sector

To better understand the impact of agility in organizations and WA, researchers try to understand and define the relationship between them. According to Breu et al. (2002), WA is recognized in the early 2000s by focusing on two main dimensions (speed and flexibilityThe concept of agility includes both adaptability and flexibility as qualities, and agile organizations incorporate all core elements from the concepts of adaptable and flexible organizations. Abrishamkar et al. (2021) examine the extent to which the new innovation of products favorably affects the link between WA, which raises the possibility of businesses becoming top performers in the high-tech manufacturing sector

of a developing economy. WA is necessary for organizational and manufacturing agility. Raisch & Birkinshaw (2008) demonstrate that agility in the workplace is the individual's ability to rapidly and successfully adapt to new situations. On the other hand, Franco & Landini (2022) explain WA as an organization's ability to reallocate resources quickly and effectively from non-value-adding tasks to those that create value, emphasizing innovative resolutions to challenges.

Sherehiy et al. (2014) illustrate that successful businesses in unpredictable business environments need WA in their WA model. Also, WA implies a workforce with three essential factors (proactivity, flexibility, and resilience) in handling unplanned and unusual situations. These characteristics are the main components of WA since it is empirically proven to positively impact new product innovation in the manufacturing sector in Iran (Abrishamkar et al. 2021). Similarly, A study of several Indian industries, including those in the manufacturing and service sectors and the public and private sectors, indicated that agile organizational strategies and practices that support WA could improve the agile characteristics and behavior of the workforce (Muduli 2016). Previous scholars used different frameworks to support their research, like the dynamic capabilities framework and theory of planned behavior (PBT). Alavi & Wahab (2013) divide the study in this area into two groups (agile manufacturing models and practices reaches) and suggest future research to look at the influence of WA on the behavior of organizations and employee performance. Ajgaonkar et al. (2021) view WA as a high-level approach under the dynamic capabilities framework since they develop a conceptual model heuristically of WA drivers connected with the framework components. Sensing, seizing, and constant renewal help organizations make decisions including relocation of external and internal human resources. According to Tessarini Junior & Saltorato (2021), relatively few empirical studies have been done, making it difficult to arrive at a single definition and classification for WA. Moreover, a theoretical model is developed for an agile workforce based on Ajzen's theory of planned behavior (TPB) to examine the relationship between agility and workforce attitude/behavior using TPB (Asari et al. 2014). TPB shows how attitudes, subjective norms, and perceived behavioral control affect people's actions, improving understanding and predicting human behavior (Ajzen 1991). However, the theoretical model proposed by Asari et al. (2014) is not empirically tested despite the significant study analysis. This paper will use the TPM to explore the impact of workforce agile behavior of manufacturing enterprises on innovative performance.

2.3 Agility and Organizational Innovation Performance

Research on innovation generally agrees that it is the main driver of economic growth, competitive advantage, the industrial revolution, and public service highly requires innovation practices (Evangelista & Vezzani 2010). Cai et al. (2019) argue that the ability to innovate depends on the availability of human resources that may be redirected or reassigned to assist organizations that develop new products or services. Thus, Franco & Landini (2022) investigate how WA can influence innovative performance as a distinct component of the organization's success. Also, the agility of the workforce is a critical aspect in triggering behavioral motivations to perform innovatively, which positively

influences product and process innovation. According to Yildiz & Aykanat (2021), innovation is the best way for businesses to adapt to quickly changing circumstances in complex structures. The scholars suggest splitting technical (new products, new manufacturing) and non-technical (new marketplaces, new approaches of organization) structures to eliminate the complexity and achieve the desired innovative performance. The scholars' research shows that organizational innovation is crucial in the relationship between agility and firm performance since it directly impacts the business's performance and adaptability to changing conditions. Nevertheless, the literature on organizational innovation is limited compared to other types of innovation despite its importance and the focus on technology and process innovation. (Phan 2019). For example, an empirical study showed that firm agility significantly mediates the link between big data analysis use and innovation performance (ZareRavasan 2021).

3 Theoretical Framework

After reviewing the literature on the most relevant theoretical framework related to the research topic, this paper mainly utilizes TPB as the theoretical framework to study the impact of agile behavior manufacturing enterprise workforce on organizational innovation. The first factor of TPB influencing behavior is an individual's intentions, which represent their readiness to engage in a particular behavior. The subjective norm is the second one, and it expresses the subjective experience of social pressure to engage in or abstain from the behavior. Perceived behavioral control, which measures how much one believes behavior is under their control, is the third factor that influences intentions (Ajzen 1991). Several researchers extend the TPB to investigate individuals' intentions and organizational behaviors. Moreover, Jimmieson et al. (2008) argue that the researchers can utilize the framework to understand better the antecedents of employees' intentions to support an organizational change event behaviourally and decide if a behavior will be taken in response to market changes. Therefore, the three factors of TBA can predict employee support for organizational changes in the surrounding landscape to sustain competition.

Agile behaviors consider deliberate action based on a personal objective of the workforce; consequently, internal and external perceived control impacts it. The behavioral components of agility, such as flexibility and adaptation, have received much attention in WA research (Asari et al. 2014). Furthermore, the absence of flexible resources and competencies might hinder achieving agility in organizations. WA is a component that demonstrates how the workforce will behave in the workplace at the time of change through specific factors such as proactivity, adaptability, and resilience (Milicevic et al. 2022). Yildiz & Aykanat (2021) highlighted it has been demonstrated empirically that speeding up the introduction of new innovation (products and services) by organizations has a beneficial impact on their ability to perform effectively. Also, agility allows enterprises to respond swiftly to market variations by modifying the amount of items supplied, how often new models are promoted, and the number of new products released. To be able to provide a conclusive response to the paper questions, the impact of workforce behavior toward being agile in dynamic using the three factors will be studied.

4 Research Model

This paper suggests a research model based on TPA since the model offers the theoretically relevant foundation for devolving propositions that support the research variables. The proposed model focuses on the relationship between the behavior of the workforce toward agility (proactivity, adaptability, and resilience) and the innovative performance of manufacturing enterprises (product and process innovation). Because agility illustrates how organizations use speed, flexibility, innovation, and quality to compete, it may assist them in using flexible resources and best practices to deliver client-driven goods and services in a fast-changing environment (Yusuf et al. 1999). Breu et al. (2002) address a significant gap in the research on agility by delivering the first empirical study to analyze the impact of OA pressures on the workforce. Agility studies used adaptive and flexible organization concepts and approaches yet lacked essential organizational and management enhancements, such as human resources.

Most of the research on WA has focused on the effects of training and incentives on employee behavior. However, there is limited research on the causes and impact of this field (Sherehiy et al. 2014). Proactivity describes a circumstance in which an individual promotes actions that have a favorable effect on a modified environment. According to Sherehiy et al. (2014), Adaptability in business is the ability to follow many companies' plans and tactics while quickly switching from one work, job, or strategy to another. These techniques must deviate to the extent that it does not jeopardize the organization's integrity or fundamental objectives. So, to execute several duties, switch between roles with ease, and work concurrently on many tasks in various teams, manufacturing businesses must have a workforce with flexible behavior. The capacity for a person to perform under persistent stress despite significant changes in the workplace is known as resilience. As a result, individuals exhibit a positive attitude toward changes, innovative ideas, technology, and a capacity for managing stress (Milicevic et al. 2022). Thus, the following hypotheses are suggested based on these arguments:

H1a: Workforce proactivity behavior positively impacts manufacturing enterprises' product and process organizational innovation.
H1b: Workforce adaptability behavior positively impacts manufacturing enterprises' product and process organizational innovation.
H1c: Workforce resilience behavior positively impacts manufacturing enterprises' product and process organizational innovation.

The relationship between workforce agile behavior in agile organizations on their innovative performance in the manufacturing sector is represented in Fig. 1.

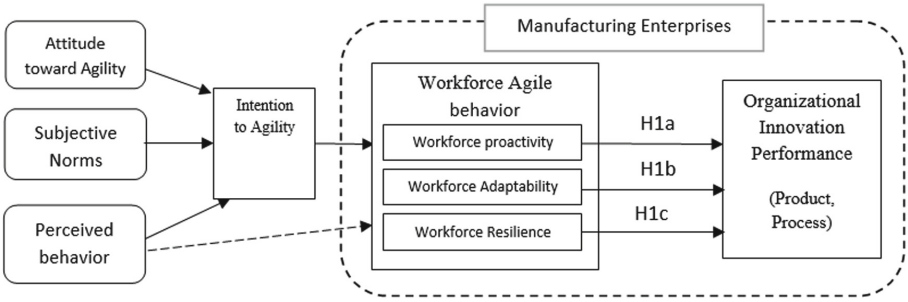

Fig. 1. The Research model representation

5 Discussion and Conclusion

The paper investigates the existing literature on agility in general and agile WA factors (proactivity, adaptability, resilience) that can impact agile manufacturing enterprises' product and process innovation. The selected WA factors result from agile intentions and behavior based on the TPB. It contributes to the body of knowledge by examining the nature of this relationship and linking the selected variables to the existing literature since there is limited focus on studying the impact of agile behavior on the workforce. Moreover, the suggested hypotheses can prove the degree of the positive correlations between WA and the desired organizational innovative performance. As a result, an agile workforce can adapt more quickly to shifting markets and help accelerate the development of new products, services, and business models. The model can be empirically studied in future research to enhance the knowledge of agility. The proposed research model can be empirically tested with selected intervening variables, such as the sizes and ages of enterprises in the manufacturing sector in diverse regions of the world. The study can be conducted to examine the impact of agile behavior on employees' and organizations' innovative performance in the public sector. Also, the research model hypothesis can be extended to investigate the effect of intention to agility on organizational innovative performance. The result can help leadership create more comprehensive knowledge of the workforce's characteristics and traits to help with strategic agility planning, especially during a crisis.

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The Impact of Digital Knowledge Management on Organizational Performance

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Abstract. Digital knowledge management is one of the important components of the overall operations of the organisation, particularly in this digital era. It is comprised of three main components including digital knowledge creation, digital knowledge sharing and digital organisational learning in order to get maximum output in terms of financial and non-financial outcomes. This study particularly provides insights into the constructs of creating, sharing, disseminating, and learning on financial objectives such as profitability, return on investment cost saving, as well as non-financial objectives that include employee satisfaction, customer satisfaction and innovation. The Research will help us to evaluate whether digital knowledge management tools can have a positive impact on the overall organisational performance through digital technology that not only helps internal operations through digitised specifications as well as gains a competitive advantage in an external digital environment.

Purpose: The aim of the study is to investigate the overall effect of digital knowledge management on organisational performance particularly the purpose of the studies the impact of digital knowledge creation, digital knowledge sharing and Organisational learning on the overall performance that includes financial and non-financial outcomes.

Methodology: The methodology adopted in the study is based on the quantitative research approach utilising the survey data to get information on digital knowledge management practices and Organisation performance indicators.

Findings: The findings of the studies show a significant positive relationship between Digital knowledge management and Organisational performance in both financial and non-financial outcomes to enhance the overall performance of the organisation.

Implications: After evaluating all the data this study suggests that the organisation should protect prioritise and invest in digital knowledge management practices in audit in hands the financial and non-financial goals that include sustainable innovation, enhanced decision-making strategies and digital organisation learning.

Keywords: Digital Knowledge Management · Digital Knowledge Sharing · Digital Knowledge Creation · Organizational Learning · Organizational Performance

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1 Introduction

Organisations may face many challenges to enhance their productivity efficiently and effectively in such a rapidly changing environment of digitization. Due to this dynamic change organisations adopt digital sophistication that may include many digital tools to generate, collect, process, disseminate and store the vast amount of data in a well-organized and logical system. However, without the effective use of digital knowledge management practices, organisations may struggle to operationalise the knowledge assets into actionable insights that lead to innovation, productivity and low cost, hence overall performance.

Digital knowledge management (DKM) is a multi-dimensional process that involves the creation, sharing, storage and utilisation of knowledge assets through digital technology (Alavi and Leidner 2001). Digital knowledge management (DKM) is identified as one of the essential processes for many organisations to achieve and sustain a competitive advantage in a technology-reforming environment (Alavi and Tiwana 2003). Digital knowledge management the productivity of employees, which leads to overall organisational learning as well as customer satisfaction to boost the organisational performance (Cegarra-Navarro et al. 2016; Dwivedi et al. 2019). All though digital knowledge management is becoming one of the vital factor performance of organisations, there is still a lack of empirical research to show the relationship between digital knowledge Management (DKM) and Organisational performance (Li and Wang 2018). Though few studies have examined the relationship between digital knowledge management practices and other outcomes such as innovation or Information sharing, a thorough understanding of digital knowledge management practices on financial and non-financial outcomes is necessary to evaluate. This study particularly will examine the relationship of digital knowledge management comprising digital knowledge sharing, digital knowledge sharing and Organisation learning with the financial outcomes consisting of return on Investment, profitability revenue growth and non-financial outcomes that include employee satisfaction and innovation.

Overall, the significance of this study lies and its capacity to educate business organisations, and policymakers about the importance of digital knowledge management in this era of digitisation and to offer recommendations on how to effectively use digital knowledge management practices to improve overall organisational performance.

1.1 Problem Statement

Organisations massively rely on digital technology to manage their knowledge assets in the technologically advanced era. Digital knowledge management has emerged as one of the most important tools to create, store, disseminate, process, share as well as learn via different digital techniques. Digital knowledge sharing has been also identified as a medium to learn for enhancing organizational performance by fostering innovation, increasing employee productivity, and boosting customer satisfaction (Cegarra-Navarro et al. 2016; Dwivedi et al. 2019).

Despite the extensive benefits of digital knowledge management (DKM), many organizations scuffle to gain maximum productivity and manage knowledge assets in a competitive environment of digitalization. A survey by APQC (2019) found that only 39% of

surveyed organizations reported that they were effective at managing their digital knowledge. This demonstrates that many organisations may not be aiming to make the most of Digital knowledge management's (DKM) capacity to improve overall performance. Moreover, while there is growing interest in DKM, there is still a lack of empirical research on the impact of DKM on organizational performance. While some studies have examined the relationship between DKM and specific outcomes, such as knowledge creation and knowledge sharing, there is a need for a comprehensive understanding of the impact of DKM on financial and non-financial outcomes.

This study addresses the lack of empirical research particularly in the field of digital knowledge management more importantly the impact of digital knowledge creation, digital knowledge sharing and organizational learning on organizational performance in terms of financial and non-financial outcomes. The studies also highlight the prominent gaps by examining the relationship between digital knowledge management and organizational performance and providing insight into how organizations can implement digital practices to improve overall organizational performance.

1.2 Research Questions

1. How does digital knowledge creation impact organisational financial and non-financial performance?

2 Literature Review

2.1 Digital Knowledge Management

Digital knowledge management (DKM) has emerged as a crucial process for organizations to create, store, distribute, and utilize their knowledge assets through digital technology. It may involve a range of activities including digital knowledge creation, digital knowledge sharing and organizational learning that are enabled by digital technology (Dwivedi et al. 2019). The main objective of digital knowledge management (DKM) is to enhance organizational performance that ultimately improves employee productivity, promotes innovation facilitates organizational learning and enhances customer satisfaction (Cegarra-Navarro et al. 2016).

2.2 Digital Knowledge Creation

Digital knowledge creation describes the process of generating new knowledge or ideas using digital tools and technologies but involves the use of various digital platforms such as social media forums, blogs, wikis, and application portals that help to generate and disseminate knowledge. Digital knowledge creation may also involve the use of data analytics and machine learning algorithms to analyze and extract information from the data (Dwivedi et al. 2019).

The ability of an organisation to successfully collect and analyse information, which ultimately results in the development of new knowledge, is what we mean when we talk about an organization's capacity for knowledge generation (Nonaka 1994; Nonaka, Byosiere, Borucki, and Konno 1994). KMS processes are responsible for the generation

of new knowledge inside organisations. These processes take previously implicit information and make it explicit on the levels of the individual, the group, the organisation, and the industry. Here, everything from the level of a person to the level of interaction between institutions is feasible. The theory that can best be summed up as the driving force behind Nonaka's study is that the tacit-explicit axis may be used to classify the four most common methods of creating new knowledge. These shifts may also be described using terms like socialisation, combination, externalisation, and internalisation. The term "socialisation" refers to the process by which tacit information may be transformed into many new kinds of tacit knowledge via contact with other people. This process is sometimes referred to as "information exchange," another word that is occasionally used to describe it (Nahapiet and Ghoshal 1998). People often gain tacit knowledge via social techniques such as apprenticeship, teamwork, and group brainstorming sessions because of the nature of the topic at hand.

On the other hand, externalisation is the process of making something that was previously only known to oneself implicit so that it may be shared with other people (Nonaka 1994). For businesses to reap the benefits of reuse economics, the information that has been gathered via routines or processes that are carried out often should be shared, rather than the knowledge that has been garnered through infrequent occurrences (Zollo and Winter 2002). On the other hand, the processes of combination and internalization explain how new information may be generated from explicit knowledge that already exists. Both approaches have the potential to be useful strategies for combining and preserving data that was gathered in the past.

2.3 Digital Knowledge Sharing

Digital knowledge sharing is also defined as a procedure of disseminating knowledge using various digital technologies through digital tools it is a process where the knowledge is shared as an asset among different employees in various fields as well as with external stakeholders using different digital platforms that may include intranets, online forums, social media internal portals, dashboards etc. However, to use digital knowledge sharing in the most appropriate way, we should also have strategies that may involve the use of digital tools such as collaborative workspaces, webinars, online meetings, video conferences, the discussion threads to maximize the benefits of knowledge exchange. (Dwivedi et al. 2019).

Knowledge management is the strategy of preserving crucial data and skill sets within an organization or other types of external organisations or stakeholders that are connected directly or indirectly with the organization. When it comes to managing one's knowledge, a variety of procedures can be applied, such as methods to locate, use, document, and share data. A significant amount of documentation is required for the process of "capturing" information, which lays a focus on transforming tacit knowledge into explicit understanding as well as the flow of knowledge from externalization to internalisation (Bento et al. 2014). The listing or documenting of best practices is one way that is used often in the process of gathering or sharing the information that workers are prepared to practice getting the maximum benefits of digital knowledge sharing. A written record of what was learned is another instrument, document or report that may be used in the process of disseminating the message (Tallon et al. 2019).

A system that is viewed as simple to use and easy to handle is necessary for successful information sharing. Additionally, workers need to be eager to engage in the information-sharing process, and they need to be incentivized to do so (Shen et al. 2015). Research and evaluations on the construction of knowledge-sharing systems, as well as assessments of systems that are already in place, are often carried out in information technology firms or organizations where the commonplace use of computers is the case. This leads one to believe that not a great number of studies have been conducted to establish the usefulness of knowledge-sharing systems in different settings, especially in situations in which information technology systems have not been employed extensively inside the organization to fulfil tasks (Saldanha et al. 2017). It has been discovered that digital knowledge sharing has a positive effect on organizational learning and performance. According to a study conducted by Bhatti and Qureshi (2017), digital knowledge sharing positively affected organizational learning in Pakistani companies.

2.4 Organizational Learning

The topic of organizational learning has been the focus of a substantial amount of study, and the results consistently indicate a strong relationship between the two ideas and the accomplishment of objectives by businesses that apply them. The research was carried out to determine the nature of the connection that exists between organizational learning and the outcomes of financial analysis (Vizano et al. 2020). Their research led them to conclude not only that organizational learning had an effect that was directly related to the performance of businesses, but also that it provided some evidence that there may be indirect connections between the two.

Organisational learning not only had an impact that was directly tied to Ellinger's performance after conducting their analysis but as a result, they and several other co-authors released an article in 2002 stating "The Relationship between the Learning Organization Concept and Enterprises' Financial Performance: An Empirical Assessment." In this article, the researchers investigated the connection between organisational learning and the financial performance of businesses. According to what they discovered, there is a considerable correlation between the learning that occurs inside an organisation and how well it performs in terms of its bottom line. Gao et al. (2015) delve further, highlighting the transformative effect of digital knowledge-sharing platforms. These platforms, by fostering collaboration and innovation among employees, expedite decision-making processes and enhance operational efficiency. These enhancements naturally extend to financial gains, reflecting the virtuous cycle between digital knowledge management and financial performance.

2.5 Organizational Performance

Richard et al. (2009), describe it as "the actual output or results of an organization as measured against its intended outputs (or goals and objectives). It encompasses the outputs, outcomes, and impacts of an organization as well as its efficiency, effectiveness, and competitiveness. The financial landscape remained a focal point for assessment, as highlighted by Cunha et al. (2011). They emphasized the significance of financial ratios,

such as return on assets (ROA) and return on equity (ROE), as vital indicators of an organization's financial health and operational efficiency. These financial metrics provided stakeholders with a lens into an organization's efficiency in utilizing its resources. In the pursuit of excellence, organizations are increasingly harnessing the potential of digital knowledge management systems. Chua et al. (2012) emphasize how these systems can elevate financial performance. Their study reveals a positive correlation between effective digital knowledge management and superior financial metrics, with organizations adeptly leveraging digital platforms witnessing heightened revenue growth and profitability.

Amid this evolving landscape, the role of non-financial indicators gained prominence. Chowdhury and Fang (2014) delved into the profound influence of organizational culture on performance outcomes. The connection between a positive organizational culture, employee satisfaction, and innovation emphasized the intangible yet impactful aspects of performance. García-Sánchez and García-Morales (2016) added another layer by exploring the significance of digital knowledge management in driving both financial and non-financial outcomes, highlighting its role as a catalyst for growth and adaptability.

Creating new information, spreading existing knowledge, and capitalizing on the experiences of others are all activities that will need open communication lines, cooperation, and collaboration. For companies to earn the confidence of their staff members, certain actions, such as supplying them consistently with information that is both correct and up to date, are required (Zak 2007). In the pursuit of excellence, organizations are increasingly harnessing the potential of digital knowledge management systems. Chua et al. (2012) emphasize how these systems can elevate financial performance. Their study reveals a positive correlation between effective digital knowledge management and superior financial metrics, with organizations adeptly leveraging digital platforms witnessing heightened revenue growth and profitability. Alavi and Leidner (2001) unearth the power of digital platforms in nurturing employee engagement. By offering unfettered access to pertinent information, these platforms cultivate job satisfaction, motivation, and overall engagement, ultimately fostering a more dedicated workforce.

As the literature converges, a comprehensive picture emerges digital knowledge management is a catalyst for holistic organizational advancement. Becerra-Fernandez et al. (2018) provide a clarion call for aligning digital initiatives with organizational objectives, ensuring that knowledge management initiatives contribute directly to improved performance outcomes.

3 Conceptual Framework

Digital knowledge management comprises three main components: digital knowledge creation, digital knowledge sharing, and organizational learning. Digital knowledge creation involves using technology to create new knowledge that is accessible and shareable within the organization. Organizational learning is the act of obtaining and using information within the organisations, whereas digital knowledge sharing refers to the process of exchanging knowledge among employees using digital platforms. The results of this study emphasise the significance of digital knowledge management in organisational

success. Organizations can improve their non-financial outcomes, such as customer happiness, employee satisfaction, and social responsibility, as well as their financial outcomes, such as revenue and profitability, by effectively developing, sharing, and exploiting digital knowledge. The findings of this study show that for businesses to remain competitive and achieve sustainable performance in the present business environment, they must invest in digital knowledge management methods and leverage digital technology. For instance, the development of new products or services might result from the creation of digital knowledge, which can boost sales and profitability. Customer satisfaction can rise as a result of improved employee productivity and customer service through digital information exchange. Along with organisational learning, businesses may perform better in their social and environmental responsibility while adapting to changing market situations.

According to the conceptual framework, digital knowledge management can significantly improve organisational performance (Fig. 1).

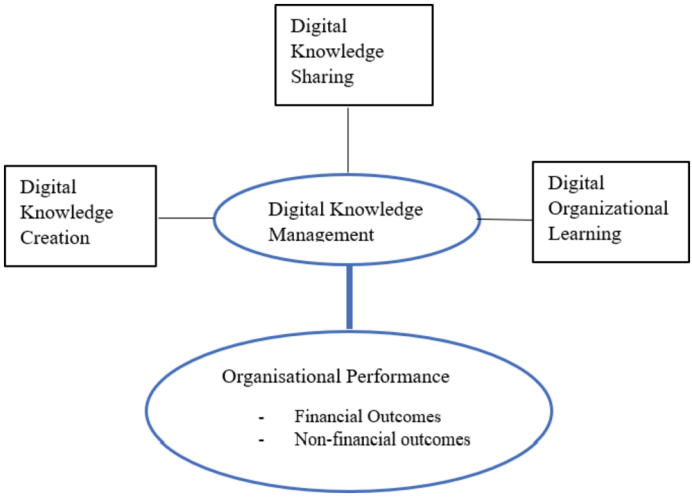

Fig. 1. The Diagrammatical representation of the conceptual framework

4 Conclusion

This study specifically focused on financial and non-financial outcomes while examining the influence of digital information management on organisational performance. The importance of digital knowledge generation, digital knowledge sharing, and organisational learning in organisational effectiveness was highlighted in the study of pertinent literature. Investigating the relationships between digital knowledge management and both financial and non-financial results was the goal of the study questions. The conceptual framework and available literature imply that effective digital knowledge management strategies have the potential to enhance organisational performance. Digital knowledge sharing makes it easier for staff to share information, which improves

output, client satisfaction, and non-financial results. Digital knowledge management facilitates organisational learning, which aids in change management and performance enhancement. This study advances knowledge about how businesses might use digital technology to improve performance by examining the connections between digital knowledge management and financial and non-financial outcomes. The study's conclusions can be very helpful to businesses looking to improve their digital knowledge management procedures. It's crucial to recognise the limits of this study, though. Further empirical research is required to confirm the links indicated in this study, which is mostly based on current literature and conceptual frameworks.

The importance of digital knowledge management in enhancing organisational performance is highlighted by this study's result. Organizations can improve their non-financial results, such as customer happiness, employee satisfaction, and social responsibility, as well as their financial outcomes, such as revenue and profitability, by effectively developing, sharing, and exploiting digital knowledge. The results of this study highlight the necessity for firms to make investments in digital knowledge management strategies and use digital technologies in order to maintain competitiveness and achieve sustainable performance in the current business environment.

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The Impact of Organisational Structure on Project Performance in the Energy Sector

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Abstract. Purpose – The objective is to explore the impact of organisational structure on project performance and current research topics regarding organisational structure theories, types, and aspects in terms of challenges, culture, communication, organisational dynamics, and drivers.
Methodology – The adopted methodology employs two integrated approaches. First, use a systematic mapping approach to explore the existing research studies on organisational structure's impact. Second, correlate the research studies to existing case studies in the energy sector, record findings, and propose recommendations on the way forward.
Findings – The study results concluded that most oil producers are a mix of functional and matrix organisations with diversified thoughts on centralizing project management teams.
Implications/limitations – It is essential to conduct follow-up research validating the potential for using the findings of this study to establish frameworks for the organisational transformation approach in meeting cultural variance and market conditions.
Originality/value – The proposed case studies and relevant theories present the most effective organisational structure model to improve project-based operations performance, thus enabling oil and gas organisations to manage their business mandates effectively.

Keywords: Organisational structure · Performance · Challenges · Enablers · Energy

1 Introduction

Organisational structures support the industries to effectively allocate all required activities, roles, and responsibilities to dedicated resources and the workforce to undertake their duties to meet the objectives and achieve the set targets.

The oil and gas business has significant concessions, including upstream, midstream, and downstream developments. These investments cover production facilities, widely spread pipeline networks, producing wells, refineries, and gas plants, and launching megaprojects and programs to deliver these facilities. However, all projects face risks

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and challenges in subsurface uncertainty, resource shortages, poor scope definition, procurement implications, logistics constraints, and construction challenges (Miller and Lessard 2001).

Agility is another critical dimension of organisational culture. An agile organisation is the ability of the firm to establish an adjustable system to respond actively and on the fast track to any external or internal changes. In this paper, we will study the impact of organisational structure on projects' performance in the energy sector in achieving companies' objectives.

2 Literature Review

2.1 Organisation Concept and Theory

The organisational concept is defined as the analysis of generated functions interlinkage internally and externally with emphasis on setup response to all associated factors within the environment in the organisation. The three main pillars of any effective organisation are structure, culture, and change (Jones 2013). Organisational structure is the official setup that defines the roles and responsibilities, workflow, level of authority, and decision control among the people to achieve set goals and targets.

Regarding organisational culture, several definitions are highlighted in the literature. For example, Schein (1990) emphasized the importance of integrating central values, norms, best practices, engagement, and ethics to be embedded with the organisational environment.

Organisational change is a transformation process in which the firm and business unit exert alteration (major or minor) to an existing organisation, covering the other two parts in terms of culture and structure. Modifications involve changes in the internal process, procedures, reporting mechanism, objectives, production line, people, and functions. The organisational theory emphasizes studying the merits of implemented structures and functions in an organisation with the primary objective of problem-solving, improving performance, increasing productivity, and exceeding customer and stakeholders' expectations. Their several theories are considered the main contributors to the development of organisational structure basis.

Institutional theory is one of the fundamental theories in organisational research and can be correlated to the oil and gas sector. The main characteristic of an institutional theory is that it has a combination of theoretical and practical drivers with a significant focus on the cultural values environment. In addition, it embraces implementing a range of formal procedures, standards, regulations, and defined policies (DiMaggio and Powell 1983.)

Contingency theory is another critical theory that can also be correlated to oil and gas organisational structure. Contingency theory is a tactic to ensure the presence of possible contingent drivers in any organisation to compensate for any embedded risks, such as culture, technology, authority, and external factors that could affect the formation and function of the organisation. (Hamann, P. M. 2017).

2.2 Organisation Structures Styles

With consideration of most companies and associated businesses, the projects have always been considered as "Supporting Tools" providing services in the short term. The project organisation in this model is considered a secondary contributor and not part of the central core operation. The project team will be out of the main operation structure functional organisation since the team is not directly influencing the return values to the firms. (Lundin and Soderholm 1995).

There is added value and risks in allocating the projects within a functional organisation. The ultimate authority and decision-making process will be under the function manager with minimum or no delegation to the project manager or within a hybrid structure called a "Matrix Organisation." In this section, we will briefly highlight the literature's past views on three main types of organisational structure: functional organisation, project-based (Projected) organisation, and matrix organisation. (Cristobal, Fernandez, and Diaz 2018).

2.2.1 Functional Organisation

The functional organisation structure divides the company into different functions based on the product that the firm is managing. For example, any food-producing company has production, marketing, quality, Human resources…etc. as functions with independent roles and responsibilities.

In the project management context, a Project manager has no significant influence on the decision-making process, which is laid mainly with the functional manager. So, the project manager performs his duties under the authority of the functional manager. The function manager provides all resources and technical engineering support to support the project manager (Lichtarski 2008). Figure 1 demonstrates an example of a functional project structure.

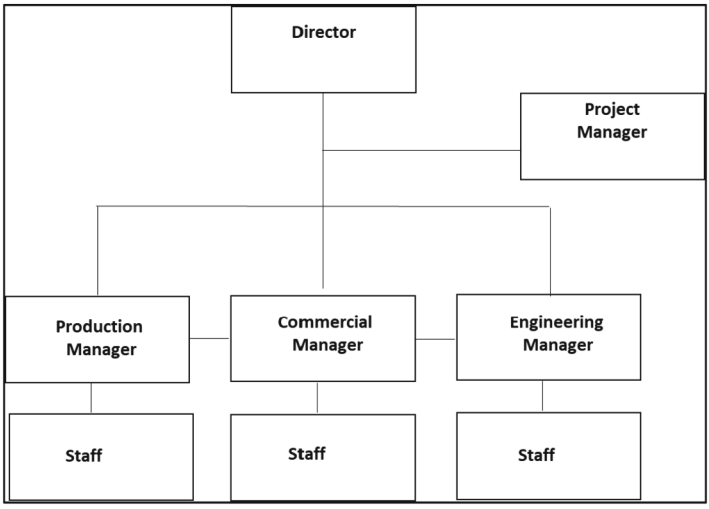

Fig. 1. Functional Project Structure (Cristobal et al., 2018)

2.2.2 Project-Based Organisation (Projectized)

This structure provides project managers with all the required resources and workforce to effectively allow them to control the project better and make the proper decisions. In addition, the project manager has the delegation of authority to communicate with his subordinates in achieving project goals with the proper performance.

The project-based organisation is often found in big organisations that recognize long-term projects strategy can add value and deliver the targets as planned. Examples of projectized structures are construction contractors, real-estate companies, and many government authorities related to infrastructure, transportation, housing…etc. Figure 2 shows a classic example of a projected structure. (Kerzner 2017).

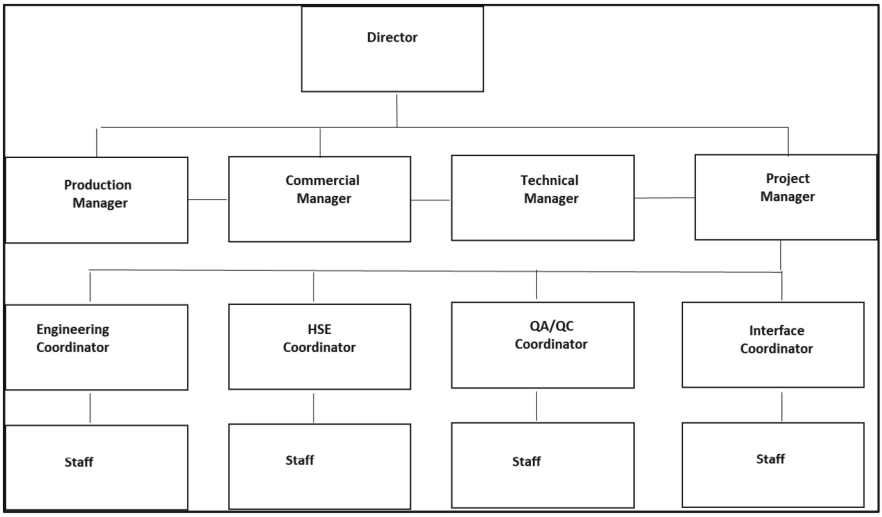

Fig. 2. Projectized Structure (Cristobal et al.. 2018)

2.2.3 Matrix Organisation

The matrix organisational structure is a combination of functional and projected structures. It balances the delegation of authority between the functional manager and several project managers assigned to different projects at both vertical and horizontal levels. The functional manager provides all required technical resources to different projects. However, the ultimate responsibilities of managing resources and delivering the projects are within project managers, but the technical authorities remain under the functional manager (Villanova 2014). Figure 3 shows a typical matrix organisation. Matrix organisation is divided into three main categories, weak matrix, balanced matrix, and strong matrix, concerning project manager engagement level and his coordination with function manager in the context of organisation structure as illustrated in Fig. 4

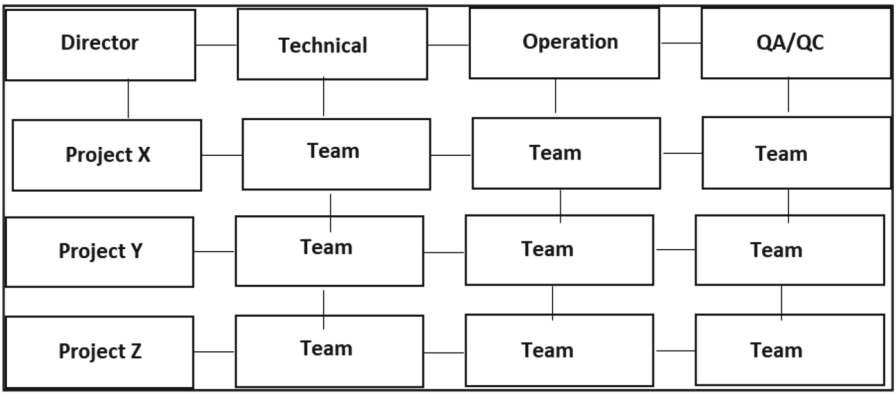

Fig. 3. Matrix Structure (Cristobal et al. 2018)

Strucure	Description	PM Influence	FM Influence
Functional Structure	Project is divided into segments and assigned to relevant Functions.	No Influence	Full Authority
Weak Matrix	PM is designated to coordinate the project across different functional areas.	Limited Authority	Retain Responsibility
Balanced Matrix	PM is assigned to oversee the project and shares the responsibility	Share responsibility	Share responsibility
Strong Matrix	PM is assigned to oversee Project	Primary Responsibility	Limited with Technical support
Projectized Structure	A PM is put in charge of a project team composed of a core group of personnel from several functional areas.	Full Authority	No formal involvement

Fig. 4. Comparison between structures types with PM/FM influence (Gobeli and Larson, 1987)

2.3 Relationship Between Organisation Structure and Project Performance

Martinelli (2001) defined the performance of any organisation as the outcomes resulting from decision-making by the employees following the defined organisation values, culture, systems, and processes. Key Performance Indicators (KPIs) are sets of financial and non-financial parameters the senior management defines to measure achievements and results according to predefined targets and objectives.

According to several researchers, there is a general commonality that organisational performance is a general term and could include several aspects such as profitability, return on investment, net present value (NPV), production growth, and market share (Gimenez 2000). Other researchers suggested that performance could be subjective and measured in terms of the amount of savings, safety records, technology adoption, training provided, social responsibility contribution, environmental development, and government-added value (Hodge and William 2004).

2.4 Challenges and Risks Concerning Organisation Structure in the Oil and Gas Sector

Significant projects and Programmes in the oil and gas industry face several challenges. These are related to the complications of these projects and the harsh environment in which the projects are implemented. Most of the literature papers addressed the barriers in terms of the project control system and the management control system and the effect of these control mechanisms on project management processes—furthermore, the organisational performance to deliver targets and objectives.

The challenges of the project control system are related to the planning and control process, competency and experience of staff, senior management commitment, and execution strategies. Planning and control are considered the main barriers to project performance (Jiang et al. 2001).

Another challenge in the oil & gas industry is the level of interfaces due to the enormous organisation setup that involves a considerable number of the leading organisation, sub-organisation, stakeholders, Concession holders, shareholders, owners, contractors, customers, and governmental authorities (Jawad et al. 2018).

2.5 Enablers and Mitigation Measures

Leadership engagement is a significant influence in setting the scene. It sends a positive signal about the importance of the project and encourages the project team to perform and deliver as per plan. Establishing attractive incentive and reward schemes for involved stakeholders, especially Selecting an appropriate project organisation structure, is essential to the success of projects. In many oil and gas companies, the matrix organisation structure is adopted with a significant focus on core business in hydrocarbon facilities, including oil and gas production, drilling, operation, refining, oil movement, transportation, storage, and export functions. Projects, engineering, and construction remain support services to the main oil business. However, centralizing the project's portfolio with one function associated with support tools in terms of technical engineering, construction team, and project management process will strengthen the role of the project function to support the company's overall vision. Considering matrix structure in energy business provides excellent flexibility, optimisation, and opportunity that all employees under functions can be assigned to projects to support the project manager.

One contributing element to the success of organisation structure performance is implementing an effective governance process. Since the oil and gas industry is contributing massively to the economics of nations, it is essential to have a sound and solid governance process to ensure compliance with all set guidelines and rules. This will result in safe end projects and facilities to avoid catastrophic accidents (Asadullah Khan et al. 2019).

Critical major decision-making that could positively enable the project performance and enforce the project organisational structure within the oil and gas industry is establishing a Project Management Office (PMO). Project Management Office is an organisational setup established to take the responsibilities of the substantial portfolio of projects in central mechanism and providing support and improvement of existing functions to deliver their programs according to best project management practices" (PMI 2008, p. 25).

3 Research Methodology

3.1 Data Collection

The methodology to complete this research is first to define the problem statement and specific topic on which to build my research. Second, to start a literature review about this topic to be studied. This required an extensive search process based on the secondary data literature search.

Fig. 5. Research Methodology Process

Several survey engines were used, such as The British University in Dubai (BUiD) effective library database, which contains extensive articles, journals, papers, and e-books relevant to risk subjects in project management and my topic of organisational structure, challenges, barriers, and enablers in oil and gas. In addition, access to the PMI database and articles helped me to have additional sources. The search used keywords such as organisational structure, oil and gas, theory, challenges, barriers, energy, enablers,…etc. focusing on the past ten years before that for some theoretical background. The survey resulted in around 125 publications. The screening stage has around 35 references, as illustrated in Figs. 5 and 6.

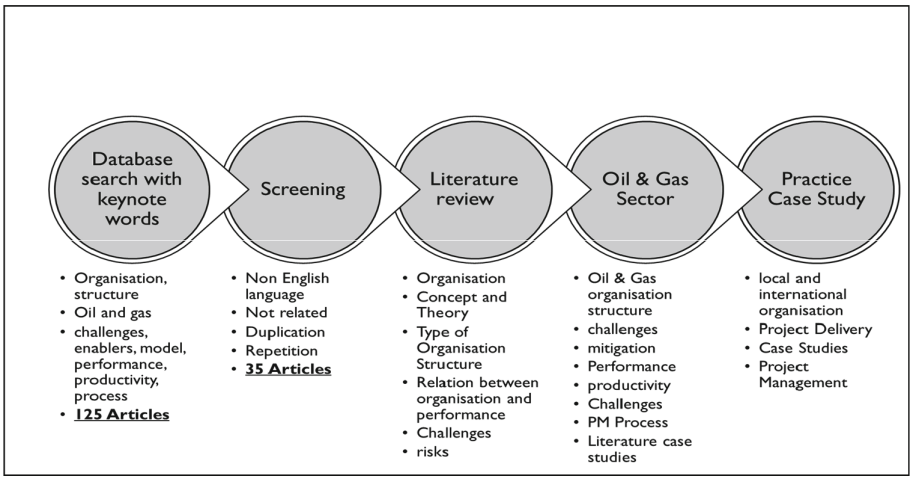

Fig. 6. Systematic process for paper development

3.2 Data Analysis

In order to answer the two research questions indicated in the introduction section, a detailed literature review was conducted on previous works interrelated to organisational structure analysis. Several theories were tested and found relevant to the research topic. However, three theories were selected to base my research on institutional, contingency, and transformation theory. Filtration and citation were then carried out to find the most relevant articles to respond to questions on the relationship between structure and performance in oil and gas, as well as the barriers and enablers facing organisational performance in project management.

4 Discussion and Analysis

In this section and view of the literature review conducted in Sects. 2.1 and 2.2, we will analyze several organisation structures within the local energy sector, reflecting the merits of organisation structure, advantages, disadvantages, and the strength of project management within this organisation structure. As highlighted earlier, using a solid matrix organisation is the most suitable type of structure implemented in the energy business for several reasons. This includes effective distribution of resources, better utilisation of project managers allocating to several projects, flexibility in terms of cross-posting staff among different functions for exchanging experience, clear delegation of authority, smooth flow of information and directives, and efficient project management process. Figure 7 illustrates the organisational structure of a local onshore oil Production Company. Based on the company's business nature, the organisation structure is divided into a hybrid model of asset-based in terms of different fields/assets (Field 1 – F1, Field 2 – F2…etc.) and supporting function in terms of drilling function Terminal for oil export, Projects & Technical Center function, Asset function, human function, and other functions like HSE, finance, legal and audit. This includes the drilling function, looking

after all drilling activities, production function, and terminal for exporting oil. Organisation structure is a matrix with solid and well-established processes and procedures to manage the set objectives. The advantage of this strudel is that the project management function is considered a standalone entity with a vertical hierarchy to top management Chief Officer Executive (CEO). All projects initiated as per the business plan to meet the company objective (vision and mission) are managed with the full power of the Senior Vice President of the Projects function. The second advantage is that this project function also has a technical support arm where all engineering disciplines support project managers in delivering all project stages, such as concept, Front End Engineering Design (FEED), and detailed engineering, as well as during the construction phase. This is considered a small projectized structure embedded within the overall function organisation. The organisation shows that vice president projects are fully responsible for filed 1 (F1) projects and all associated modifications in the field.

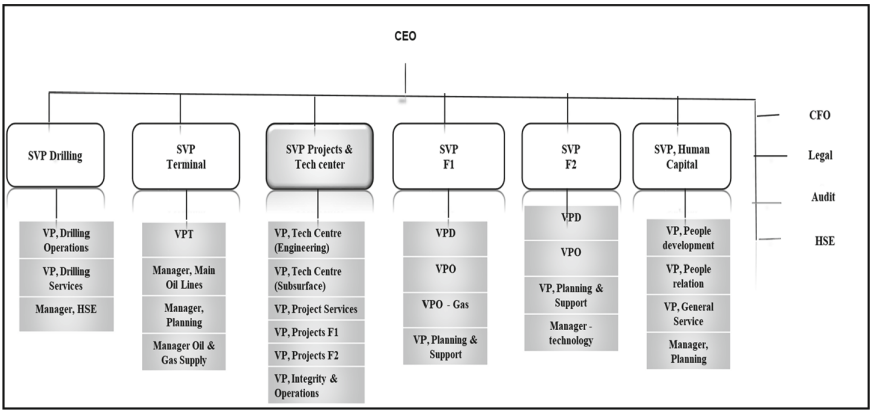

Fig. 7. Onshore oil production Organisational structure (Local oil company, 2021)

All concept, FEED, and engineering reviews are carried under the responsibility of the vice president's technical center. Standardisation, procedures, and technical specifications are the main deliverables the engineering team produces to support projects. Several engineering groups are dedicated to supporting individual projects with the support of external project management consultants (PMC). However, some specialists, such as corrosion, integrity, and stress analysis experts, are shared across all projects due to the scarcity of these experts and the difficulties in securing such resources on a large scale. Also, cost reduction plays a role in optimizing direct technical support and promoting outsourcing in some significant projects where external aids are a more efficient solution.

On the other hand, offshore organisational structures adopt different models similar to asset-based organisations. However, the project management role is embedded to be part of an individual asset. Figure 8 illustrates the organisational structure of an offshore company.

Based on the literature review, this type of structure is a balanced matrix. This consideration is because there is a balanced level of authority between the project focal point and the Asset owner. The Vice president of Projects is still responsible for delivering the assigned projects and tasks.

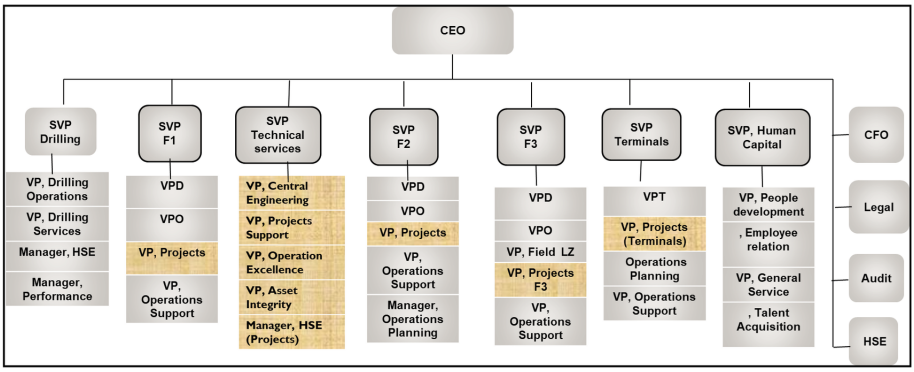

Fig. 8. Offshore oil production Organisational structure (Local oil company, 2021)

Figure 8 demonstrates that project focal points are scattered in several assets, reporting directly to the senior vice president of an individual asset. One advantage of this setup is that accountability of the whole asset, including operation performance, drilling, project delivery, and completion, remains under the accountability of one person, the SVP. In comparison to the onshore organisational structure, the ultimate responsibility is held by the SVP (Technical Center and Projects). In contrast, other SVPs (Assets) should extend the needed support to deliver this support from an operation and drilling acceleration plan point of view.

Also, the overall offshore company structure is divided into several assets with dedicated concession holders for each asset, who dedicate specific resources and cost allocation to each asset based on the workload portfolio. Moving to other Gulf state countries, some similarity was found in having a solid matrix organisational structure with primary power engineering and project functions.

5 Conclusion and Recommendation

Oil and gas are considered critical industries and require a stabilized and effective organisational structure to meet their ambitious plan for growth and sustainability. Due to the continuous fluctuation in the market condition, political instability, logistics challenges, and commodities limitations, energy firms should establish agile processes to face all these challenges to ensure business continuity. The improvement in project performance and companies' productivity is highly linked to the success of the established organisation structure, efficient processes, timely decision-making, and motivational culture environment.

It is to be concluded that there is no "best Organisation structure" as this depends on internal and external factors in which the organisation operates. However, in the oil and gas industry, a hybrid solid matrix structure proved to work effectively to meet the industry objectives. On the other hand, additional research could be established to explore additional enablers to improve the performance of the organisation's capabilities. One of the areas that could be proposed for further research is the sustainability and agility of organisational structure in responding to continuous market variances, digitalisation

impact on organisational structure and performance, maximizing virtual management, and adopting green organisational structure / PMO in oil and gas companies.

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A Qualitative Study of the Impact of Currency on Socio-cultural Identity

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Abstract. The purpose of the current study was to investigate the relationship between currency and the socio-cultural identity of a people. The research sought to investigate the phenomenon by examining how a particular community considers currency as an important tenet of their identity.

The methodology of the research was qualitative in nature considering its ethnographic premise – culture. To this extent, the research developed an interview schedule and used this to collect data from targeted participants on their perceptions regarding the impact of currency on their culture.

The findings of the research were that currency is directly related to culture and strongly impacts the cultural identity of a people. The respondents to the interview agreed that the currency they use is a depiction of their culture and strength and they shared a lot of confidence on the currency as a cultural facet.

The implications of the research including fostering the deeper understanding of the role of money in the socio-cultural setting as a multiplier of cultural identity and enthusiasm apart from the common attributes of money.

The current study is original in nature in the sense that, while there are numerous researches already conducted about money and the society, the impact of the same in the socio-cultural domain remains unstudied. This qualitative research will highlight the gap and seek to cover it in a step to open up a new dimension of study of the subject of money and society.

Keywords: Money · Socio-cultural identity · Culture

1 Introduction

Cash has always affected interpersonal connections (Baron, Field, and Schuler, 2000; Jacob, Brinkerhoff, Jovic, and Wheatley, 2004). Baron et al. (2000) explain how currency's history has shaped people's identities and relationships. Baron et al. (2000) found that currency has always been more than a medium of transaction. In a pioneering study of the Ithaca HOURS, a local currency created and utilized communally in upstate New York, Jacob et al. (2004) found that most individuals in the area still maintained significant attachments to it despite its discontinuity. The money was issued to improve local trade, community, and economy, not just its monetary value.

Thiel's (2011) essay on local money is the ultimate word in helpful advice. This document, "The Better Money: An Ethnographic Study of Regional Currencies," offers

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the basis for the intended research. Thiel's in-depth critique perfectly shows currency illiteracy. Thiel (2011) attacks economists' thorough deconstruction of money and their flawed reasoning.

Thiel explains that money is the main tool for social stratification since it allows certain people to benefit while depriving others. This evidence supports Karl Marx and Max Weber's estrangement and objectification motives. To effectively highlight the ambivalent nature and ubiquity of money, which makes it unable to fit in only as an economic concept, Thiel (2011) integrates the views of the aforementioned philosophers on money as a social phenomenon that permeates all social strata, fostering solidarity among different groups, counteracting isolation and consumerism, and making clear delineations. When there's cash on the line, people from many walks of life can feel comfortable acting incognito. Thiel (2011) uses the work of others to illustrate that the expansion and development of money into numerous forms has occurred in line with the fast rise of society through industrialization and globalization, proving that money is a social instrument.

1.1 Statement of the Problem

The proposed research is ambitious on several levels; its primary goal is to draw attention to the dearth of empirical research into the link between monetary systems and social/cultural identities. To begin, the goal of the study is to fill in some of the gaps in our understanding of a field of sociology that has been largely neglected despite the many accomplishments in related fields that have been made on more nearby turf. The study of how people's social and cultural identities intersect with monetary systems constitutes this subfield of sociology.

Buscha, Muller, and Page (2017) are concerned that the topic of currency and the socio-cultural identity of individuals has been remarkably understudied, despite the fact that Simmel's "The Philosophy of Money" (2004) makes some progress in its attempts to debunk money and advance an understanding of the relationship between money, humans, and existence. Simmel, in his landmark work from 2004, stresses the importance of money's structural function, its historical evolution, and its symbiotic relationship with value. Simmel concludes that money is the primary quantification of value because of its impact on people, its history as different currencies as units of exchange (such as items during barter trade), and its reconciliation under universal currency.

Money, as Simmel sees it, provides the frameworks through which human beings can comprehend life in its entirety. Therefore, according to Simmel (2004), money is social because individuals are the fabric of society. However, the foregoing is not supported by empirical evidence, which provides a strong impetus for the proposed research.

Buscha et al. (2017) demonstrate the breadth and depth of the relationship between currency and society through their investigation of the Euro and its potential to build unified identities among individuals of diverse nations.

The authors (Buscha et al. 2017) observe a dearth of literature on the topic of monetary values and sociocultural identity, therefore they set out to investigate this phenomenon across the European Union. According to their findings, the common currency of the Euro has had a little effect on Europeans' sense of shared cultural identity across national boundaries. Despite these results, Buscha et al.'s (2017) research suggests that

thinking of the European Union as a single culture based on the Euro is a stretch, given that its member states have vastly different cultural traditions and that most of the people surveyed only gave the currency a passing thought. When considering communal contexts, the early evidence shown in the Ithaca HOURS case provides sufficient justification for the connection between currency and culture. To address the theoretical void left by Buscha et al., an empirical examination of the link between money and social/cultural identity is done (2017), who discount the null hypothesis almost immediately in their study, defending their position by pointing out the diversity of the European Union and the small size of their sample.

1.2 Research Aim

The proposed study aims to systematically examine the many ways in which people's sociocultural identities might be influenced by money in order to provide them with a sense of satisfaction and pride in their identities.

1.3 Objectives

The suggested research aims to accomplish the following in service of the aforementioned goal:-

- To gain a comprehensive understanding of cultural identity by exploring its many facets.
- To have a thorough familiarity with monetary systems, their components, and their defining features.
- To investigate in depth how a specific people's currency shapes their sense of cultural identity.

1.4 Questions

Based on the results of the literature review and the research objectives, the following research questions have emerged:-

- How do people define themselves in terms of their cultural background?
- What are the attributes and constituents of currency?
- What is the relationship between a nation's currency and its cultural identity?

1.5 Rationale of the Study

The study concept is fresh and great. The proposed study is grounded in the scant prior lierature that has sought to investigate the link between a nation's currency and its sense of national identity. Evidence and studies in the past have mainly focused on tangential topics, such as the economics, politics, and philosophy of money, or the connection between investment behavior and individuality. This investigation, however, is interested in the monetary topic from a sociological perspective. Money plays a part in the social feeling and identity of a people, as was evident from the investigation into the instance of the Ithaca community in upstate New York that was stated previously. There

was no real purpose to further investigate the cultural and social effects of money in the communities studied in the proposed research, which distinguishes it from previous studies. However, the current proposed study does not deny that the Ithaca HOURS case provided the perfect illustration of the current research and provided proof of the impact of currency on social and cultural connections. Questions like, "Can currency aid in reinforcing the pursuit of nationhood?" are at the heart of the research we're conducting. Do people feel more of a sense of community when they have more money? The purpose of the proposed study is to determine this.

2 Theoretical Underpinning

2.1 Currency

Though simple, explaining cash's origins and nature is difficult. Academics believe that money is flexible and inconsistent. Smith (1991, 1996) claims that early civilizations invented money to trade. As agriculture and manufacturing grew, people had surpluses of one good but shortages of another, requiring bartering.

Commodity money replaced inefficient bartering. Davidson and Lee (2014) dispute the idea that money evolved to improve bartering, but money's initial purpose was to make trading easier. Salt, cocoa beans, rice, fur, and even animals were bartered for payment. Precious metals, first used as money approximately 1700 B.C. and as coins in 640 B.C. (Dittmar and Pepper 1992), replaced earlier transaction systems.

Nowadays, people usually mean paper bills, but they might also signify coins, banknotes, or even legal digital currencies. To grasp the complete picture, we must ask "what does money do?" And "how do people react to money?" To comprehend money, academics have had to delve beyond its economic and transactional meanings (Duffy and Ochs 2002).

Duffy and Ochs (2002), Jacob et al. (2004), Gelleri (2009), and Thiel (2011) share this stance, which encourages multidisciplinary research on money. Thus, scholars won't agree on a single money definition. They should agree on several areas, though. This literature study addresses that question. Since money is both ever-changing and incredibly broad, this inquiry will start with its economic aspects before moving on to its sociological and cultural relevance.

2.2 Economic Aspects of Currency

It's not surprising that most definitions of "money" come from the field of economics, given the importance of currency in modern society. Housel (2020) notes that conventional economic explanations of money are notoriously difficult to understand. Housel says that money is just a way to trade goods and services. Despite its brevity and clarity, many economists reject this definition as insufficient, preferring instead to focus on the materiality and utility of currency. Most people also think this definition accurately describes what money is for. Most likely, this is because of the widespread belief that money exists primarily to satisfy the need for mutual satisfaction inherent in barter-based exchanges. In his fundamental work from the 18th century titled "Wealth of Nations,"

Smith (1991, 1996) argued that it was problematic to use the terms "wants" and "surplus" interchangeably. Inequity in the distribution of goods exists if "one individual, we shall imagine, has more of a specific product than he himself has occasion for, while another has less," as Smith puts it. But if the latter is short on everything the former needs, no deal can be made. To get what they need, barterers may keep "a certain quantity of some commodity or other," which "he imagined few people would unlikely refuse in exchange for the produce of their industry" (p. 29–30).

2.3 Sociology Aspects of Currency

George Simmel, in his landmark book titled, *'The Philosophy of Money',* Simmel approaches the subject from two different perspectives, which he calls the "analytical" and the "synthetic" perspectives. The analytical view deals with the practical nature of money and how external conditions mold its meaning in society, while the synthetic view deals with the opposite, namely how money in return influences culture and lifestyles. Simmels's analytical perspective sees the value of money coming from subjective judgments of the consciousness, and ultimately not being dependent on reality (Simmel 1989: 29). For him, this is the origin of the value bringing 'essence' of money. Simmel sees money as a "value" itself, and therefore not just a medium of exchange. This highlighted by Thiel (2011) who goes in-depth into the analysis of money to inform that money is itself a commodity. To this extent therefore, money-value exchanges between two entities require that two individual value estimations, be negotiated to a common value, and in this process, individual subjective estimations and objects desirability are transformed into mutual determination of its value (Simmel 1989: 52f). Simmel (1989) therefore essentially argues that the inherent value given to otherwise mundane objects provides a "socially created essence", providing a stabilizing effect in the society. Through the process of random exchanges of various commodities, a certain commodity with the right attributes gradually turns into a form of money, i.e. a general medium of exchange. This monetary commodity, which may for example be a precious metal, becomes money and almost entirely leaves normal use, and becoming a general expression of value.

3 Proposed Research Methodology

3.1 Research Approach

As captured in the title of the proposed study, a qualitative method of research will be applied in the current study. Qualitative research uses video or audio evidence and descriptive narratives to elaborate on opinions, perspectives, and experiences. Qualitative methods allow people to communicate their feelings, which is ideal for studying money's cultural impact. Qualitative research, as discussed by Creswell and Poth (2018), Flick (2019), and Bhandari (2020), enables researchers to investigate a topic in depth and develop novel insights and ideas about it, particularly from the perspective of people. The Creswell and Poth (2018) demonstrate that interpretivism underpins the qualitative approach. This concept changes researchers' roles in research, according to Creswell and Poth (2018). The paradigm shift challenges positivist research philosophy, which

views researchers as observatories. The researcher actively interprets concepts under the interpretivist philosophy of research, which is equivalent with qualitative technique. Thus, researchers using qualitative methodology must actively interpret knowledge elements they encounter during research, especially when collecting data. Flick (2019) adds that humans have their own objective reality and experiences that cannot be called upon using static data collection methods that do not allow participants to express themselves. Qualitative research was chosen because the current study seeks to examine how currency affects a population's socio-cultural identity, which requires participants to elaborate and express themselves. Qualitative methodological theory is explained by Bernard (2000/06) and Birks et al. (2007). The mentioned evidence explains grounded theory and its usefulness in focusing on contextual details of a research sample population. Grounded theory allows data collection and inductive theory development, according to Bernard (2000/06). Birks et al. (2007) note that grounded theory can help researchers comprehend solution linkages between groups and research topics by including the sample population. In this research, grounded theory will be used to interview individuals to examine the relationship between currency and socio-cultural identity. Research shows that a secondary methodological approach must be considered when analyzing data acquired using grounded method. Interviews are a standard method of data collection in qualitative research, so Brinkmann and Kvale (2015) use inductive thematic analysis to triangulate participant responses to relevant secondary data sources to produce objective and referent interpretations. Using the most up-to-date literature and the collected data, inductive thematic analysis objectively categorizes data themes for interpretation. This was confirmed by Guest et al. (2012).

3.2 Data Collection

The proposed study will use face-to-face interviews facilitated by ZOOM to study a community and determine how money affects their culture. Keating (2007) suggests obtaining data directly from community members to conduct ethnography. Keating (2007) suggests case study and community observation. Interviews allow the research to acquire data from community members. Semi-structured interviews will allow the researcher to ask leading questions to support the main research question and encourage participants to contribute more information on diverse topics to get a more complete picture of their experience. In a review of ethnographic data collection, Emerson et al. (2011) found that recording field notes from interviews or other ethnographic research methods requires attention to detail and observation of verbal and non-verbal cues to gain insight from data and draw objective conclusions. The planned data gathering exercise will use 20 randomly selected community interviews. The current study attempts to meet age-based quotas to gain a better grasp of the topic, hence there will be inclusion and exclusion criteria. The research will focus on adults because the minimal age of involvement is 18. Accordingly, the research will seek 5 individuals between 18 and 27, 5 between 28 and 37, 5 between 38 and 47, and 5 between 48 and 57 for a total of 20. Qualitative researchers Holliday (2007) and Denzin and Lincoln (2013) agree that careful sampling is the difference between objective and mediocre outcomes. Thus, Holliday (2007) and Denzin and Lincoln (2013) believe that researchers must critically evaluate their aim and determine who in the sample population may help them achieve it. The current study

intends to involve people with diverse money time and use experiences. Age groups will divide the sample size The proposed research assumes that it is interesting to validate the same from older people across age ranges to determine the sites of convergence and/or divergence, as younger participants may have a different identity idea with money. The people who call Yanbu Province home are the focus of this study.

3.3 Piloting, Validity, Trustworthiness

Three possible sample participants will pilot the data instrument after construction to assure objectivity in the proposed qualitative research. Maxwell (2003) discusses the interactive approach to qualitative study design and the importance of pilot studies to improve data instrument objectivity, understandability, and usability. Inductive thematic analysis will be used to test the validity of the pilot study's data. The pilot and validity exercises will strengthen the data instrument and highlight areas of concern to improve the research before actual data collecting. Maxwell (2003) advises that data output must be verifiable, objective, and referrable to be trustworthy. This ensures dependability and makes findings transferable to other groups. According to Maxwell (2003), transparent and bias-free data gathering and analysis can achieve this. Inductive thematic analysis, a step-by-step approach to data processing, analysis, and literature triangulation, would provide the suggested study credibility and authenticity.

4 Expected Results

This investigation into the role of money in shaping social and cultural identity hopes to uncover some fascinating insights., particularly in light of the rise of digital forms of currency that seem to provide freedom and identity to younger members of the population. These results will help inform a fresh perspective on money, one that celebrates the social and cultural freedoms that a given currency affords its users.

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The Impact of Fostering Parasocial Relationship Between Influencing Entrepreneurs and Social Media Followers on the Brand Image and the Purchase Intentions of Start-Up Companies

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Abstract. Purpose: this research tends to study the parasocial relationship between influencers on social media and their followers, and how it impacts the purchase intentions of the startup companies and their brand images.

Findings: The parasocial relationship has a moderate impact on the purchase intentions, while it has a strong impact on the brand image, while the brand image has a strong positive impact on the purchase intentions.

Conclusion: parasocial relationship can be used in an effective way to build the brand image of the company and to increase the purchase intentions.

Keywords: parasocial relationship · brand image · purchase intention · influencers · startup companies

1 Introduction

The convergence between the social media entrepreneurs and their followers via the online platforms, has emerged as a phenomenon parasocial relationship that narrowed the distance between influencers on social media and their followers, this changed the dynamics of the social media by strengthen the impact of influencers on their followers' actions (Chung, Chu 2014).

Recently, various social media platforms have updated their communication tools in a way that caused a revolution in the social media industry. The interactive tools launched a 24/7 relationship between the followers and their influencers, consequently evolved a new kind of one-sided relationship in which followers feel they are intimately attached to the influencers thus, a high sense of intimacy between the influencers and their followers has arisen, Chung and Chu (2014) defined this unusual relationship as parasocial relationship which grant the influencers the power to affect their followers lives by manipulating their life experiences and decisions making processes.

This phenomenon has big economic impact by launching new marketing opportunities including influencers marketing in which these individuals have more power on

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customers to persuade them of a product or a service. Not to mention that different studies manifested that the influencers marketing powers exceeded the normal celebrities' power (Aw, Chuahb 2021). Since the influencers endorsement is considered as a productive tool in marketing and even branding. Influencers act as a stimulus that affect the learning and perception processes of the customers.This kind of relationships exceeds the limit of normality and gained more attention by the researchers and marketers all over the world for the potential economic profits can be drawn via the productive usage of the parasocial relationship.

Weinswig (2016) stated in her article that $255 million dollars is spent monthly on influencers marketing, hence the need for a clear mechanism to operate this business effectively is highly needed. Research indicates that influencers branding facilitates forming a friendship with the brand, thus a higher purchase intention along with a higher brand attitude will arise (Ballentine & Yueng 2015). In addition to all of that, marketers depend highly on influencers who can create an effective brand campaign by pushing customers purchase intentions via spreading information (Wadhwaa, Chaihanchanchaib 2021).

Researcher stated in their article that the best branding strategy for startup company was personal branding as word of mouth, event participation, and more exposure of company logo and products to make memorable (Tuominen 2020). And this strategy can be easily applicable through influencers.

2 Problem statement and ROs

Despite the social media popularity, the extent to which these tools can be effective for commercial impact is not cleared enough. While the desired qualities in influencers to have a positive endorsement message is not explained completely.In specific this paper tends to investigate:

1. The extent to which parasocial relationship can act as a brand endorsement for the purchase intentions of the startup's companies.
2. The extent to which parasocial relationship impact the brand image.
3. Whether the brand image can positively impact the purchase intentions of startup companies.

3 Literature Review and Hypothesis Development

3.1 Parasocial Relationship

The one-sided relationship social media users develop with the social media influencers that manifested as an illusional intimacy encompassing the elements of understanding and affectionate is defined as parasocial relationship (Aw, Chuahb 2021). Different researchers tried to scale the dimensions of parasocial relationship as (empathy, friendship, understanding, problem solving, interaction, wishful identification, and intimacy). Yet Horton and Whol (1956) specified the key themes of parasocial relationship as understanding, friendship, and identification. Therefore, the influencers who have intimate and personal conversational styles are able to build a strong connection with the social media users resulting as a friendly connection, this friendly nature facilitate the formation of the parasocial relationship (Chung and Cho, 2014).

In recent years new perception for the parasocial relationship has evolved as a result for the electronic word of mouth (Ballantine & Yeung 2015), this change shifted the attention from normal celebrities to social media influencers and the way they interact with each other (Ballantine & Yeung 2015, Chung and Cho, 2014).

Parasocial relationships are highly affected by influencers content, in a way that influencers attributes in some cases are not enough to build a strong parasocial relationship that's why marketer needs to engage with influencers who have a strong quality relationship with their followers (Aw, Labrecque 2020). Though, some studies stated that the strong relationship the followers have established with their influencers enable them to distinguish the fact if the influencers truly liked the product they are promoting or branding or they just do it for personal gains (Farivar, Wang, & Yuan, 2020). But Woods and Scott (2016) argued that followers cannot differentiate the lines between paid advertising and sincere endorsement is not clear, this blurred area adds more value to the influencer's endorsement. Nevertheless, these obstacles can be mitigated by choosing an influencer who is already a customer for the brand itself so he can amplify the brands itself by teaching the customers about the products and how they are used or even share information about the company itself (Watkins 2020). Despite all of that we cannot ignore the fact that parasocial relationships remains a largely not explored area as research don't provide us for a fully understanding of how to manage the parasocial relationships to increase the purchase intentions, brand credibility and brand attractiveness (Aw, Labrecque 2020). However, Influencer credibility reduced the customers resistance for the persuasive effect of the influencer (Breves et al. 2021).

3.2 Brand Image

Brand image is the way people perceived the brand and how it positioned in their minds (Killer 1993). It consists of physical factors that describe the characteristics attributes of the brand such as logo, packaging, products functionality, brand name, and psychological factors related to the emotions and feelings associated with the brand such as beliefs, values and even the personalities of the consumers (Wijaya 2013). Meanwhile, some researchers stated that the psychological factors contribution is larger than the physical factors in forming the brand image (Wijaya 2013).

Brand image is the first impression the consumers have about the products (Yang eat al. 2017). Nevertheless, that brand image is in the customers mind, it formed by the direct experience functionally along with emotionally satisfaction (Wijaya 2013).

At this stage it differentiates the company from its competitors, and grant it a competitive advantage (Rode, Vallaster 2005), it facilitates the company growth and new market entry (Aaker & killer 1990). More powerful distribution channels (Aaker 1991), and better opportunity for development (David 2000).

Brand image depends on credibility and reputation of the brand (Wijaya 2013). Reputation is controlled by the customers as how they interpret the brand in their life, and it impacted by the brand Credibility through guaranteeing specific quality level the brand products deliver as what has been promised, this extremely may change the consumers behaviors to be a brand loyal more than a product loyal by surpasses others and increasing the purchasing intentions (Yang et al. 2017).

3.3 Purchase Intentions of Startup Company

Startup companies is a group of people working together in high risks conditions to achieve new products or services, or as the founders believe they can offer a better version of existed services and products (Tuominen2020). While purchase intention is the likelihood of buying a specific products or service by the customers at specific condition (Mirabi, Akbariyeh,Tahmasebifard 2015). Purchase intention controls the buying decisions of the customers, a good understanding can detect the consumer behaviors, lead to less risks in case of new products, new companies, And new situations (Tahmasebifard 2015). Purchase intention is highly affected by the price, value, and quality, although it is not static as it may impacted by internal and external impulses (Gogoi, 2013).

Branding strategy can be used by startup companies as a marketing tool instead of traditional marketing. Thus, new companies should invest on their brand image to increase the purchase intentions. Higher purchase intentions provide the company with profit and a competitive advantage which stands them out among competitors (Abimbola, 2001). The sustainability of the startup companies depends greatly on branding as it directly affects the equity of the company in the eyes of the customers and facilitate the purchasing decision (Keller 1993).

3.4 Conceptual Framework

The following conceptual framework to inspect the research hypotheses to answer the research questions (Fig. 1).

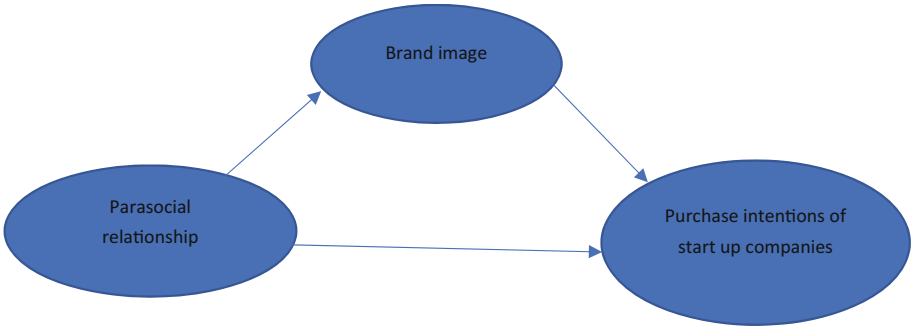

Fig. 1. Conceptual framework.

H1: there is a significant relationship between the parasocial relationship and the purchase intentions of startup companies.
H2: there is a significant relationship between the parasocial relationship and brand image.
H3: there is a significant relationship between the brand image and purchase intentions of startup companies.

4 Methodology

4.1 Research Design

The current study has adopted a descriptive and cross-sectional research design aimed at examining the impact of fostering a parasocial relationship on start-up branding between influencers and their followers. This research design involves the collection of data from several different people at a single point in time and the observation of variables is done without influence (Cataldo et al., 2019).

4.2 Sample and Data Collection

The study used quantitative methods and collected data via questionnairs that distributed by social media platforms.Purposive sampling was adopted targeting Generation Z for having the greatest confidence degree in influencers as compared to other groups (Zatwarnicka-Madura et al., 2022).We captured 107 responses that were underttaken in November 2022.

4.3 Data Analysis

The study engaged three main variables, i.e. Parasocial Relationship, Brand image and Purchase Intention. The variables were measured using a five-point Likert scale (1 = strongly agree, 5 = Strongly disagree). Generally, SPSS version 26 Software was utilized in hypothesis testing. Correlation analysis was conducted to explore the relationship between the three variables and reliability statistics was done using Cronbach's alpha.

5 Results and Analysis

It is very important to prove instrument's reliability and validity when handling a quantitative research study to confirm the credibility of the research findings (Rose & Johnson, 2020). Reliability is all about a measure's consistency while validity explores the measure's accuracy. The current study adopted Cronbach's alpha to measure the reliability of the test which is considered to be a scale reliability measure. The SPSS version 26 software was used to generate Cronbach's alpha values. The value for the overall tool was .958, which signifies that the tool used had satisfactory internal reliability above the accepted level (Bujang et al., 2018). Similarly, each variable had a strong Cronbach's alpha value between .834 and .935 indicating a high internal consistency level, therefore, fit for statistical analysis as shown in Table 1:

5.1 Reliability Statistics

Table 1. Reliablity Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.958	.960	24
Number of measured variables	***Cronbach's Alpha***	***N of Items***
Parasocial Relationship	.935	12
Brand Image	.935	9
Purchase Intention	.834	3

5.2 Descriptive Statistics

Fig. 2.

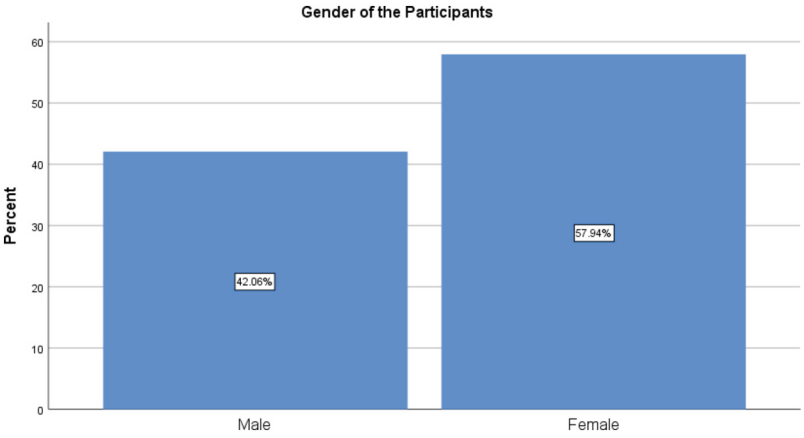

Fig. 2. Participants' Gender

Out of the total 107 responses, 42.06% were males while the 57.94% were females as shown in Fig. 1. The descriptive statistics for all the variables tested in the study are reported in Tables 2, 3 and 4. Among the parasocial relationship items, the "*he/she is the kind of persona I would like to pay to hang out with*" item had the highest mean value (M = 3.00, SD = 1.380), followed by "*I would invite the influencer to my party*" (M = 2.63, SD = 1.225), "*he/she would fit in well with my group of friends*" (M = 2.62, SD = 1.130). The rest of the items had mean values below 2.6. Among the brand image items, "*this*

Table 2. Parasocial Relationship items

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
He/She Makes me feel comfortable, as if I am with a friend	107	1	5	2.47	1.127
I look forward to seeing his/her posts	107	1	5	2.28	.919
I see him/her as a natural, down-to-earth person	107	1	5	2.38	1.146
If he/she starts another social media channel, I will also follow	107	1	5	2.47	1.093
He/she seems to understand the kind of things I want to know	107	1	5	2.35	1.010
If I see a story about him/her in other places, I will read it	107	1	5	2.21	1.026
I would love to meet him/her in person	107	1	5	2.53	1.284
He/she would fit in well with my group of friends	107	1	5	2.62	1.130
If something happens to him/her, I will feel sad	107	1	5	2.42	.972
I would invite him/her to my party	107	1	5	2.63	1.225
He/she is the kind of persona I would like to pay to hang out with	107	1	5	3.00	1.380
If he/she lived in my neighbourhood, we would be friends	107	1	5	2.24	.960
Valid N (listwise)	107				

startup company is a brand that gives a belief", "*this startup company is a brand that has a large-scale*", and "*this startup company is a brand that has a competitiveness*" responses had the highest mean values (M = 2.36) and Standard deviation of 0.882, 1.022 and 1.021 respectively. On the purchase intention variable, the "*I will consider this brand first*" item had the greatest mean value (M = 2.43, SD = 1.020).

Table 3. Brand Image items

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
In relation to a Start-up company that your influencer promotes, how far do you 2 with the below statements This startup company is a brand that gives a good impression	107	1	5	2.13	.952
This startup company is a brand that gives a belief	107	1	5	2.36	.882
This startup company is a brand that gives an easiness	104	0	5	2.30	.880
This startup company is a brand that gives a good service	107	1	5	2.26	.862
This startup company is a brand that has a good reputation	107	1	5	2.21	.942
This startup company is a brand that gives a closeness	107	1	5	2.30	.913
This startup company is a brand that has a large-scale	107	1	5	2.36	1.022
This startup company is a brand that has a competitiveness	107	1	5	2.36	1.021
This startup company is a brand that has a technical skill	107	1	5	2.34	.980
Valid N (listwise)	104				

5.3 Correlation Analysis

Hypothesis Testing

H_1: there is a significant relationship between the parasocial relationship and the purchase intentions of startup companies (Table 5).

Table 4. Purchase Intention items

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
In relation to a Start-up company that your influencer promotes, how far do you 2 with the below statements I have purchase intention of this brand	107	1	5	2.36	.956
I will consider this brand first	107	1	5	2.43	1.020
I will recommend to others the HMR brand	107	1	5	2.37	.957
Valid N (listwise)	107				

Table 5. Correlation analysis H_1

Correlations			
		Parasocial relationship	Purchase intention
Parasocial relationship	Pearson Correlation	1	.661**
	Sig. (2-tailed)		.000
	N	107	107
Purchase intention	Pearson Correlation	.661**	1
	Sig. (2-tailed)	.000	
	N	107	107

**Correlation is significant at the 0.01 level (2-tailed).

The p-value for the relationship between the parasocial relationship variable and the purchase intention of startup companies is (.000 < .05). Moreover, the correlation coefficient value is .661. Thus, we accept H_1 that there is a moderate positive significant relationship between the parasocial relationship and the purchase intentions of startup companies.

H_2: there is a significant relationship between the parasocial relationship and brand image (Table 6).

The p-value for the relationship between the parasocial relationship and brand image variables is (.000 < .05).Moreover, the correlation coefficient value is .713. There is a positive significant relationship between the parasocial relationship and the brand image. Therefore, H_2 was supported as it proposed a significant relationship between the two variables.

Table 6. Correlation analysis H2

Correlations			
		Parasocial relationship	Brand image
Parasocial relationship	Pearson Correlation	1	.713**
	Sig. (2-tailed)		.000
	N	107	107
Brand image	Pearson Correlation	.713**	1
	Sig. (2-tailed)	.000	
	N	107	107

**Correlation is significant at the 0.01 level (2-tailed).

H_3: there is a significant relationship between the brand image and purchase intentions of startup companies.

Table 7. Correlation analysis H_3

Correlations			
		Brand image	Purchase intention
Brand image	Pearson Correlation	1	.832**
	Sig. (2-tailed)		.000
	N	107	107
Purchase intention	Pearson Correlation	.832**	1
	Sig. (2-tailed)	.000	
	N	107	107

**Correlation is significant at the 0.01 level (2-tailed).

From the above Table 7, the p-value for the relationship between the brand image and purchase intentions of start-up companies is (.000 < .05). The Pearson's correlation coefficient is .832 indicating a positive significant relationship between the variables. The study supports H3 that projected a significant relationship between brand image and purchase intentions of the start-up companies.

From the study findings above it's clear that all variables are significantly correlated with each other having a correlation coefficient above .50.

6 Discussions and Implications

The main goal of this study is to define the factors that influence the Parasocial relationship between influencers and their fans on the social media platforms, and how to fully exploit the relationship to get the desired brand image that match the company brand equity.

The research started with literature review that shed the light on the purchase intentions of the startup companies, brand image and the parasocial relationship. The analysis for the 107 responses resulted as following:

- The parasocial relationship positively affected the purchase intentions of the startup companies in a moderate way.
- The parasocial relationship positively affected the brand image of the startup companies greatly.
- The brand image has a positive impact on the purchase intentions of the startup companies greatly.

In other words, the parasocial relationship between platform influencers and their followers can highly impact the brand image of the startup company, and by enhancing the brand image the purchase intentions increased highly. These factors can used together to launch a strategy that can increase the purchase intentions of the companies in a way that guide the brand image of the startup company. Consequently, positioning the startup company in the market successfully.

7 Limitations and Future Research

Although, this study has met its purpose and shed a light on the main factors that should be focused on while using parasocial relationship to build the targeted brand image for startup companies, it's quite normal to admit that the sample size 107 is not enough to generalize the results in an accurate way. Also, the used scales within the survey were taken from different journals which are little and new in a way they do not provide a full trust scale, so more context-fitting scales will provide a better result.

8 Conclusions and Recommendations

Parasocial relationship is very important to build the Brand image for the startup companies, Entrepreneurs need to make sure that their brand images are perceived as their companies' identities, though choosing the right influencer may mean the win or the failure for their campaigns. To avoid any controversial topics in the future of the campaign the marketers need to undertake the following Recommendations:

The influencers number of followers must suit with your company products and services. Moreover, If you seek more visibility so large numbers of followers will be helpful while increasing purchase intentions benefited more from a small audience. Pay attention to the influencers value and content that must aligned with the company values. Understand who your customers aspire to Check the influencers engagement rates with their followers. Taking these recommendations seriously, will greatly build a strong brand image match perfectly with the brand equity.

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Law Comparison as a Research Method in Legal Studies, and Its Importance in Promoting Uniformity in Legal Systems

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Abstract. The article examines law comparison as a research method and its application in reinforcing legal systems. Comparative legal research methods and challenges will be briefly discussed. Comparative legal research is crucial for identifying effective methods, promoting legal framework uniformity and comprehension, as well as modernising the legal system. This article also discusses comparative law and model laws like the New York Convention (the "NYC") on the Recognition and Enforcement of Foreign Arbitral Awards. Comparative law investigations ensure fair, efficient, and successful utilisation of legal systems. The author suggests that legal practitioners and scholars utilise it to clarify legal difficulties and find worldwide best practices.

Keywords: Law Comparison · Treaties · New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards · Uniformity · Best Practice

1 Introduction

Law comparison is a well acknowledged approach in legal research that comprises assessing various legal systems of different jurisdictions from several perspectives to identify commonalities and differences. This method is often used to provide a detailed understanding of the global legal structure and to identify areas that may be improved. Comparative law may significantly contribute to maintaining uniformity in the implementation of model laws and conventions such as the NYC, thereby assuring consistency.

Comparative law has gained recognition as a significant analytical tool, taking into account model laws, treaties, and conventions such as the NYC. Through the analysis of how various legal systems interpret and implement certain rules, comparative law may facilitate the identification of areas that need more precision and uniformity. Furthermore, it may provide guidance on the proper understanding and execution of these laws in a way that is consistent with the core concepts and objectives.

This study will examine utilization of comparison as a technique for legal research and explore its distinction from comparisons and analogical reasoning often used by

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legal professionals and judges in their daily practise. This methodological approach has certain obstacles that will be discussed.

This paper will emphasise various ways and methodologies that may be applied in comparative law study, with each method serving a specific purpose.

Subsequently, the author will analyse the objectives of comparative law research, whether conducted at a national or multinational scale, and assess its significance in discerning optimal methodologies. Consequently, enhancing the consistency and accuracy in enforcing rules and treaties, thus improving overall legal systems.

The author will assert that comparative law is a fundamental study methodology that enhances legal systems and fosters further uniformity in the implementation of laws and conventions. Researchers and legal practitioners should use comparative law methodologies to get a more comprehensive understanding of legal matters and to discern optimal approaches from other jurisdictions. By applying such approach, legal practitioners may contribute to safeguarding equitable, streamlined, and impactful judicial systems.

2 Law Comparison in Legal Research

By using comparison as a logical and inductive approach, an individual can conduct an impartial assessment of the merits and drawbacks inherent in a particular standard, method, framework, process, or establishment in comparison to others. Regarding its significance in legal research, comparison involves analysing the legal experiences of diverse situations and jurisdictions in order to make evaluative judgments (Siems, 2022).

At first instance law comparison does not seem arduous; legal practitioners often use comparisons to support their arguments, and judges use analogical reasoning to apply legal rules from comparable situations to new or unregulated situations. Simply put, almost any claim made by legal practitioners the comparison will either explicitly or implicitly involve juxtaposing the situation with another. Furthermore, judges often use analogical reasoning to make decisions in novel or unregulated scenarios by applying guidelines from comparable situations. They compare the situation at hand with others, whether real or hypothetical, to determine a suitable decision (Lundmark & Waller, 2016).

However, with the increase in global international trade, legal situations can become more complex when multiple jurisdictions are involved. For example, consider a transaction or trade between a French and an English person taking place in Saudi Arabia for the sale of goods to be shipped on a Cypriot vessel to a port in China. In the event of a dispute, determining the appropriate jurisdiction for the court and which law to apply becomes the first challenge. Should it be the law of France, England, China, or Cyprus?

As globalism continues to shape our world, the need for comparative law has become more apparent. The legal systems of different countries are increasingly interacting with one another, through international trade, investment, and other forms of cooperation. Comparative law provides a framework for understanding these interactions and for resolving conflicts that may arise between different legal systems. According to Sathe, S.P:

> *"During an era of globalization, if a particular culture is not dominant, the culture stands the risk of losing the features of its legal system that are unique to the culture. Globalism is the latest exigency that emphasizes the need to employ comparative law."* (Sathe, 2002).

Consequently, comparative legal research involving various laws is distinct from the comparison used by lawyers and judges to particular situations. Conducting comparative legal research requires a unique approach and specific methods that enable legal scholars to delve into unfamiliar foreign legal systems.

Attempting to comprehend foreign legal systems, or even specific elements within them, in order to compare them with national laws can present significant challenges. This process extends beyond mere fact-finding and requires a different approach to legal interpretation than the one used at the national level.

3 Methods and Methodology of Law Comparison

Method and methodology are often used interchangeably, but they have distinct meanings which is particularly relevant within the domain of comparative law.

Method refers to the specific techniques or approaches used to compare legal systems. Mark Van Hoecke identified six commonly employed approaches in comparative law research: (1) the analytical approach, (2) the functional approach, (3) the historical approach, (4) the structural approach, (5) the law-in-context approach, and (6) the common-core approach. The combination of those techniques represents the complete set of instruments available for conducting comparative research (Van Hoecke, 2011).

Each method can be a standalone method in legal research, or combining all of them in the same research is possible. The method's name points to the particular characteristic of that approach, notwithstanding the possibility of the integration of that approach with an additional technique.

3.1 Functional Approach

This approach centres on the roles and purposes that legal principles and establishments fulfil within a community. It seeks to identify the underlying societal needs and goals that legal rules aim to address and compares how different legal systems respond to those needs (Van Hoecke, 2011).

This technique includes various elements such as comprehending the law, emphasizing resemblances through comparison, constructing a framework (such as that of "legal families"), identifying what the researcher considers superior law, critically evaluating legal systems, or harmonizing laws (Michaels et al., 2006).

The functional method can be useful in identifying areas of legal convergence or divergence and in identifying the underlying values and goals that legal systems seek to achieve (Adams et al., 2017).

3.2 Structural Approach

The structural method involves analysing the overall structure and organization of legal systems and comparing the relationships between different legal institutions and rules.

This technique holds significant importance, especially because it is acknowledged that disparities among diverse legal systems in terms of fundamental regulations lose significance if they exhibit adequate structural resemblances to classify them under the

same "legal family" when compared to other jurisdictions and families lacking those commonalities. Thus, the process of selecting the most appropriate criteria to identify "similar structures" exerts a critical influence on shaping the outcomes.

This method seeks to identify the hierarchical and organizational patterns that exist in different legal systems (Van Hoecke, 2011).

3.3 Analytical Approach

This approach explores legal interpretation by evaluating numerous explanations of a given concept within multiple legal systems. It comprises examining and contrasting legislative theories across these systems. Legal analysts deploy this method to study the origin and use of legal terminology in differing systems and assess the approach they utilised to identical legal situations (Van Hoecke, 2011).

3.4 Law in Context Approach

For legal outsiders, contextualising the law clarifies its practicality. However, explaining foreign legislation requires extensive exploration (Orucu, 2006).

This approach evaluates legal norms and institutions' social, political, and economic environment for the purpose of understanding the way cultural, political, and economic influences shape legal laws and institutions. This strategy helps comprehend how legal concepts and institutions address social issues (Hantrais, 1999).

3.5 Historical Approach

The historical approach explores the law's origins and reasons in specific countries to understand its current state. Although comparative analysis entails knowing current laws' roots, the "law-in-context" approach extends beyond historical methodologies. It correlates and contrasts beyond simple examination to reflect how political, social, and economic pressures have affected legal laws and institutions across time. History in this context can elucidate legal concepts and institutions (Glenn, 2019).

3.6 Common-Law Approach

The common law approach evaluates shared legal concepts and standards by analysing a common legal concept or rule across legal systems. To draw meaningful comparisons, comparative law studies would carefully select legal systems dependent on their cultural, historical, and systemic roots (Glenn, 2007). Methods ought to coincide with the study question and legal systems' advantages and disadvantages. Comparative study results must be analysed thoroughly while recognizing technique limitations and biases. Research credibility and dependability rely upon well-designed procedures, careful survey, and reliable data from various juridical systems, involving an in-depth evaluation of legislative source accuracy, translations, and case selection biases (Legrand, 2023).

4 Comparison-Based Legal Research Challenges and Goals

Legal researchers have acknowledged that comparative legal research, is critical in a multinational economy with interrelated legal frameworks, yet it raises numerous obstacles. Language barriers and access to statutes and research articles are challenges that hinder comparative research in law. International law comparability and cross-jurisdictional police work are made more difficult by legal system design, language, approaches, as well as cultural and socioeconomic distinctions. Legal systems vary; additionally, political pressures tend to render comparisons invalid. When considering cultural diversity, intellectual property rights, and privacy, ethics are essential (Van Hoecke, 2011).

Comparative law has various goals. It aids in helping students perceive global legal dynamics by exposing them to other laws and customs (Zweigert & Kötz, 1999).

It's particularly valuable in developing nations with minimal legal resources. The comparative legal system addresses justice, equality, and human rights, providing innovative solutions to injustice and disparities in gender (Bhat, 2015). Also, it assists in achieving local and global legal targets. It strengthens the understanding of national law, enhances updates legal frameworks, facilitates new legislation, and guides policymakers on forthcoming modifications by comparing other jurisdictions. By recognising best practises across the legal systems, it promotes global legal norms, supports international cooperation, and strengthens human rights protection (Zweigert & Siehr, 1971). This approach fosters legal solidarity and reverence amongst legal traditions. (Eberle, 2008).

5 The Need for Harmonisation and Uniformity of Transnational Law

Transnational legal practise relies on the comparative law approach to develop transnational commercial law, improve conflict of laws, promote consistency in resolving commercial law disputes, interpret uniform laws, and determine international trade usage. Commerce has always relied on applied comparative law to assess, allocate, and mitigate cross-border transaction risk, mostly through commercial law harmonisation.

The International Convention on the Recognition and Enforcement of Foreign Arbitral Awards (NYC), the UNCITRAL Model Law on International Commercial Arbitration (1985), and the Convention for the Promulgation of International Commercial Arbitration are prime examples of international law harmonisation efforts in international commercial transactions.

The widely recognised NYC, signed and ratified by 172 states, promotes international commercial arbitration and encourages countries to pass laws supporting it. To promote harmonisation, many jurisdictions have adopted the Model Law, which provides a uniform template for arbitration proceedings. The Model Law has been used by 118 jurisdictions in 85 states to adopt civil or common law legislation. At the time of publication, 95 states are CISG signatories.

The ICC has championed NYC harmonisation and global adoption. The NYC is the most respected international legal instrument for international arbitration, according to the ICC.

The ICC's 2020 Statistical Report on International Court of Arbitration shows a steady rise in international arbitration cases worldwide. The NYC's global reach and importance in facilitating international trade and investment through the successful acknowledgment and execution of international arbitration awards are shown by the ICC's 35% caseload increase between 2010 and 2020.

The Model Law on International Commercial Arbitration, GISG, and NYC have helped global trade and investment by providing a framework for resolving cross-border commercial disputes. These conventions can reduce transaction costs and boost international trade and investment confidence by resolving commercial disputes reliably and effectively, boosting economic growth.

6 Application of the NYC in Different Legal Jurisdictions

Article V of the NYC provides a structured approach with seven clearly defined and comprehensive grounds upon which Contracting States may refuse recognition and enforcement of an arbitral award, yet the consistent application of those grounds is often lacking.

Article V use and interpretation in different jurisdictions determine their propensity or hesitancy towards engaging in to arbitrate internationally. Additionally, this phenomenon could significantly impact international arbitration system stability. Consistent enforcement builds arbitration trust. Although national courts generally support enforcement, issues can arise, especially when applying Article V of the NYC and the public policy exception.

US Supreme Court stance is an example. The court interprets Article V grounds for refusing to enforce an arbitration award carefully. In this methodology, the criteria for denial should be narrowly interpreted, with judicial bodies deferring to the arbitrator's decision unless there is conclusive evidence of one of the explicitly stated justifications. In GE Energy Power Conversion France SAS v. Outokumpu Stainless USA, LLC, the court upheld the position. In this case, the NYC does not allow a court to refuse to enforce the Convention's provisions due to the parties' lack of agreement on arbitrators or procedures. The case of GE Energy Power France v. Outokumpu Stainless USA examines their legal dispute. (GE Energy Power France v. Outokumpu Stainless USA).

The U.S. District Court for the District of Columbia refused to enforce a foreign arbitral award against India in Hardy Exploration & Production (India), Inc. v. Government of India, citing public policy violations. The court ruled that a specific performance order would violate India's sovereignty and jurisdiction over its territory and violate public policy of upholding foreign nations' rights. The court also found that investment interest would be indistinguishable from specific performance. The court also found that the punitive interest violated public policy. The interest also violated US foreign sovereign immunity law, which prohibits punitive damages against foreign states. Government of India v. Hardy Exploration & Production (India), Inc.

The London arbitral award in Société PT Putrabali was issued. England invalidated this award under Sect. 69 of the English Arbitration Act 1996, which governs legal appeals. However, the winning party used the French delocalization doctrine to enforce the award in France (Société PT Putrabali v Rena Holding & Ors). The parties then

initiated a second arbitration, which favoured the losing party. The second award was enforceable in England but not in France due to the res judicata exception. Thus, France and England had two legitimate but unenforceable awards due to differing views on setting aside and recognition (Thadikkaran, 2014).

The London award was not enforced by the Dubai Court of Cassation because the signatory of the arbitration agreement did not authorise arbitration. The Court ruled that the NYC should apply to recognising and enforcing the award. The Court also found that the party seeking to enforce the award had shown the signatory's incapacity. Thus, the Court denied recognition and enforcement of the aforementioned based on NYC Article V(1)(a). DCC Case 400/2014.

In UAE court proceedings, the party responsible for paying a debt The debt-holder claimed in a UAE court that the arbitration agreement was signed by an unauthorised person and that the tribunal notified an unrelated commercial agent. They claimed the award should not be recognised and implemented under New York Convention Articles V.1(a) and (b). The court ordered that capacity and authority be determined by the arbitration seat's legal framework, not the company's jurisdiction. Therefore, the Dubai Court of Cassation dismissed the objection against the foreign award, arguing that the individual who signed the agreement had the authority to legally bind the company and that it must comply with the arbitration agreement. According to this decision, the arbitration seat's legal framework is crucial to the enforceability of an arbitration agreement, regardless of the company's incorporation jurisdiction. DCC Case 693/2015.

The Dubai Court of Cassation rejected a Chinese arbitral award for violating Article 41(3) of the UAE's Arbitration Law. This provision requires the arbitrator's signature on all pages of the award, not just the operative section. The Court ruled that the issue was public policy and could be raised for the first time in the Court of Cassation. (DCC Case 403/2020).

The previous decision was procedural, not substantive. However, the inflexible procedural stance seems to contradict the Convention's main goal of enforcing arbitral awards unless they meet specific grounds for refusal, usually related to more serious issues.

Comparative legal research is needed to harmonise NYC Article V implementation worldwide. The U.S. Supreme Court often interprets Article V provisions restrictively. Due to public policy concerns, the U.S. District Court did not enforce legal measures against India. Award invalidation in England and res judicata in France complicate matters. The Dubai Court of Cassation has held various rulings on arbitration agreement signatories and procedural issues. Comparative legal research helps identify these differences and unify Article V understanding and implementation across legal systems.

7 Conclusion

Despite various inconsistencies in the NYC and Model Law application, both have been adopted and have been broadly implemented worldwide, promoting international trade and investment by providing uniform and predictable systems for recognizing and enforcing foreign arbitral awards and resolving cross-border commercial disputes. This can lower costs and risks, thus benefiting economic growth (Mistelis & Brekoulakis, 2009).

There are different proposals for unifying the NYC application in international arbitration which involve:

1. Clear and unambiguous regulations that are necessary for parties to fully -recognize their rights and duties under the NYC. To reduce the likelihood of misunderstanding and contradiction, national legislation must align with NYC requirements.
2. Consistent interpretation: NYC interpretation must be comparable across jurisdictions. A unified body can propose binding Convention interpretations. As an alternative, the International Court of Justice might provide NYC interpretation advisory opinions.
3. Treaty obligations compliance: Governments have to conform to NYC treaty commitments-by recognising and enforcing arbitral judgements according to NYC rules as NYC's efficacy and international arbitration system reliability could be jeopardised -by non-compliance to treaty

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Performance of Mutual Fund During the Global Financial Crisis: Evidence from Saudi Arabia

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Abstract. Purpose – This paper is an attempt to analyze the performance of the Saudi equity diversified fund on the basis of return and risk evaluation before, during and after the global financial crisis (GFC).
Methodology – The study uses secondary data of 12 Saudi mutual funds from Jan 2000 until Dec 2018. The analysis is conducted by assessing various performance and statistical measures including average return, standard deviation, Sharpe ratio, Treynor ratio, and Information ratio (IR), and M2 measure. The outcomes of these measures are compared with a benchmark, i.e. the stock market index Tadawul.
Findings – The results show that funds managers showed good decisions attempts during the crisis to minimize investors losses as the majority of the funds had positive IR during the crisis. Although the crisis had negative effect on MFs in Saudi Arabia, they outperformed the market.

Riyad Saudi Equity Fund and Saudi Fransi Saudi Istithmar Equity Fund outperformed all other fund in the sample during the crisis,
Research Implications – This study would be useful for new investors who want to start investing in funds with good history of investment and portfolio management during the financial crises. For decision makers of Riyad Saudi Equity Fund and Saudi Fransi Saudi Istithmar Equity Fund, to find out the reasons for their superiority during the crisis period, and the relapse they experienced after the end of the crisis at a time when the rest of the mutual funds in the sample recovered.
Originality/Value – The study is valuable to investors as it increases their knowledge about Saudi Arabia funds, which are attractive source of investing, since they still can offer a good return and perform better than the market, especially during crisis.

Keywords: Saudi mutual funds · Risk-adjusted measures · Global financial crisis

1 Introduction

The performance of active mutual funds (MFs) has been a debated issue in the area of finance for a long time with no decisive conclusion. Several studies in this field have found that MFs outperformed their benchmarks, whereas other studies have found the opposite (Carhart, 1997; Malkiel, 1995). To measure MFs performance, academic studies as well as professional performance evaluators have employed different measures that compare

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the returns of these funds to the returns of a selected benchmark. The most widely used measures are CAPM, Sharpe, Treynor, Jensen, and M2. Kosowski (2011) studied the open-end US MFs performance during recessions and found that the negative return performance is attributable to the expansion and not to recession periods. Choudhary and Chawla (2014) used several measures to evaluate the performance of Indian equity funds and reported that they have outperformed the market.

MFs appeared in Saudi Arabia as a type of investment in 1979 when the country created the open-ended fund which was called "AlAhli Short Term Dollar Fund". Ahmed & Soomro (2017) compared the performance of selected conventional funds and Islamic funds, and with a conclusion that both funds performed better than the market benchmark. Merdad, Hassan and Alhenawi (2010), applied the performance measures on Saudi MFs managed by HSBC, to find that Islamic funds underperformed the conventional funds during the full study period.

This study attempts to shed more light on the performance of Saudi MFs during the global financial crisis (GFC) as they are attractive source of investing. The study focused on measuring if the MFs perform similar to Saudi Market Index Tadawul, especially during a critical investment period.

2 Literature Review

Literatures on performance evaluation of portfolios are dated back to the 50's, initiated by Markowitz (1952) who earned the credit of introducing the concept of evaluating risk/return trade-off. As further extension to Markowitz's work, many performance evaluation measures were proposed. Tobin (1958) expended Markowitz's work by adding the risk-free rate.

The Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) as a basis for the minimum expectation of an investor who is seeking to evaluate a fund adjusted to market fluctuations.

Treynor (1965) created a new notion by putting a benchmark, to measure the return in light of the systematic risk. He focused on the relationship between return and systematic risk – above the risk-free rate. As further extension to Treynor's work, Sharpe (1966) proposed a module incorporated the volatility of the fund's return, where an investor receives reword per unit of increase in risk. In the late 60s, Jensen (1968) measured returns on a risk-adjusted basis in relation to a benchmark to gauge performance. His work determined the average return over or below (positive alpha/negative alpha respectively) the expectation calculated by the CAPM.

Theories kept developing, to make it easier to evaluate funds. In 1997, Modigliani and Modigliani developed a risk-adjusted performance measure, which also known as M2 as an alternative to Sharpe ratio and easier to investors to be understood when analyzing a fund as it expressed as a percentage return instead of return versus risk.

Ahmad and Alsharif (2019) concluded that Islamic mutual fund and conventional mutual funds in Saudi Arabia had almost similar performance on the basis of Treynor ratio and Jensen's Alpha. However, Islamic funds performed better than their conventional counterpart under Sharpe ratio. Merdad and Hassan (2011), used a sample of 143 Saudi mutual funds. The study concluded that Islamic and conventional funds performed almost the same. Same results found when Ashraf (2013) reviewed the performance of Islamic mutual funds during the global economic crisis by using the CAPM regression and other models.

3 Data and Methodology

3.1 Data

Daily Net Asset Value (referred to as NAV) of Saudi open-ended equity funds were obtaining from Eikon database. It is worth noting that the study period was divided into three periods as shown in Table 1 below.

It was logical to choose the Saudi stock market index (referred to as Tadawul) as a benchmark. Data for the daily closing price of Tadawul were obtained from Bloomberg database.

The Saudi Arabia short-term interest rate of 3 months SIBOR (Saudi interbank offered rate) was selected to be the risk-free rate of returns, and was extracted from financial data website called Ceicdata.

The sampling processes excluded non-equity, not invest locally, and closed-end funds. Furthermore, the study did not take any Islamic fund or funds that have been created after or during the crisis. Therefore, out of 247 existing funds in Saudi Arabia, the study examined only 12 open-end funds of the category of locally-oriented equity funds with 73,526 observations.

Table 1. The Study Periods

	Period
Before GFC	January 2000 to November 2007
During GFC	December 2007 to May 2009
After GFC	June 2009 to December 2018

3.2 Methodology

To test the hypothesized impact of 2008/2009 financial crisis on MFs performance, this study applies ordinary least squared (OLS) regression analysis, and CAPM. measures of MFs performance like Sharpe, M2, Treynor and Information ratio are also applied.

Fund's return in each period was calculated using the following formula:

$$R = \frac{P_{t+1} - P_t}{P_t}. \tag{1}$$

where, R is rate of return, P_{t+1} is price in time t + 1 of the fund, and P_t is price of the fund at time t

CAPM provided the statement of the relationship of the expected premium on the selected funds and their systematic risk, which is presented by βeta (β). β Shows how the stock moves with the market. the closer the β to 1, the closer the movement of the fund to the market movement. CAPM has been used in many relative studies, such as in Connor & Korajczyk (1991), Bello (2008), and El-Masry and El-Mousallamy (2016), as follows:

$$R_i = R_f + \beta_i(R_m - R_f) + \varepsilon_i \tag{2}$$

where R_i is expected return of the funds, R_f is the risk-free rate, β_i is systematic risk of the fund industry's return towards the benchmark, R_m is Tadawul expected return.

As an extension of CAPM, Jensen's Alpha is calculated, as it will provide the excess return of the mutual funds industry, which will be seen when positive alpha is found, whenever Jensen's alpha is positive, then the fund outperformed the benchmark, and it can be said that the fund's manager has done some value addition, and vice versa.

Following Boudreaux et al. (2007), Hasan and Ahsan (2016), and Tripathy (2017), this study used Sharpe ratio as measure to test the performance of MFs. Sharpe ratio gives us the information about how much return an investor can get, given the level of risks that investor is willing to take. Sharpe ratio is calculated as:

$$Sharpe\ ratio = \frac{(R_i - R_f)}{\sigma} \tag{3}$$

where R_i is return of the fund, R_f is risk-free rate of return and σ is standard deviation of the fund's return

Furthermore, this study calculated M2 to determine how well the fund reward investors for their level of risk taken. The formula applying this measure is:

$$m2 = Sharpe\ ratio\ X\ \sigma_{Benchmark} + R_f \tag{4}$$

where R_f is risk-free rate, σ is standard deviation of the benchmark

If the risk can be diversified away and investor is not diversifying, then it is his fault. By using β instead of σ the market will reward the investor for the systematic risk only (undiversifiable risk) through Treynor ratio which can be calculated as follows:

$$Treynor\ ratio = \frac{(R_i - R_f)}{\beta} \tag{5}$$

where R_i is return of the fund, R_f is risk-free rate of return and β represents the systematic risk of the fund.

Information ratio (IR) will only be positive when the mutual fund outperforms the benchmark. IR is calculated as follows:

$$IR = \frac{(R_i - R_m)}{\sigma_{i-m}} \tag{6}$$

where R_i is return of funds, R_m is return of benchmark, and $\sigma_{i\text{-}m}$ is standard deviation of the difference between returns of the funds and the benchmark.

4 Empirical Results and Discussion

Table 2 presents some statistics extracted from OLS regressions. The low R-squared of the funds reflect the lack of relationship between the selected Saudi equity mutual funds and the benchmark, the variation in mutual funds return is not explained by the variation in Tadawul returns null hypothesis was that there is no relationship between the Saudi MF and Tadawul. While the alternative hypothesis stated that the independent variable (Tadawul's return) did affect the funds' returns. As the p-value of alpha is not significant, then there is no relationship between Saudi mutual funds' return and Tadawul's return, despite of the fact that these funds are consisted from equities registered in Tadawul itself..

Table 2. Summary Statistics of All Funds

	Pre-Crisis	*During-Crisis*	*After-Crisis*	*whole period*
R-squared	0.01565	0.01910	0.14614	-
Expected return (CAPM)	2.015%	1.946%	1.314%	1.861%
Funds real average return	0.072%	-0.104%	0.027%	0.037%
Tadawul average daily return	-	-	-	0.0420%

The CAPM model gives an estimate of what the return should have been, using beta. From Table 2, the average expected return from Saudi MFs should be 2.015 percent in the pre-crisis period, while it actually earned much lower than the expected with 0.072%. This expected return decreases to a 1.946 percent, then to 1.314 percent during, during and after crisis respectively. while in real market the funds' return showed a loss of 0.104 percent, and a gain of 0.027 percent respectively. Over all, the funds underperformed the expectations.

Most of the funds and the market itself performed before the crisis better than after the crisis is over. The study showed two MFs were generating returns during the crisis, and collapsed after the crisis was over.

On average the funds performed better than market relative to each one's total risk, as Sharpe ratio was higher than the market during and after the crisis. During the crisis Saudi Fransi Saudi Istithmar Equity Fund and Riyad Saudi Equity Fund kept rewarding their investors for the total risk of the funds, although a significant decline in the reward occurred after the crisis, which requires further investigation.

The MFs included in the analysis generated better returns before the crisis – as M2 equaled to 2.95 percent – than after the crisis – where the M2 was equal to 0.31 percent.

In general, based on Treynor ratio, Saudi MFs performed better than the market in the three periods. As shown in Table 3, the negative result during the crisis indicates that for every one percent of undiversified risk taken, the mutual funds lost 0.18 percent on average, and improved a lot after it was losses and earned 0.41 percent on average after the crisis. HSBC Saudi Equity Income Fund had the highest Treynor ratio compared to the market and other funds in the study. This fund maintained its position during the crisis. Investors should consider this fund in their investment decision.

The funds' managers had the skills, abilities, and decisions to outperform Tadawul by 1.33 point before the crisis, while sharply dropped to 0.31 point during the crisis. However, this value improved slightly and increased to 0.34% after crisis. Saudi Fransi Saudi Istithmar Equity Fund had the higher IR during the crisis, which indicates that this fund had good manager who could manage the crisis with the higher returns

.

Table 3 Performance of the Saudi Mutual Funds Before, During and After the Crisis

	Name	sharpe			Trynor			M2			IR			σ			p-value			% change of average returns	
		BC	DC	AC	BC	DC	AC	BC	DC	AC	BC	DC	AC	BC	DC	AC	BC	DC	AC	DC	AC
1	ANBI - Al-Arabi Saudi Equity Fund	4.43	-0.62	4.43	1.54	-1.82	1.54	0.81	-0.25	0.81	3.15	0.35	3.15	0.18	0.52	0.18	0.2541	0.7981	0.2541	-160.47%	177.72%
2	Alawwal Invest Saudi Equity	-2.39	-0.68	-2.39	-1.53	-7.17	-1.53	-0.4	-0.27	-0.4	-3.22	0.12	-3.22	0.35	0.63	0.35	0.6614	0.6977	0.6614	8.50%	87.02%
3	Alawwal Invest Saudi Financial Equity	-2.4	-0.69	-2.4	-1.47	-8.38	-1.47	-0.4	-0.27	-0.4	-3.24	0.07	-3.24	0.35	0.66	0.35	0.6166	0.6906	0.6166	-309.75%	85.11%
4	HSBC Saudi Equity Fund	5.05	-0.85	5.05	3.17	-1.85	3.17	0.92	-0.35	0.92	3.27	0.03	3.27	0.23	0.56	0.23	0.1659	0.5958	0.1659	-178.45%	133.15%
5	HSBC Saudi Equity Income Fund	3.18	-0.8	3.18	2.03	23.04	2.03	0.59	-0.32	0.59	1.53	0.06	1.53	0.23	0.63	0.23	0.2901	0.5361	0.2901	-279.02%	115.17%
6	HSBC Saudi Financial Institutions Equity Fund	2.82	-1.33	2.82	1.78	-3.61	1.78	0.52	-0.55	0.52	1.31	-0.06	1.31	0.23	0.55	0.23	0.3607	0.2393	0.3607	-198.26%	120.55%
7	Riyad Blue Chip Equity Fund	2.3	-0.86	2.3	1.39	-3.28	1.39	0.43	-0.35	0.43	0.72	-0.04	0.72	0.22	0.62	0.22	0.4530	0.5623	0.4530	-192.97%	137.44%
8	Riyad Saudi Equity Fund	-2.67	1.13	-2.67	-1.61	4.43	-1.61	-0.45	0.51	-0.45	-3.59	1.54	-3.59	0.22	0.61	0.22	0.1979	0.6160	0.1979	-192.97%	137.44%
9	SAIB Saudi Equity Fund	3.86	-0.83	3.86	0.99	-2.63	0.99	0.71	-0.34	0.71	2.95	0.04	2.95	0.14	0.58	0.14	0.2760	0.6005	0.2760	-210.00%	131.78%
10	Samba Capital Al Fareed Saudi Equity Fund	3.94	-0.79	3.94	2.52	-3.1	2.52	0.72	-0.32	0.72	1.92	0.02	1.92	0.21	0.62	0.21	0.2635	0.6284	0.2635	-910.76%	130.40%
11	Samba Capital Al Musahem Saudi Equity Fund	4.23	-0.81	4.23	1.29	-1.39	1.29	0.78	-0.33	0.78	2.85	-0.01	2.85	0.16	0.57	0.16	0.2756	0.6725	0.2756	-266.04%	129.35%
12	Saudi Fransi Saudi Istithmar Equity Fund	-3.1	1.18	-3.1	-5.13	3.58	-5.13	-0.53	0.53	-0.53	-3.52	1.6	-3.52	0.25	0.57	0.25	0.0926	0.5700	0.0926	-213.33%	141.64%
	Average	**1.6**	**-0.5**	**1.6**	**0.41**	**-0.18**	**0.41**	**0.31**	**-0.19**	**0.31**	**0.34**	**0.31**	**0.34**	**0.23**	**0.59**	**0.23**	**0.3256**	**0.6006**	**0.3256**	**-258.63%**	**127.23%**
	Tadawul	**1.28**	**-0.92**	**1.28**	0.28	-0.4	0.28	**0.3**	**-0.37**	**0.3**										-228.04%	116.11%

BC: Before the crisis, DC: During the crisis, AC: After the crisis

5 Conclusion

Although 2007/2008 crisis had impacted economic activities and financial markets, Riyad Saudi Equity Fund, and Saudi Fransi Saudi Istithmar Equity Fund provided their investors with positive return during the crisis. The diversified assets in these funds made them in better position during the crisis. Likewise, HSBC Saudi Equity Income Fund maintained the first position holding the highest Treynor ratio before and during the crisis, meaning that it's manager could diversified the assets in the fund to gain the best benefit. Moreover, HSBC Saudi Equity Fund had also the highest IR ratio, Sharpe and M2 ratios compound with the lowest risk (σ). Its manager's decisions, represented by the high IR ratio, led to high Sharpe, M2 and Treynor ratios after the crisis. its investors received the highest return (33.5% before the crisis, and 5.05% after the crisis) for the 1% extra volatility they endured for holding this fund. As risk and reward must be evaluated together when considering investment choices, HSBC Saudi Equity Fund's investors had compensated the investors for the additional risk.

The main implication for Saudi investors as MFs is attractively offer a good return and perform better than the market. As for new investors who want to start investing in a fund with a good history during crises. For decision makers of HSBC Saudi Equity Fund to continue the way they manage the portfolio and make improvements where necessary. And for Riyad Saudi Equity Fund and Saudi Fransi Saudi Istithmar Equity Fund managers to find out the reasons for their superiority during the crisis period, and the relapse they experienced after the crisis.

The main limitations were, the sample size was limited to only 12 equity funds, as many mutual funds were closed and ended during the study period, which considered too small to provide conclusive evidence. Additionally, the transaction costs or taxation were not considered in the analysis. Future research can include more comprehensive data. It is also recommended future studies to examine the causes of anomalies in the results for HSBC Saudi Equity Income Fund performance before and during the crisis. It will worth investigating the factors that affect the performance of Saudi Arabia mutual funds including mutual funds industry, investment companies, or to the funds' assets. Future studies may also link the mutual fund performance to investor's behavior and attitude, innovation, business intelligence, or decision-making style. Finally, analyzing the rating of the mutual funds provide a wide scope for future research on MFs performance including Saudi Arabia.

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The Validity of Executed Terms of Settlement in Arbitration, Mediation, Conciliation and in Some Selected Rules of Court

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Abstract. This piece attempt to discuss the term of settlement in arbitration, mediation, and conciliation; and to determine the validity of the terms of settlement in face the court or tribunal in relation to some of the major mediation and arbitration laws and rules. Inquiry revealed that the validity of terms of settlement rests on the Arbitral Tribunal in arbitration, and in mediation, its validity lies on when the Parties signs or where Mediator signs. Under Conciliation, the terms of settlement if agreed and signed by the parties, and endorsed by a Conciliator becomes valid and can be considered as Arbitral Award to be enforced by Courts. Discovery indicates that the Courts are always willing to enforce a term of settlement that stem from ADR Options in the form of Consent Judgement. The position of the parties, Rules of Court, and Arbitral Tribunal on the validity of executed terms of settlement under ADR will be highlighted.

Keywords: Arbitration · mediation · conciliation · terms of settlement

1 Introduction

Alternative Disputes Resolutions (ADR) involves a wide range of dispute resolution process that parties explore in settling their dispute without necessarily resorting to court. In this regard, the disputants to a dispute whether individual or corporate are often referred to as parties mainly at the options of arbitration, mediation, early neutral evaluation, negotiation, and conciliation without necessarily being litigants. A settlement is the finale of every dispute, whether for, against or on a win-win basis and can be done at the beginning, during or the end of a litigation, just as it can also be reached at the beginning, ongoing or conclusion of any of the options resorted to, in ADR. Hence, a settlement is encouraged at every phase of dispute.[1]

Once a settlement is reached in arbitration, mediation, or conciliation proceedings, it becomes paramount to ensure the execution and enforcement of the agreed terms. This ensures that the settlement brings about the desired outcomes and maintains the faith of the parties involved in the alternative dispute resolution (ADR) processes. However,

[1] Section 4 (1) Arbitration and Concliation Act Cap A18 Laws of Federation of Nigeria 2004.

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the validity of the executed terms of settlement can present unique challenges in these quasi-judicial mechanisms, which often operate under different rules and procedures.

In arbitration, the validity of the executed terms of settlement revolves around the Arbitrators/Tribunal.[2] Mediation, on the other hand, involves the assistance of a neutral third-party who guide the parties towards a mutually acceptable settlement, rather than imposing a decision. Conciliation shares similarities with mediation, as it involves the intervention of a neutral third party who assists the parties in reaching a settlement. Like mediation, the validity of a conciliated settlement agreement depends on the jurisdiction and the parties' agreement.

This essay clears the doubts of executing the terms of settlement in arbitration, mediation, and conciliation. It delves into validating the outcome of these ADR processes in achieving effective execution of settlement. This will allow understanding the nuances of executing settlement terms in ADR and the position of some selected rules of court.

2 Terms of Settlement Under Arbitration

In Arbitration, settlement is not usually regarded as consensual but a decision of the tribunal. This is because the Arbitral Tribunal has undergone different phases and procedures before arriving at a decision or award. However, where the parties decide to settle the dispute, the Arbitral Tribunal shall either issue an order for termination of the arbitral proceedings or, if requested by the parties and accepted by the tribunal, It will record the settlement in the form of an Arbitral award on *agreed terms* signed by the Arbitrators and communicated by the Arbitral Tribunal to the parties.[3] In KLRCA Arbitration rules 2013, it encouraged the settlement of dispute before the final award is delivered, and the Tribunal will record it in the form of Arbitral Award on agreed terms, signed by the Arbitrators and communicated by the Arbitral Tribunal to the parties[4] which is similar to the UNCITRAL Arbitration rules. This is also the position under the ICC Arbitration rules, provided the settlement is requested by the parties and agreed by the Tribunal, the settlement shall be recorded in the form of an award made by consent of the parties.[5]

On the award under KLRCA Fast Track Arbitration rules 2013, art. 12 paragraph 3 was not specific as to the nature of the award but instead states that, the award shall state the reason upon which it is based.[6] Owing to this, it will not be out of perspective to include the settlement options or consent award which may take a form of Arbitral Award in the context of art. 12 paragraph 3, and must be signed by the Arbitral Tribunal.[7] Similar to KLRCA Fast Track Arbitration rules, is the AIAC Fast Track Arbitration Rules 2018,

[2] Article 34 United Nations Commission on International Trade Law (UNCITRAL) Arbitration Rules.

[3] Article 34 Paragraph 1 and 2 of the United Nations Commission on International Trade Law (UNCITRAL) Arbitration Rules.

[4] Article 36 Paragraph 1 and 3 Kuala Lumpur Regional Centre for Arbitration Arbitration Rules 2013.

[5] Article 33, ICC Arbitration rules, 2021.

[6] Article 12 Paragraph 3 Kuala Lumpur Regional Centre for Arbitration, Fast Track Arbitration Rules 2013.

[7] Ibid.

which also left the authenticity of the consent award with the signatories of the Arbitral Tribunal.[8] The AAA Commercial Arbitration rules 2013 mandates the Arbitrators to set forth the terms of settlement as a consent award and shall be signed by a majority of Arbitrators.[9] In addition, the CIArb Arbitration rules 2015 also aligned with the previous rules mentioned in that, the terms of settlement should be recorded in form of Arbitral Award and must be signed by the Arbitrators.[10] The rules are unanimous on this provision on this.[11]

From the forgoing rules, it is evident that settlement can be reached before the conclusion of arbitral proceedings which is validated by the signature of the Arbitrators/tribunal and not that of the parties. Where parties have reached or drawn a settlement but was not properly signed or failed to be signed by the Tribunal. As settlement reached and endorsed by the Tribunal is often considered to be an award. The London Court of International Arbitration rules 2020, provides that in circumstances where arbitrator fails to sign an award[12], the majority signatures suffice or where there is no majority, the signature of the presiding arbitrator shall be sufficient.[13] In any case, for any form of award to be valid. It must be signed by the Arbitrators/Tribunal.

3 Terms of Settlement Under Mediation

The parties retain ultimate control over the decision to settle and the terms of resolution.[14] Under the guidance of the neutral third party (the Mediator), parties collaboratively work out the solution.[15] The Mediator is not a legal representative of any party and holds no fiduciary duty to any party.[16] He lacks the authority to impose a settlement but serve as an assessor to help the parties reach a satisfactory resolution of their dispute. Unlike in arbitration where the Arbitrator/Tribunal signs the award, the Mediator has no such authority. It should be noted that settlement can be reached before, during or after mediation. Under Asian International Arbitration Centre (AIAC) Mediation Rules 2018, when parties settled their dispute through mediation, the settlement reached shall be referred to Arbitral Tribunal to be recorded as a consent award and the mediation shall be deemed terminated.[17] Rule 13 states that upon the conclusion of the mediation and agreement reached by the parties, parties shall enter into a settlement agreement which shall be written and signed by them and authenticated by the Mediator which

[8] Rule 19 paragraph 2, AIAC Fast Track Arbitration Rules 2018.

[9] Rule 46 and 48 American Arbitration Association Arbitration Rules 2013.

[10] Article 36 Paragraph 1 and 3 Chartered Institute of Arbitrators Arbitration Rules 2015.

[11] Opcit n5 Article 32 Paragraph 4. See also Section 31 of Indian Arbitration and Conciliation Act, 1996.

[12] Award here include a settlement award or an agreed award or a consent award.

[13] Provided the majority or the presiding arbitrator shall state the reason for any omitted signature in the award. See also Article 26.6 London Court of International Arbitration rules, 2020.

[14] Opcit, n15.

[15] Kristin Hero, Dispute Resolution by court and dispute resolution in court, partners or rivals?' (2011) volume 1 n Oñati Socio-Legal Series http://papers.ssrn.com accessed 19 October 2021.

[16] M7 (vi) American Arbitration Association Mediation Procedures (2013).

[17] Rule 14 AIAC Mediation Rules 2018.

shall be final.[18] But where there is a proceeding in court, the settlement agreement may be recorded before the court as a consent judgement or judgement of the court.[19]

Under the CEDR Model Mediation agreement and procedure 2018. The Parties representatives have the authority to bind the disputants by signing the terms of any settlement when it provided in rule 7 that;

> ***"the term of settlement in Mediation will not be legally binding until set out in writing and signed by or on behalf of each of the parties".***[20]

From the foregoing, the CEDR Model Mediation is flexible as it allows either parties or their representatives to validate the term of settlement. However, in CIArb Mediation Rules 2018, parties are required to personally sign the written settlement agreement[21] and not their representatives. Similarly, DIFC-LCIA Mediation Rules 2018 goes to the effect that, parties are required to sign the settlement agreement.[22]

Mediation has witnessed a tremendous breakthrough with the coming of Singapore Convention 2020[23] which marks a milestone for International Commercial Mediation. It establishes a uniform regime for recognition and enforcement of International Mediated Settlement Agreements (IMSAs).[24] This paved way for a harmonized and uniform structure for the enforcement of mediated settlements which has over time posed to be an impediment to better exploration of mediation. The convention in Article 4 states.

> ***" A party relying on a settlement agreement under this convention shall supply to the competent authority of the parties where the relief is sought which include the requirement that parties must sign the agreement as well as provide evidence that the agreement resulted from a mediation, the evidence required here can be the mediator's signature and any document signed by the mediator indicating that mediation took place e.t.c".***[25]

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[18] Section 13 Mediation Act, Laws of Malaysia 2012 and 14 (4) (a) Asian International Arbitration Centre Mediation Rules 2018.

[19] Section 14 Mediation Act, Laws of Malaysia 2012.

[20] Rule 7 CEDR Model Mediation Agreement and Procedure 2018 Edition.

[21] Article 8 CIArb Mediation Rules 2018 see also Rule 6 CEDR Model Mediation Agreement 2018.

[22] Article 7 Dubai International Financial Centre- London Court of International Arbitration Mediation Rules 2012.

[23] Otherwise called United Nations Convention on International Settlement Agreements Resulting from Mediation.

[24] A handbook on Singapore Convention on Mediation, "Singapore International Dispute Resolution Academy", https://www.singaporeconvention.org p.5 accessed on 6 November 2021.

[25] Evidence that such a settlement agreement came from mediation includes the Mediator's signature on the settlement agreement, the document signed by the Mediator indicating that the mediation was carried out, an attestation by the institution that administered the mediation, or, in the absence of any evidence mentioned earlier, any evidence that the competent authority may find acceptable.

Settlement agreement under the Convention is enforceable by the parties like that of Arbitral Award or judgement in accordance with its rules of procedure and under the conditions laid down in this Convention.[26] if a party does not comply with the terms under the settlement agreement, the other party can enforce the settlement agreement directly,[27] provided the competent authority of the state has accented to the convention or is a party to the convention. Unlike before the convention was in force, the parties would have to enforce the settlement agreement like a contract or according to the law of the jurisdiction where they seek enforcement.[28]

4 Terms of Settlement Under Conciliation

Like Mediation, the Conciliator is to be independent and impartial in his attempt to reach an amicable settlement.[29] Conciliated settlement is submitted to the parties after the conciliator or conciliation body have heard the parties and have graded the case.[30] The Conciliator shall draw up and sign the record of settlement if the parties agree to the terms submitted.[31] Hence, indicating that the Conciliator can sign the settlement agreement. However, art. 15 paragraph (a) of the third schedule of Nigerian Arbitration and Conciliation Act provides that the parties to the settlement agreement are to sign the agreement not the conciliator. In the same act, art. 13(1) provides that, the conciliator can formulate possible settlement and submits them to the parties for their observation, and the conciliator may reformulate the settlement terms based on such observations. Art. 13(2) and (3) further shows that the conciliator if requested by the parties can draw up the settlement agreement where parties can sign and put an end to the dispute. Interestingly, s.42(2) of the act states that once parties agree, the Conciliator shall draw and sign the terms of agreement. This prompted a question on whether the parties are to sign the settlement to be endorsed by the conciliation body or by merely agreeing to the settlement allows the Conciliator to execute the record of the settlement. In any case, the conciliator endorses the executed settlement agreement as proof that they have gone through conciliation. This endorsement signifies the termination of the conciliation once the parties sign the settlement agreement.[32]

Similar to the art. 15 of the third schedules of Conciliation Rules in Nigerian Arbitration and Conciliation Act is section 58 of Ugandan Arbitration and Conciliation Act, which provide that the Conciliator may draw up or assist the parties to draw up the term

[26] Article 3 Singapore Convention 2020.

[27] A handbook on Singapore Convention on Mediation, "Singapore International Dispute Resolution Academy", https://www.singaporeconvention.org accessed on 6 November 2021 p.11.

[28] Ibid p.7.

[29] Article 9 United Nations Commission on International Trade Law (UNCITRAL) Model Law on International Commercial Conciliation (2002).

[30] Opcit. n4 Section 42 Arbitration and Conciliation Act CapA18 Laws of Federation of Nigeria 2004.

[31] Section 42 Arbitration and Conciliation Act CapA18 Laws of Federation of Nigeria 2004.

[32] Article 15 paragraph (a) of the third schedule Conciliation rules in Arbitration and Conciliation Act Act CapA18 Laws of the Federation of Nigeria 2004.

of settlement which must be signed by the parties. It should be noted that s. 73 of the same act is very unequivocal in its provision in that it was specific with the expression, "if requested by the parties, the Conciliator may draw up the settlement agreement to be signed by the parties". This connotes that the conciliator cannot on his own accord draft the term of settlement to be signed by the parties.

5 Settlement under Rules of the Court

Under the High Court Rules of FCT, Nigeria. The Court is mandated by the application of the parties to enrol the terms of settlement reached at the AMDC[33] as consent judgement, and the terms shall thereupon have the same effect as judgement.[34] It further states that, for a consent judgement to be entered, parties must consent either by themselves or through their legal representatives or agent. It should also be noted that where a party has no legal representative. He/she must give consent in person in open court.[35] This rule placed a weight on either the legal representation or on the party to validate the terms of settlement which later metamorphosed as consent judgement by the Court. However, the Civil Procedure Rules (CPR) in the United Kingdom established a framework in which parties can expedite the resolution of dispute on agreed terms which must be expressed by consent.[36] The CPR in the UK, like the FCT High Court Rules in Nigeria, also provides that, such agreed terms must be signed by the legal representatives of each of the party or by parties themselves.[37] Additionally, the UAE Civil Procedure Code (CPC) also allow parties to reach an agreement or settlement through submission of a joint request to the court for the issuance of a judgment based on their mutual consent, which must be signed by parties or their representatives.[38]

5.1 Some Judicial Authority

The Supreme Court of Nigeria held that it is the role of a judex in adjudication to encourage an amicable settlement in a suit where it can adequately meet and satisfy the end of the justice.[39] When the term of settlement becomes an order of the court, in legal parlance, it becomes a CONSENT Judgement.[40] Consent judgement is a judgement where parties to a dispute freely enter the terms of settlement. Once parties' consent to the terms and sign it, it is no longer open to the court to adjudicate on the subject matter as it ceases to have jurisdiction thereon and the doctrine of estoppel applies.[41]

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[33] AMDC means Abuja Multi-Door Court.

[34] Order 19 rule 7 High Court of Federal Capital Territory, Abuja (Civil Procedure) rules 2018.

[35] Order 39 rule 6 and 7 High Court of Federal Capital Territory, Abuja (Civil Procedure) rules 2018.

[36] Rule 40.6 Civil Procedure rules of High Court and County Court of the United Kingdom.

[37] Opcit, n38 Rule 40.6 Paragraph 5.

[38] Article 198 of the UAE CPC.

[39] *Star Paper Mill Limited V. Adetunji* [2009]13 NWLR Part 1159 p647.

[40] Opcit. *Star Paper Mill Limited V. Adetunji.*

[41] *Ochijenu-Achara V. Ejiga and Anor* [2018] LPELR-45958 (CA).

In a decision of the Court of Appeal in England and Wales which established that a consent judgment must reflect a genuine agreement between the parties[42] to be valid, and that a real and genuine agreement must be reached voluntarily by the parties. The court noted that the parties do not need to settle all the issues in dispute, if they clearly define and agree upon matters covered by the consent judgment.[43] It is final[44] and can only be set aside on the grounds of duress, undue influence, misrepresentation, or fraud.[45]

6 Conclusion

Settlements executed under the different ADR Models are valid to the extent that they adhere to the laws and rules governing them. For instance, in arbitration generally, the arbitrator validates the terms of the settlement once he/she signs the award.

In Mediation, when the parties reach an agreement upon the conclusion of the mediation, they shall enter into a settlement agreement, which they will sign themselves. The agreement will then be authenticated by the Mediator, and it shall be final.[46] It is important to note that parties validate the terms of settlement by affixing their signature in mediation, except for the CEDR Model Mediation agreement, which allows for some flexibility and offers either the parties or their legal representatives the mandate to sign the settlement terms. The requirement for settlement agreement under Singapore convention is that the parties must supply the court the settlement agreement, which is to be signed by the parties and evidence showing that the settlement agreement emanated from the mediation to the effect that there must be a Mediator's signature on the settlement agreement. It further emphasized that the Mediator should deliver the signed document(s) signifying that the mediation was conducted, and/or the institution that administered the mediation should authenticate it or provide any evidence that the competent authority may deem acceptable.[47]

While in conciliation, the terms of settlement if agreed and executed by the parties, the dispute is deemed resolved. Also, the Nigerian High Court rules, UK CPR and UAE CPC stipulates the validity of terms of settlement reached on the parties or their legal representatives. The crucial aspect of terms of settlement agreed upon by the parties and entered as judgement of a court is that it is final (binding), provided it is not marred with fraud, misrepresentation, undue influence, or duress.

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[43] Opcit, *Swain v Hillman.*

[44] *Abey & Ors v. Alex & Ors* [1999] LPELR-32 (SC).

[45] *Race auto supply co.Ltd & Ors V. Akib* [2006] LPELR-2937 (SC)

[46] Opcit. n22 Section 13 Mediation Act, Laws of Malaysia 2012 and also 14 (4) (a) Asian International Arbitration Centre Mediation Rules 2018.

[47] Article 4 paragraph 1 Singapore Mediation Convention.

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Centre for Effective Dispute Resolution(CEDR) Model Mediation Procedure 2018
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United Nations Convention on International Settlement Agreements Resulting from Mediation (Singapore Convention 2020)
United Nations Commission on International Trade Law (UNCITRAL) Arbitration Rules

The Impact of Key Determinants of BIM Technology Adoption on Organizational Performance within the UAE Construction Industry

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Abstract. Purpose- To evaluate the impact of key determinates of BIM technology adoption on various aspects of organizational and business performance in the UAE construction industry using the UTAUT model. The three factors examined in this study are performance expectancy, behavioral intention, use behavior and their impact on organizational performance.
Methodology- This paper employs a theoretical background and proposes a research module to study the impact of key determinants of BIM technology adoption on organizational performance within UAE-based construction companies. The scope of this paper does not cover performing field empirical analysis.
Findings- The paper's expected outcomes will allow a better understanding of the impact of BIM adoption key determinants of BIM technology, and organizational performance within the UAE construction industry
Implications- The study can assist in maximizing the overall performance of companies within the UAE construction industry while adopting BIM technology, contributing to the literature in this area.
Originality/ value - Discussing BIM technology adoption key determinates impact organizational and business performance related to the construction industry within the UAE by employing the UTAUT model to develop a new research model, which will allow construction companies to increase overall business performance by adopting new technology. This will also contribute to the literature related to the diffusion of new technologies.

Keywords: BIM Technology adoption · Innovation · UTAUT · Organizational Performance · UAE Construction Industry

1 Introduction

The construction industry worldwide is one of the most important and considerable revenue-generating industries, and there is a vast movement to incorporate new technologies into construction management practices, processes, and strategies (Chen 2022). Technology advances can provide essential solutions and innovative ideas to improve the

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construction industry's response to present targets, future needs, and threats to boost performance (Duncan et al. 2018). BIM technology has changed the construction industry by providing a collaborative digital platform for managers, architects, engineers, contractors, and other participants in the building process (Azhar 2011). The United Arab Emirates (UAE) is not an exception to the increasing prevalence of BIM technology adoption worldwide. In recent years, despite the challenges, there has been an increase in the intention to use BIM technology in the UAE construction market supported by the UAE government (Mehran 2016). Yet, the effect of BIM technology adoption on different aspects of organizational performance in the UAE's construction sector remains limited in the literature.

Previous research on technology adoption aimed to discover, forecast, and describe the factors that influence how organizations and individuals accept and use technological innovations using different innovation theories and modules such as UTAUT and TAM (Dube et al. 2020). However, there is a need for more studies in the context of construction innovation within the UAE, such as BIM technology adoption and its overall effect on business outcomes. Moreover, due to the impact that BIM and other modern technologies have on various organizational-level aspects, there is still a necessity to develop emerging and innovative paradigms to understand and assess the exploitation of new technologies, such as BIM technology in the context of a specific country (Dube et al. 2020). Therefore, this study aims to evaluate the impact of key determinates of BIM technology adoption on organizational performance in the UAE construction sector via the employment of the UTAUT model determinates (Performance expectancy, behavioral intention, use behavior) and their impact on organizational performance. The paper will address a main question: How do the key determinants of BIM technology adoption relationship impact organizational performance in the UAE construction industry?

2 Literature Review

2.1 Innovation and Technology Adoption

A broad definition of innovation is applying any idea, method, tangible artefact, or technological advancement that the relevant adopting unit perceives as novel (Blayse & Manley 2004). Innovation can be classified as organizational or technological innovation (Damanpour & Aravind 2012). However, this study will focus on both technological and organizational contexts, as innovation is an integrated practice. Organizations need to preserve their competitive advantage and ensure organizational performance by using new innovative technologies that support the increasing market demand. Research reveals that new technologies significantly impact the construction industry's overall performance, efficiency, and productivity (Sepasgozar & Davis 2018). Khasawneh (2008) defines adoption as the initial intention to use or accept an innovative technology or system. Hence, studying and employing innovation theories and models is essential to understanding technology use and acceptance and the overall impact on construction-based organizational performance.

Multiple diffusion of innovation theories and models have been developed over time by different scholars so far to study, clarify, explain, and analyze various types

of organizational or technological level innovations, such as the well-known technology acceptance model (TAM) and the extensively used unified theory of acceptance and use of technology (UTAUT). However, TAM and UTAUT frequently examine the organizational level's technology adoption (Zhenhua et al. 2008).

UTAUT, introduced by Venkatesh et al. (2003), was derived over a decade ago by combining different proven theories in the area of technology acceptance and innovation and is widely utilized in many other research fields (Venkatesh et al. 2016). As Venkatesh et al. (2013) highlighted, performance expectancy, effort expectancy, social impact, and different conditions enabling are the four factors of UTAUT, which are linked to behavioral intention and use intention moderated by age, gender, experience, and voluntarism. These determinants affect the assessment of behavioral engagement in utilizing and using technology, principally within the organizational-level contexts. Many scholars endorse the UTAUT model and claim that UTAUT is reliable and can be used in any culture or context. However, it is argued that the existing and followed scale measures must be revisited, including the relationship to any new technology usage behavior (Oshlyansky et al. 2007).

2.2 Information Technology in Construction (ITC)

Information technology in construction (ITC) studies are still a relativity new area of research, which lacks a solid methodological base or proven practices (Björk 1999). According to Björk (1999), the use of technologies, strategies, and systems in construction to streamline and reengineer the information process sharing is of significance to ITC, and the primary purpose and driver of ITC research is to speed up the information process sharing across the whole life cycle of developed projects and engineering practices.

"Information Technology" refers to employing computer hardware and software capabilities to process, store, transmit, and display information (Björk 1999). However, information technology in construction can be narrowed to reflect relevant technologies to this unique industry due to the complex nature of the construction sector. As Sepasgozar and Davis (2018) suggested, construction technologies can be defined as new tools, machinery, and adjustments that can assist in achieving a goal, carrying out a specific role, or resolving a challenge. Until now, substantial research has been undertaken on applying certain technologies in the construction industry, such as big data and augmented reality, 3D printing, and robotics (Guo and Skitmore 2017). However, a systematic review conducted by Chen (2022) revealed that 26 technologies were identified from other literature in the construction field, and the study's conclusion highlighted that visualization technologies can support and enable innovation in the construction field and practices. According to this review, building information modeling (BIM) tends to be the most widely employed technique among these construction-based technologies. However, there is very limited research done to evaluate the impact of BIM technology adoption on organizational performance using the UTAUT model with a focus on UAE construction. Therefore, this study will focus on BIM technology adoption in this context.

2.3 Building Information Management (BIM)

The construction sector is famous for its delayed adoption of advanced technologies that can support running businesses, increase productivity, and deliver construction projects with the desired quality (Elmualim & Gilder 2014). However, BIM technology adoption worldwide has risen recently due to the non-traditional organizational advantages and the impact on construction business efficiency (Azhar 2011). BIM provides an integrated project delivery mechanism, a breakthrough method that integrates people, tools, and innovative business structures and processes in a joint effort to minimize waste and maximize efficiency throughout the project's lifespan (Glick & Guggemos 2009). BIM has altered traditional business procedures for engineering projects and business plans of different sizes of organizations within the construction industry. Previous research indicates that BIM adoption is governed by its technological, organizational, and environmental benefits (Elmualim & Gilder 2014). In addition, to achieve the desired outcomes and with the advancement of computer technology in the construction industry, BIM has been combined with other relevant construction technologies such as information systems (GIS) and visualization technologies (Chen 2022).

2.4 Understanding BIM Adoption in Literature

Academic, architectural, engineering, and construction (AEC) and facility management (FM) businesses have conducted extensive research on BIM applications due to untraditional advantages on organizational financial and operational performance (Azhar 2011; Juan et al. 2016). Moreover, BIM adoption detainments, drivers, risks, and challenges in different countries and contexts using various technology adoption models, such as the technology-organization-environment (TOE) framework was widely covered in the literature on the diffusion of innovation (Ariono et al. 2022). For instance, Chen et al. (2019) conducted an empirical study to examine Chinese construction companies' BIM technology adoption determinants using TOE. They found that BIM benefits and management support contribute significantly to BIM adoption success, organizational readiness is not significant to BIM adoption in construction, and small-size organizations have more tendency toward BIM adoption. Another study examines BIM adoption in several Taiwanese organizations by building organizational innovation readiness and technology acceptance assessment models based on TAM and other relevant innovation theories (Juan et al. 2016). In the UAE construction industry context, Mehran (2016) conducted a study on BIM technology adoption due to the UAE government's new requirement to use technologies in this field. This research revealed three significant barriers to implementing BIM technology: a lack of BIM standards, understanding BIM features, and unwillingness to change stakeholders. However, despite the thorough literature on BIM adoption prerequisites and challenges, the available studies on the impact of BIM adoption, focusing on employing the UTAUT model to measure the effect on organizational performance, are limited, especially in the UAE construction industry context (Mehran 2016).

2.5 Organizational Performance in Construction

Innovation and modern technologies adoption affect performance in the construction industry, and different forms of innovation implemented by an organization have varying consequences on performance (Tajuddin et al. 2015). To accomplish the appropriate levels of performance and outcomes, the construction sector must adjust to the rapid advancements in technological capabilities. The literature on innovation and technology diffusion shows the construction industry's reluctance to adapt to new methods to adopt novel technologies despite the ability to boost operational and financial performance (Yitmen 2007). Nonetheless, adopting new technology such as BIM is essential as it's expected to enlarge the performance and profitability of the construction industry because of its known benefits (Azhar 2011; Mehran 2016). It is essential to highlight that organizational performance definitions and measures are generally used without relating to different businesses' or industries' nature and requirements. However, the best definition that fits the context of this study is that organizational performance is a multidimensional construct comprised of subjective and objective measurements, including financial performance measures such as ROA, customer-related results, innovation practices, and operational-related measures (Singh et al. 2016). This definition is suitable because it touches all factors that can directly or indirectly affect the performance of the complex nature of the construction sector requirements.

3 Conceptual Framework and Hypothesis Development

This study examines the impact of key factors of BIM technology adoption on organizational performance to achieve construction innovation in the UAE. It is mainly based on the widely used UTAUT model of technology adoption. The UTAUT model introduced by Venkatesh et al. (2003) was derived over a decade ago by combining different proven theories and frameworks in technology and innovation and is widely utilized in many other research fields and contexts (Venkatesh et al. 2016). As Venkatesh et al. (2013) highlighted, performance expectancy, effort expectancy, social impact, and conditions facilitating are the four factors of UTAUT, which are linked to behavioral intention and use intention moderated by age, gender, experience, and voluntarism. These determinants contribute considerably to analysing actual technology usage decisions and behavioral engagement in the use of technology, primarily within the context of organizational-level settings.

Since its establishment, UTAUT has been frequently utilized as a theoretical lens in technology adoption and diffusion of innovation by scholars performing different empirical examinations of user intent and use behavior of various technologies within various contexts and industries. Despite this evident influence, limited studies have measured or analyzed the performance of UTAUT or examined/evaluated conclusions accordingly (Williams et al. 2015). According to Williams et al. (2015), performance expectancy and behavioral intention, which impact actual usage variables, are qualified as predictors in the UTAM model. Therefore, this study employs these factors affecting organizational performance in the UAE construction industry.

This study proposes a research model based on UTAUT as the model offers theoretical direction that supports building the research hypotheses for identifying key determinants

of BIM adoption impact to achieve organizational performance within the context of the construction sector in UAE. The model employs three out of six of the known influential constructs from the UTAUT model, touching the perceived performance, intention to use, and actual use, and studies their impact on organizational performance as a dependent construct of BIM technology adoption. Despite the considerable usage of the UTAUT model in literature, limited research was done to explore the relationship between these selected constructs to study their relationship and impact on companies' organizational performance (Financial and operational). The following proposed hypotheses explore the associations between the study variables to support the development of a proposed research model.

Performance expectation refers to how new technology can give consumers the anticipated rewards for doing particular activities, and it makes complete sense that the more a user's performance improves when utilizing technology, the greater their intention to continue using it (Venkatesh et al. 2013). Performance expectation and intent behaviour are the greatest predictors of new technology usage (Williams et al. 2015). Therefore, it's essential to explore the impact of performance expectations on BIM technology adoption within UAE-based construction companies. Hence, the below hypothesis is proposed :

H1: Performance expectancy positively impacts the behavioral intention of BIM usage in the UAE construction industry

The correlation between a user's behavioral intention and their actual use of a new technology, such as BIM, is supported by a few of the models incorporated as part of the UTAUT model (Davis 1989). According to Venkatesh and Davis's (2000) research, there is a persistent movement toward organizations shifting away from hierarchical structures and toward those comprising more networked, self-governing teams and integrated practices that support using new technological innovations such as BIM. Therefore, the below hypothesis is proposed :

H2: Behavioral intention positively impacts the use of BIM in the UAE construction industry

According to the study performed by Tajuddin et al. (2015), innovation has a considerable positive influence on the overall performance of businesses. The study also supported the significance of dynamics within the construction industry, the requirement for reform strategies to improve the performance of the sand, and the need for reform strategies to improve the sector's performance. As a result, investigating how BIM affects organizational performance within the UAE construction industry is vital as it can lead to an overall performance improvement in the UAE business ecosystem.

H3: The use of BIM positively impacts the organizational and business performance of UAE-based construction companies.

As shown in Fig. 1, the proposed research model demonstrates the proposed hypotheses and the relationships between the research variables.

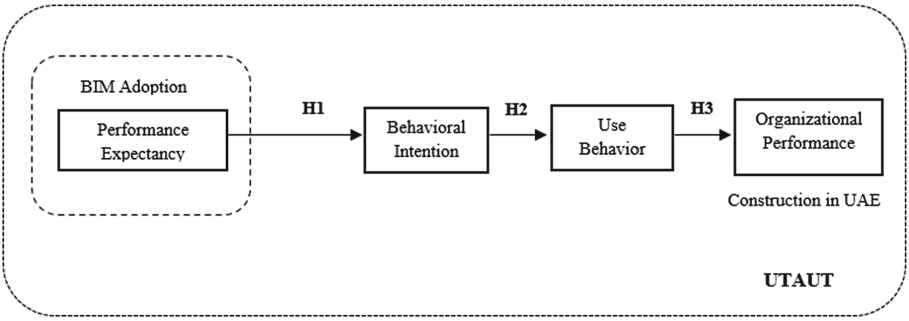

Fig. 1. The research model

4 Conclusion

This paper addresses the impact of key determinates of BIM technology adoption on various aspects of organizational performance in the UAE construction industry. The proposed research model and hypotheses in this paper address the research objective and question by highlighting an existing gap in the literature related to BIM technology adoption determinates impact on organizational performance using the UTAUT model specific to the UAE construction industry (Rogers et al. 2015). The model evaluates BIM technology performance expectancy, behavioral intention, use behavior, and organizational performance, as variables to investigate the relationship in the context of the UAE construction industry. Hence, assisting construction companies in the UAE to increase organizational performance by leveraging BIM technology benefits. The proposed research model in this paper offers an opportunity for future studies to focus on empirical evaluation to understand BIM and different technology adoption and organizational performance and enrich the literature on diffusion on innovation impact. Furthermore, it assists construction companies in the UAE to increase organizational performance by leveraging BIM technology benefits. However, the paper has a few limitations as it's only a framework paper applied in the UAE context. The study can be extended to other countries and industry contexts.

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Analysis of Savings and Investments in First Ten Years of Employment in Dubai

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Abstract. It is crucial in the modern world to not only start thinking about savings and investing but also to act on it. For long term financial stability and growth, one needs to start saving and then carefully investing the savings in different investment avenues. Savings and investments are used interchangeably. But the fact is that both have different meanings with one common motive of safeguarding the future in terms of finance. This paper attempts to study the savings and investments outlined in the first ten years of employment in Dubai. Dubai has all possible investment avenues available, just like any other economy may have. The primary data were collected from 118 respondents, with 65 men and 53 women. It is found that most of the employees are aware of the savings and investments. Males are more aware and hence making more savings and investments as compared to females. It is also found that the majority of the employees save 10–20% of their earnings monthly. The purpose of saving is future security followed by safety and tax savings. Further research found a significant relationship between investment awareness and Gender and the relationship between educational qualification and selection of the investment avenues.

Purpose: This study focuses on the savings and investment opportunities for the employees; further it will explore various factors that motivate employees to save and invest and factors that affect the investment behaviors of the employees.

Methodology: Primary and secondary data sources were used for data collection. Primary data was collected from the targeted population who are in the first ten years of their employment in the UAE by using Google Forms. A probability sampling method was selected for this study. The research instrument was administered to 120 respondents out of which 118 were returned. 2 respondents could not return the form and hence the final sample size was 118, with 65 men and 53 women participating in the survey.

Findings: A significant relationship between gender and investment awareness. Men are relatively more aware of the investment and savings avenues as compared to the women. Women are more driven to invest in gold as compared to their male counterparts. There is a positive relationship between level of education and awareness regarding saving and investment.

Recommendations: Creating monthly and yearly budget is crucial for the financially safe future. Investments in liquid funds to have more flexibility can be considered in this age group. Consulting a financial advisor to make wise investment choices is recommended. Further research can be conducted on the gender-wise investment choices, investment choices at different age level from the early years of earning till retirement.

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Keywords: Savings · Investments · Dubai · Employees etc.

1 Introduction

The Financial foundation of any individual depends on two vital elements i.e. Saving and investments. Investment is the engagement of money to get more income in value in the future. Generally speaking, saving and investments are used interchangeably. But the fact is one needs to understand that both the terms are different, having one common motif of securing the future in terms of finance (Abhinandan. 2019).

Saving is for spending money on our requirements and, of course, for any unseen circumstances. Savings are generally in highly liquid form, as one may require at any point in time. But one must limit the expenses so that the remaining portion from savings can be invested in the long term for capital appreciation. While on the other hand, Investments are done from one's income for securing future emergencies or some plans. Investments come with the questions like the number of investments, the risk involved, time horizon, tax benefit, and many more. There are many investment avenues available like bonds, shares, real estate, insurance, pension, gold and silver, bank fixed deposits and the list goes on. The level of risk and return decides the choice of investment, and hence it is advisable to invest at an early age. With this backdrop, financial literacy is gaining more attention from various stakeholders like bankers, employees, governments, working women, businesses, and many more. Due to the introduction of new financial products, fin technologies, complications of the processes and the economic and political environment, financial literacy has increased. Investing in the UAE is candid and is stimulated by a legally friendly financial environment. UAE is considered the world's freest economy with global business culture, and hence it is considered a steady and investor-friendly hub.

2 Literature Review

The UAE has experienced incredible economic growth and extraordinary prosperity in recent decades, making it one of the richest oil-producing nations (Ali and Wisniesk, 2010). The UAE has all possible investment avenues available, just like any other economy. (Kalli, 2009). Investment opportunities in Dubai: Most of the preferred investment avenues are Real Estate, Stocks, Bonds, Mutual funds, Funds, Deposits accounts, e-saver accounts, and gold. Etc. Investors prioritize innovative economic solutions as key drivers of commercial growth and diversification.

Setting realistic goals for retirement planning is essential for working people. They should also seek professional guidance if they run into any difficulties (Alkhawaja & Albaity, 2020). Due to better living standard, salaried class people started to learn the value of saving and investment and choose to save for child's education, marriage and emergencies rather than spending money on unnecessary luxury items (Sood & Kumar, 2015).

The financial market is the backbone of an economy. Share capital is made available through the financial market and creates a lucrative climate for savings and investment.

The author has discussed different investment options to choose from. Based on the risk-return trade-off, investment options can be selected. It says that the definition of perfect investment is different for different people and therefore, the first step for investment should start with recognizing the investor's need. (Manikandan and Muthumeenakshi, 2017).

The savings and investment pattern of salaried women in the Coimbatore district to evade any emergencies coming into their lives needed for systematic planning for their financial needs. The study was done using questionnaires, and it was analyzed through percentage and Friedman rank tests. It was found that the investment pattern was varied due to taxation slab, safety, and return, regular income (PAVITHRA, 2018).

The following six factors were the most influential ones like expected returns, how fast will it take to be rich, stock volatility, the company's record, government holdings and the making of organized financial markets. At the same time, they also came up with the least important factors: expected losses in other investments, expected losses in International financial markets, religious acceptance, family judgment, and one's gut feeling (Al-Tamimi, 2005).

The level of financial literacy in the UAE is below the expected level and depends largely on education, nature of job and level of income. Those who are working in the financial sector such as banking, insurance and investment are more likely to be more aware about different financial terms and investment avenues. (A. Hassan Al-Tamimi and Bin Kalli, 2009).

A report was made available with all the necessary information required while making investments in the UAE. This guidance included saving accounts investments, pension investments, property investments, business investments, investments in funds, stocks and shares and finally, taxation in UAE with useful investment advice. It was concluded with the statement saying that check before you invest and do your homework! (Lazell, 2021).

While attempting to examine the investment pattern of different classes of working women, households, rural population, salaried people, teachers and others, it was found that the behaviour of each class is different from one another. The reason may be the risk level and the investment awareness. Bank fixed deposits were the most preferential investment avenue, making it clear that Indian people still believe in the traditional investment model (Abhinandan. 2019). The attitude towards spending and risk are positive and not insignificantly are related to the awareness of investment options. There is a need to introduce policies and take action to make young generation aware about the investment and it's importance.

The objective of this report was to check the financial debt status in the youth of UAE. It is believed that this will serve as a platform to develop financial literacy and good investment practices to protect the youths' interests. This report comprises six chapters and six appendices with all the fact sheets and recommendations. This report starts with defining financial literacy, literature review, bank support, on-going programmes on financial literacy and implementation plans (Unknown, 2012).

This study tried to compare the youth who migrated for education with the youths who migrated for jobs and further examined the features of family financial planning. After the survey and some information from records, it was found that youth's migration

for education and jobs had one common thing: the increasing age (Wissenschaften, 2015).

The relationship between savings and income is found and made it evident that people prefer safe and liquid investments which can give them tax benefits, more returns and shorter lock-in periods (Dhawan & Mehta, 2019).

It was found that the youths were very active savers using informal methods of saving for their school fees and some other expenses in Ghana but now, they were quite acquainted with the formal methods of saving (Gina A.N. Chowa, 2012).

Numerous studies have been conducted on the various aspects of savings and investment patterns, awareness about investment avenues, factors affecting the choice of investment avenues and the list. These studies mainly focused on factors like time horizon, risk and return trade-off, tax benefit, to name a few. However, not much research has been done on savings and investment patterns during the first ten years of employment.

2.1 Objectives

1. To study the various investment avenues available for salaried Employees in the Dubai region.
2. To analyse various motivational factors of salaried employees in their first ten years of career.
3. To study factors affecting the investment behaviour of the employees.

Hypothesis

H01: There is no significant relation between Gender and awareness about investments.

H02: There is no significant relation between Income level and the selection of investment avenues.

H03: There is no significant relation between Gender and the selection of investment avenues.

2.2 Scope of the Study

This study focuses only on the savings and investment opportunities of the employees; it is useful to know the best investment opportunities and their preferences in the market available for the employees in their early employment.

2.3 Significance of the Study

The first few years of employment are crucial for the young people who just started to earn and it is crucial to learn how the majority consume the money they earn. Employees usually have a fixed source of income, and various investment opportunities are available in the market. In this regard, the researcher tried to discover the investment behaviour of employees in the UAE. It is also helpful to know about employees' investment opportunities and preferences.

2.4 Research Methodology

The validity of any research depends on the systematic data collection and data analysis method. For this study, researchers have collected primary and secondary data sources. The primary data was collected from investors who are in the age of the first ten years of their employment in UAE. The data was collected through an online survey with the help of Google Form which was designed and administered to the respondents. A probability sampling method was selected for this study. Simple random sampling was used to select the respondents in their first ten years of employment. The research instrument was administered to 120 respondents out of which 118 were returned. 2 respondents could not return the form and hence the final sample size was 118, with 65 men and 53 women participating in the survey (Table 1).

3 Results and Discussion

Table 1. Demographic factors (Observed Frequency)

Age	Unawareness	Awareness	Response	Percentage
21–25	10	32	42	36
26–30	6	40	46	39
31–35	2	16	18	15
Above 36	0	12	12	10
Total	18	100	118	100

It is observed that the majority of the respondents are from the age group of 26–30 years followed by 21–25 years. The majority of the respondents are aware of Savings and Investments. Awareness is increasing as age increases (Table 2).

Table 2. Gender (Observed Frequency)

Gender	Unawareness	Awareness	Total	Percentage
Male	4	61	65	55
Female	6	47	53	45
Total	10	108	118	100

It is observed that the majority of the respondents are males, 55%, followed by females. Males are more aware of Savings and Investments than women (Table 3).

It is observed that the majority of the respondents are from the income group of AED 20,001 to AED 30,000 followed by the group of AED 10,001 to AED 20,000. The level

Table 3. Income Group (Observed Frequency)

Sr. No	Income Group	Unawareness	Awareness	Total
1	< = AED 10,000	8	18	26
2	AED 10,001 to AED 20,000	4	32	36
3	AED 20,001 to AED 30,000	4	53	57
4	AED 30,001 to AED 40,000	0	28	28
5	> = AED 40,000	0	18	18
	Total	16	149	165

Table 4. Monthly Saving of the employees (Observed Frequency).

Monthly Savings	No. of Respondents	Percentage
10% to 20%	76	46
21% to 30%	54	33
31% to 40%	22	13
41% to 50%	8	5
Above 50%	5	3
Total	165	100

of awareness towards saving and investment increases as per the level of income group (Table 4).

It is observed that the majority of the respondents (46%) are making Savings and Investments monthly between 10 to 20% of their income and only 3% of the population saves above 50% of their salaries (Table 5).

Table 5. Factors Considered for Selecting Savings and Investment Avenues

Sr. No	Factors	No. of Respondents	Rank
1	Tax Saving	96	3
2	Liquidity	72	4
3	Future Security	120	1
4	Safety	116	2
5	Affordability	46	5
6	Diversification	24	6

It is observed that the majority of the respondents are selecting savings and investment avenues that are future security followed by safety, tax savings and liquidity. A limited population goes for the diversified investment avenues (Table 6).

Table 6. Challenges Faced for investments:

Sr. No	Factors	No. of Respondents	Rank
1	Transparency	105	3
2	Valuation gap	76	5
3	Legal framework variances	98	4
4	Market regulation	124	2
5	Living standards	144	1

It is observed that the majority of the respondents facing challenges related to savings and investments are living standards as the cost of living is more followed by market regulations and transparency in the investment avenues.

Hypothesis:

H01: There is no significant relation between Gender and awareness about investments.

H02: There is no significant relation between income level and awareness regarding the investment avenues.

H03: There is no significant relation between Gender and the selection of investment avenues.

Hypothesis testing:

H01:

Ho1a: There is no significant relation between Gender and awareness about investments.

H01b: There is a significant relationship between Gender and awareness about investments.

To test this hypothesis, we can look at the chi-square values obtained for each investment instrument in Table 7.

Table 7. Investment Instruments and gender analysis

Investment Instrument		Gender		Total
		Male	Female	
Cryptocurrency	Aware	39(60)	27(51)	66(56)
	Not Aware	26(40)	26(49)	52(44)
	Chi-square Value: 0.972; df = 1; Non Significant			
Life Insurance	Aware	35(54)	15(28)	50(42)
	Not Aware	30(46)	38(72)	68(58)
	Chi-square Value: 7.802; df = 1; Significant			
Health Insurance	Aware	52(80)	39(74)	91(77)
	Not Aware	13(20)	14(26)	27(23)
	Chi-square Value: 0.681; df = 1; Non Significant			
Gold	Aware	32(49)	23(43)	55(47)
	Not Aware	33(51)	30(57)	63(53)
	Chi-square Value: 0.399; df = 1; Non Significant			
Real Estate	Aware	35(54)	41(77)	76(64)
	Not Aware	30(46)	12(23)	42(36)
	Chi-square Value: 7.040; df = 1; Significant			
Market Investments	Aware	35(54)	42(79)	77(65)
	Not Aware	30(46)	11(21)	41(35)
	Chi-square Value:8.307; df = 1; Significant			

Average Chi-Square value: 4.19: df = 1; Significant.

At 95% confidence level, $\chi 2$cal is greater than $\chi 2$ critical.

H01a: The null hypothesis states that there is no significant relationship between gender and awareness about investments.

H01b: The alternative hypothesis states that there is a significant relationship between gender and awareness about investments.

Therefore, we reject the null hypothesis and conclude a significant relationship between investment awareness and Gender.

H02:

H02a: There is no significant relation between income level and awareness regarding the investment avenues.

H02b: There is a significant relation between income level and awareness regarding the investment avenues.

Table 8 Chi-square test

	Observed (O)			
Sr. No	Income Group	Unawareness	Awareness	Total
1	< = AED 10,000	8	18	26
2	AED 10,001 to AED 20,000	4	32	36
3	AED 20,001 to AED 30,000	4	53	57
4	AED 30,001 to AED 40,000	0	28	28
5	> = AED 40,000	0	18	18
	Total	16	149	165

Table 9. Relationship between Income Level and Awareness Regarding Investment Avenues

Expected €			
Unawareness	Awareness	Unawareness	Awareness
2.52	23.48	11.92	1.28
3.49	32.51	0.07	0.01
5.53	51.47	0.42	0.05
2.72	25.28	2.72	0.29
1.75	16.25	1.75	0.19
16.01	148.99	16.88	1.81
X^2	18.70		
df	16		
p-value	0.285		

Since p-value of 0.284 would be bigger than if the significance level at 0.05, indicating that the result is not statistically significant and would fail to reject the null hypothesis (H02a) (Table 8).

It can be concluded that there is no significant relationship between income level and awareness regarding investment avenues (Table 9).

H03:

H03a: There is no significant relation between Gender and the selection of investment avenues.

H03a: There is a significant relation between Gender and selection of investment avenues.

The hypothesis that tests the coefficient of gold if zero couldn't be rejected. So, gold was found to be insignificant at the 5% level of significance. All the coefficients except gold were significant at a 5% significance level. Males prefer all investment avenues

Table 10. Tests of Equality of Group Mean

	Wilks ' Lambda	F	Sig
Crypto currency	0.981	38.017	0
Life Insurance	0.996	9.715	0.002
Health Insurance	0.997	4.94	0.025
Gold	1.001	0.591	0.454
Real Estate	0.987	22.91	0
Market Investments	0.969	69.315	0

except gold. Thus, at a 5% significance level, there is significant difference between gender and investment avenues (Table 10).

Recommendations: Every employee should make a yearly and monthly budget of their expenditure. They have to invest in liquid funds for immediate encashment when required. All employees need to make review of income and expenditures quarterly so that they can save more. For different savings and investment avenues employees should consult a Financial Adviser. They need to make retirement plans and accordingly they should start savings and investments. Further research can be conducted in the field of saving and investments, age and attitude for saving and investment etc.

Conclusion: On the data analysis it can be concluded that men are relatively more aware of the investment and savings avenues as compared to the women. More research can be conducted on the investments made by women and men in different avenues and the sources they rely upon so as to get more insights. In addition, research can be focussed on the study of investment behaviour in the early year of employment and the retiring years of employment. Similarly, the study indicates a strong relationship between educational qualification and the investment avenues. Educated individuals are likely to explore more alternatives of investments on the basis of their knowledge. Further, it could also be concluded that women are more driven to invest in gold as compared to their male counterpart.

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The Impact of Facilitating Conditions on Innovation Readiness in the Dubai Public Sector

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Abstract. Purpose- The purpose of this paper is to analyze the level of innovation readiness in Dubai's public sector by taking a critical look at the current facilitating conditions, analyzing the gaps that arise with the lack of various innovations in place, and offering recommendations to remedy the problem.
Methodology- This study uses a cross-sectional study design by using information from peer-reviewed journal articles. The search process for the articles involved the use of relevant terms such as "innovation readiness," "facilitating conditions," as well as "Dubai Public Sector." The search narrowed down 15 peer-reviewed journal articles that were now used for the study.
Findings- This study identified research gaps from the literature review and highlighted how the literature could be broadened and possible research questions that can be identified from the literature.
Implications- The intention to use innovation readiness is positively impacted by facilitating situations, but the effect is marginal after the initial usage. As a result, the Model suggests that conducive environments have an immediate, considerable impact on user behavior.
Originality/ value- The Unified Theory of Acceptance and Use of Technology discussed in this essay gives insights into the various forms of technology by comparing prominent technology acceptance theories.

Keywords: Innovation Readiness · Facilitating Conditions · Theoretical Framework · Conceptual Framework · The Unified Theory of Acceptance

1 Introduction

Innovation readiness focuses on harnessing factors such as the development of ideas, the acquisition of resources and their allocation, and the implementation of the projects (Ojiako, 2022). A country's level of innovation readiness is heavily determined by how well the leadership invests its time and resources to develop the innovation sector. Other factors include technological advancement and the availability of a conducive environment favoring innovation (Chipulu, 2022).

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1.1 Problem Statement and Rationale

Dubai is home to numerous innovative organizations spurred by UAE's financial resources and corporate influence. These organizations can further their technological advancements if they leverage existing facilitating conditions. This paper aims to 1) identify the impact of facilitating factors on innovation readiness in the Dubai public sector and 2) identify the gaps in innovation that arise when these facilitating factors are ignored. The paper will focus on how the Dubai public sector can use the current facilitating factors to boost innovation readiness. The result of this research will be used as a guide for Dubai public sector organizations to implement new technologies based on the assessment of how different facilitating factors influence the current technologies that they use.

2 Theoretical Background

2.1 Innovation Readiness/Facilitating Conditions

Innovation readiness can be defined as the degree to which an organization is prepared to identify, develop, and implement innovative ideas and strategies (Tidd & Bessant, 2013). It measures an organization's ability to generate and execute creative ideas that create value for its stakeholders. Facilitating conditions be internal and external to an organization, including factors such as leadership support, organizational culture, resources, knowledge and skills, collaboration, technology, and market conditions (Bessant & Tidd, 2011).

2.2 Types of Facilitating Conditions

2.2.1 Leadership Support

Leadership support entails an organization getting assistance from its leaders while bearing a part of the workload. Leadership support is a crucial factor in fostering innovation readiness in an organization. Leaders can provide a clear vision and mission, and create an enabling environment promoting innovation (Zuraik, 2017).

2.2.2 Resource Availability

Resource availability is money and materials being ready for use by a person or organization. Adequate resources, including funding, technology, and human capital, are necessary to develop and implement innovative ideas. In addition, knowledge and skills are vital factors in facilitating innovation readiness (Patterson et al., 2009).

2.2.3 Collaboration

Collaboration is engaging people to work hand-in-hand on a task that involves more than one person. As a facilitating condition, collaboration can occur internally, between departments and teams within an organization, and externally, between organizations, customers, and suppliers (Assimakopoulos, 2007).

2.2.4 Marketing Conditions

Marketing conditions like customer needs and preferences, regulatory frameworks, and competitive pressures can facilitate innovation readiness. Organizations responsive to market changes and customer demands are better positioned to develop and implement innovative solutions that meet these needs (Harrington & Voehl, 2016).

2.3 Theories/Concepts Regarding Facilitating Conditions

2.3.1 Diffusion of Innovation Theory (DOI)

Diffusion of Innovation Theory (DOI) is a theory that explains how innovations spread through society. The theory proposes that the adoption of innovations is influenced by several factors, including the characteristics of the innovation itself, the communication channels through which it is promoted, and the adopters' characteristics (Dearing & Cox, 2018).

2.3.2 Absorptive Capacity

The ability of an organization to recognize, obtain, and apply outside knowledge is known as its absorptive capacity (Bos-Brouwers, 2010). High absorptive capacity organizations are better able to recognize and integrate novel concepts and technologies into their operations, hence increasing their preparedness for innovation (Bogers et al., 2017).

2.3.3 Innovation Culture

An organization's common beliefs, attitudes, and practices that foster innovation are referred to as its "innovation culture" (Patterson et al., 2009). A company's risk tolerance, employee autonomy, and the degree to which innovation is rewarded are just a few examples of the many variables that make up its innovation culture (Patterson et al., 2009).

2.3.4 Measuring Innovation Readiness

The Innovation Readiness Assessment created by NESTA (Patterson et al., 2009), is a survey-based assessment instrument that can be used to measure innovation readiness. This instrument evaluates an organization's capacity to create and execute new ideas, the degree of innovation promotion by management, and its receptivity to outside ideas and expertise. Alternative methods of assessing innovation readiness, such as Lane and Lubatkin's (1998) Absorptive Capacity Index, concentrate on more particular facets of absorptive capacity.

2.4 Theories and Concepts on Innovation Readiness

2.4.1 Diffusion of Innovation Theory

This theory focuses on how various groups and individuals adapt and accept innovation over time and at different phases. This theory can assist in determining the variables that

impact Dubai's public sector's adoption of innovation. According to Dearing and Cox (2018), there are five types of adopters: innovators, early adopters, the early majority, the late majority, and laggards.

2.4.2 Role of Organizational Culture

Employees who feel free to take calculated risks and share new ideas without fear of repercussions can be encouraged by an organization's culture. Innovation-friendly cultures encourage cooperation and cross-functional communication, which can result in the exchange of information and insights that can inspire fresh concepts and methods (Schein, 2010).

2.4.3 Open Innovation Theory

Open innovation is partnering with diverse stakeholders to develop and execute creative ideas. Through the facilitation of access to a wide range of knowledge and expertise, open innovation practices can improve an organization's readiness. Companies have access to more resources, knowledge, and expertise than they could from their own internal resources (Bogers et al., 2017).

2.4.4 Technological Communities

Technological communities and networks can provide a platform for individuals to share ideas and knowledge, collaborate, and learn from each other (Assimakopoulos, 2007). These communities and networks can take various forms, such as industry associations, professional organizations, academic research networks, and online communities..

2.5 Issues and Arguments (Key Questions and Problems that have been Addressed to date)

The main issue is that there is no universally agreed-upon definition of innovation readiness, which creates challenges in measuring and assessing it. Various facilitating conditions, such as leadership support, organizational culture, and resource availability, can significantly influence an organization's innovation readiness. The argument that emerged is that innovation readiness is a critical concept for organizations seeking to thrive in today's rapidly changing business environment (Shwedeh, 2022).

2.6 Key Concepts and their Relationships

Several theories and concepts provide insights into facilitating conditions and their role in promoting innovation readiness. For example, the diffusion of innovation theory suggests that adopting new ideas depends on the innovation's relative advantage, compatibility, complexity, trialability, and observability. The social learning theory highlights the importance of social networks and communication channels in facilitating knowledge transfer and innovation (Shwedeh, 2022).

3 Framework

3.1 Theoretical framework

According to the Unified Theory of Acceptance and Use of Technology, technology use is influenced by behavioral intention. Key determinants of technology adoption are performance expectancy, social influence, effort expectancy, and facilitating conditions – the latter being the perceived importance individuals assign to using a new system (Ahmad, 2015). While facilitating conditions impact initial technology use intent, their effects diminish over time. Predictors of intention, including age, voluntariness, and workforce skills, align with facilitating conditions (Ahmad, 2015). The framework compares various technology acceptance theories and emphasizes the significance of skills and experience in innovation readiness (Table 1). The Theory of Reasoned Action emphasizes the influence of skills and attitudes on human behavior, while voluntariness, linked to the Theory of Planned Behavior, highlights the importance of individual attitudes for optimal technological efficiency (Ayaz & Yanartaş, 2020).

3.2 Conceptual framework

In this essay, we have examined and critically assessed current ideas of technology acceptance. The conceptual framework involves a comprehensive examination and critical assessment of current ideas on technology acceptance, aiming to create an extended model for technology services. To achieve this, relevant constructs from existing models were explored within the context of developing mobile technologies and services. The discussion consisted of various theoretical models in the literature on innovation acceptance and adoption, each with a distinct focus and evaluated in diverse settings. Empirically studied models, such as the Motivational Model, Reasoned Action, and Theory of Planned Behavior, originated from social psychology, while others, like the Innovation Diffusion Theory and Social Cognitive Theory, were derived from sociology (Resnick et al., 2005). The Technology Acceptance Model applied the concepts of technology adoption in a more focused manner (Table 2).

In a knowledge-based economy, having information and the ability to use it provides a competitive advantage (Hofstede, 2004). The essay expands the idea of innovation, viewing it as an interactive, geographically embedded social learning process interconnected with institutional and cultural contexts. Technological advancements, crucial for corporate operations, necessitate corresponding organizational promotions for the industry's long-term growth and survival. The diffusion of innovation is influenced by factors such as innovation typology, innovation champions, distribution timing, and adopters' ability to absorb the creation. The essay emphasizes the crucial relationship between innovation, research, and technology development, highlighting the need for a technology-based approach to deliver the necessary knowledge for successful implementation. The framework's organization is based on innovation typologies, input of knowledge, personnel, lab involvement, and the specificity of the project, contributing to the existing literature on convergent technology (Tidd & Bessant, 2013).

Table 1. Final shape for the Independent Variable

Factor	Explanation/Theory	Level 2 factors affecting the three main factors discussed	References
Age	The effects of age are usually analyzed in the context of productivity estimates, which result in younger people having more positive input	Culture –Young people tend to be more responsive and willing to embrace new technology compared to senior citizens in society Desire to age in place – The older population prefers to stay in their current residences to maintain memories and the quality of their neighborhoods Familiarity with the technology – for older people, it is easier to adapt to the technology they are familiar with	Peek et al., (2014). Factors influencing acceptance of technology for aging in place: a systematic review. International journal of medical informatics, 83(4), pp.235–248
Level of skills and experiences	The theory in support of this is the Theory of Reasoned Action, where the workers' skill and experience level is directly proportional to the rate of technological advamacnmet	Ease of use – Technology that is easier to use is usually more acceptable Familiarity with technology – individuals tend to adapt to the technology they are familiar with faster than unfamiliar technology Level of training – Skills and training level impact the ability to adapt and use new technology	Ahmad, 2015. Unified theory of acceptance and use of technology (UTAUT). LinkedIn Pulse, pp.179–211
Voluntariness to use	This refers to the degree to which the utilization of innovation is seen as being out of free will. This factor is greatly supported by the Theory of Planned Behavior (TPB), which indicates that innovation voluntariness is affected by opportunities, skills, and available resources needed to achieve the desired outcome.	Availability of resources – this dramatically affects an individual's ability to use technology since it first has to be available for it to be used Opportunities available – there should be opportunities available for individuals to be willing to embrace innovation People's perceptions – The knowledge surrounding what people see innovation as will affect how they respond to it	Ayaz & Yanartaş, 2020. An analysis of the unified theory of acceptance and use of technology theory (UTAUT): Acceptance of electronic document management system (EDMS). Computers in Human Behavior Reports, 2, p.100032

Table 2: Final shape for the dependent variable

Factor	Explanation/Theory	Level 2 factors affecting the three main factors	References
Performance expectancy	This is the degree to which individuals believe that utilizing the system will help them to attain better performance	Level of technology acceptance – the group of trust people have in technology greatly influences their level of acceptance, as low trust leads to quiet acceptance and vice versa	Ahmad, 2015. pp.179–211
		Perceived service quality – if the said form of innovation is expected to have excellent service quality, then the performance expectancy is high, giving it a greater chance	
		Effectiveness of the technology – effective technology will be readily accepted compared to non-effective technology	
Effort expectancy	This is the ease with which the use of information systems is utilized. The effects become non-significant after long-term use of technology	Ease of use - Technology that is easier to use is usually more acceptable	Ayaz & Yanartaş, 2020. 2, p.100032
		The complexity of the form of innovation – complex forms of technology are not easy to adapt to	
		Level of infrastructure – well-developed areas may find it easier to use different forms of technology effectively compared to non-developed areas	
Social influence	This is the degree to which the population perceives that essential others believe they should use the new system	Myths and misconceptions surrounding technology – people who believe in the harmful myths surrounding technology find it hard to embrace it	Ayaz & Yanartaş, 2020. 2, p.100032
		Cultural background – various cultures determine whether individuals are ready to accept innovation	
		People's perceptions - The knowledge surrounding what people see innovation as will affect how they respond to it	

4 Discussion

4.1 Research Gaps

4.1.1 Exploring how Organizational Culture can Hinder or Support Innovation Readiness

There is a need to explore how organizational culture can support or hinder innovation readiness. Although studies have recognized the role of corporate culture in fostering innovation, there is a need to examine how specific cultural dimensions can influence innovation readiness. Hofstede and Hofstede (2004) identified six dimensions of national culture that can affect organizational culture, including power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence.

4.1.2 Investigating how SMEs can Enhance Innovation Readiness

The need to look into ways that small and medium-sized businesses (SMEs) can improve their innovation readiness represents another research gap. SMEs frequently require greater resources and capabilities to develop and implement innovation strategies despite the fact that innovation is crucial to their growth and survival (Bos-Brouwers, 2010; Bessant & Tidd, 2011). Thus, in order to improve SMEs' readiness for innovation, it is imperative to investigate how they can make use of outside resources, such as technological communities and networks (Assimakopoulos, 2007).

4.1.3 Examining the Relationship Between Innovation and Readiness for Innovation

The necessity to look into the connection between regular innovation and innovation readiness represents the third research gap. According to Patterson et al. (2009), organizations should promote everyday innovation—that is, small, incremental improvements to procedures, goods, or services—in order to increase innovation readiness.

4.2 Expand Existing Literature

Subsequent research endeavours may explore the function of leadership styles and leader input in cultivating innovation readiness. According to Schein (2010), organizational culture is shaped by leadership and has the power to either foster or limit innovation. Another way is to explore the open innovation approach to enhance innovation readiness. Open innovation involves collaborating with external partners (Bogers et al., 2017). Future studies can investigate how organizations can leverage open innovation to enhance readiness and manage the challenges associated with open innovation.

4.3 Possible Future Research Questions

Possible research questions that can address the identified research gaps and expand the existing literature on innovation readiness include:

1. How do cultural dimensions influence organizational innovation readiness?

2. How can SMEs leverage technological communities and networks to enhance their innovation readiness?
3. How does innovation contribute to building an innovation-ready culture, and how can it support radical innovations?
4. How can organizations leverage open innovation to enhance their readiness, and how can they manage the challenges associated with open innovation?

5 Conclusion

The research was limited by the available literature that requires further investigation of organizational culture and its ability to support or hinder innovation readiness. More data is needed to analyze how small and medium-sized enterprises (SMEs) can enhance innovation readiness and to trace the relationship between everyday innovation and innovation readiness. The results show that the intention to use technology is positively influenced by facilitating situations, but the effect is marginal after initial usage. Conducive environments have an immediate and considerable impact on user behavior. The methodology involved a survey of employees and data analysis using regression analysis. Limitations include the use of small sample size and a single industry.

Future research should expand the scope and incorporate a broader range of industries. Therefore, the limitations of this research can become a base for future studies aiming to examine how specific cultural dimensions can influence innovation readiness. Findings' implementation can help organizations operate effectively by adapting to changing environments and facing challenges with confidence. By supporting related policies and initiatives, companies can significantly benefit from innovations and develop further advanced strategies.

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Theoretical Framework for Effective Communication Processes for the Agile Project Management Approach in the UAE Utility Sector

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Abstract. The goal of this study is to find out how well the communication processes in the UAE Utility Industry work with the Agile Project Management Approach. For this reason, the present study will incorporate a quantitative research methodology that will allow the researcher to verify secondary data on the agile project management strategy. The utility sector in the UAE will be surveyed, as will its management, to gather primary data. Agile project management has suitably made it possible to obtain an appropriate balance between stability and dynamism while providing an opportunity for quick and smart strategy, structure, and process. Due to potentially strong investment from the private sector and collaboration with global investor engagement, the utility sector is considered to be one of the strongest and most lucrative businesses that offers a wide range of services.

Research into the many facets of communication has the potential to improve utility sector efficiency and the effectiveness of related undertakings, contributing to structuration theory.

Team members should have a voice in the agile project management process, maintain open lines of communication with stakeholders, and discuss problems in a timely manner to increase tolerance and acceptance.

Keywords: Agile PM · utility sector · project communication · team members

1 Introduction

The Organizations constantly adapting have caused significant developments in the utility business. Despite an economic slowdown, critical projects in solar, nuclear, and desalination energy are developing rapidly (Bacon, 2018). Utility supply is hard. It requires a suitable framework with creative ideas and technology to allow continual innovation that meets public wants and utility sector difficulties. Most countries are adopting agile management (Booth et al., 2018) to adapt to changes (Bacon, 2018). Agile project management allows for more flexibility than conventional approaches.

Communication is difficult for the organization since there are many departments and synchronization between departments, teams, and team members is vital. Project

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operations cannot be completed efficiently without a communication plan and a strategy to overcome communication barriers. Agile project managers must focus on communication to improve outcomes (Yagüe et al., 2016).

2 Problem Statement

The primary point of the study is that agile project management bridges the gap because stakeholders regularly request planned changes, either during concession or design, which might have an unforeseen influence on project success (Larson, 2018). Involving stakeholders in each stage of development helps manage change requests quickly and eliminates several red flags that benefit the project. It has also been revealed that agile management changes were made due to inefficient communication processes, communication challenges, management styles, fewer opportunities to formalize systems, or project sponsors, which can negatively impact utility project success. Communication is crucial, and the best communication tactics must be used to effectively manage stakeholders and the project (Azanha et al., 2017). Agile project management demands more research and communication to succeed. Multiple researchers have studied agile project management in various sectors, including consulting (Foschini, 2021), ICT (Kaczorowska, 2015), public (Bogdanova, Parashkevova, and Stoyanova, 2020), telecommunication (Balashova and Gromova, 2017), and others. Water, electricity, solar energy, and other energy-related subsectors make up the utility sector. The utility sector needs agile project management and effective communication to address project failures, high losses, delays, poor procurement, increased costs, and other risks (Mtembi and Kanakana, 2015). Communication-based agile project management will boost utility project success. The following goals are based on the above discussion.

3 Research Aim and Objectives

The aim of this investigation is to determine the effectiveness of communication processes in an agile project management approach and their impact on project success in the UAE's utility sector projects.

- To understand the importance of communication in agile project management.
- To investigate the types of communication challenges that the UAE utility sector faces in regards to agile project management.
- To evaluate the impact of communication in agile project management on the project success of the UAE's utility sector projects.
- To find an agile management style of communication that will be helpful to the leaders of the UAE's utility sector.

4 Research Questions

- What is the importance of communication in agile project management?
- What types of communication challenges will the UAE utility sector face?
- What is the impact of communication in agile project management on project success of the UAE's utility sector projects?
- How will the agile management style of communication be helpful to the leaders of the utility sector in the UAE?

5 Literature Review

Structural theory emphasizes social systems repeating the same actions (Giddens, 1993). Cognitive functions are essential to interpersonal relationships, according to this idea (Ismail and Mansor, 2018). According to structuration theory, every organization, including a project, is a collection of relational interactions formed by human actors through negotiating interpretations, duties, and communication norms (Mouzelis, 1989). Structural theory has shown how industry linkages and home organizational capacities affect development organizations (Scarbrough et al., 2004). According to structuration theory, the above process takes a long period yet produces long-lasting world features. Local discussions and institutionalization may be needed to adapt rules to institutionalized norms and ethical implications, balance their contradictory needs, and rationalize keeping them despite recurring deficiencies and disagreements (den Hond, Frank et al., 2012). Even if actors' thinking controls processes, theoretical processes might explain materiality's engagement in projects. Project management researchers may benefit from studying structuration theory. Finally, structuration theory emphasizes power and interests in project-based organizations and initiatives. Giddens (1993) defines power as actors' capacity to effect transformative acts (driven by their own interest or desire) and established differences in actors' access to assets (the means by which such actions are carried out). Thus, project power requires the presumption of regularized actor independence and dependence (Giddens, 1993). Finally, structuration theory highlights the challenges project organizations confront due to mindless repeating of old systems and strives to reconcile different practices and imagine new ones. Project participants use routine, often subconscious, cognitive models of social networks and the material context of activities in the absence of difficulties or unexpected conditions. They recognize power and resource disparities, but they also know that stronger players depend on them. This image depicts Gidden's structuration hypothesis:

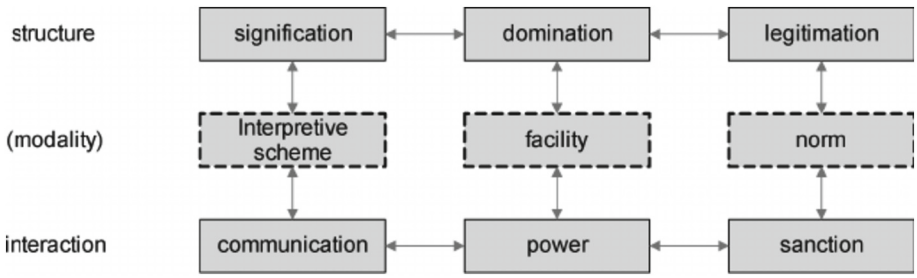

Fig. 1. Structuration Theory (*Source:* Giddens, 1984)

5.1 Agile Project Management

Agile project management is based on the principles that the time between planning and execution must be drastically reduced, that the planning process must not include all the details of its application, and that one must be creative and learn to make sense of one's

surroundings. Agile project management involves short iterations of value proposition generation and code deployment, unlike conventional project management's sequential set of well-defined processes.

Communication is one of the factors that can help project managers overcome scheduling, cost, planning, leadership, and other issues (Salman et al., 2020). Agile project management with effective communication may enhance utility project success. Next, we'll discuss agile project management communication and how it works (Fig. 1).

5.2 Importance of Communication Processes in Agile Project Management

Open communication is essential to agile project management. Communication includes data sharing, information exchange, and teamwork (Sharp and Robinson, 2010). The "basic facilitators" of agile initiatives include collaboration, feedback, and clear communication, according to Conforto and Amaral (2010). In particular, bad project communication may lead to mistakes, poor adjustment administration, poor performance, and project failure. Kamaruddin, Arshad, and Mohamed (2012) suggest that good communication helps people identify practical solutions to complex challenges while working on the project, enabling problems to be addressed before revisions. As articulated in AltSimmons' (2015) agile framework, structuration theory also represents structure, people, and communication (Fig. 2).

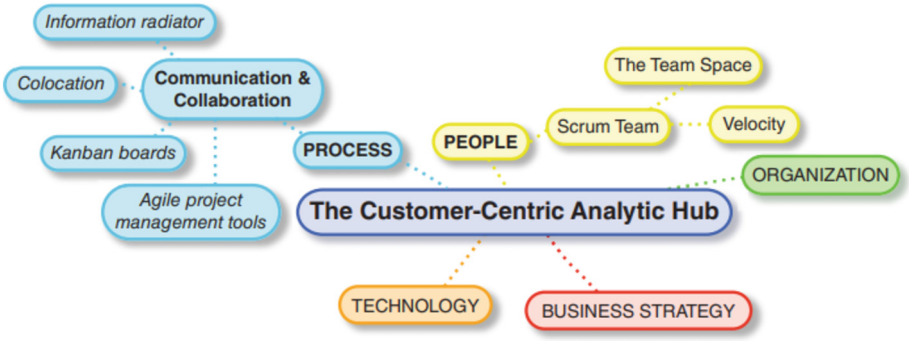

Fig. 2. Communication-Related Considerations in Agile Project Management (*Source:* AltSimmons, 2015)

6 Methodology

In the current study, a researcher will select the positivism research philosophy because the current research focuses on evaluating the empirical correlation between using agile methods and having a successful project in the UAE's utility sector. It acts as a primary guide for the study's statistical correlations among its chosen constructs.

Keeping the above in mind, the researcher will choose the constituents of the deductive research approach for the current study because they fit with the quantitative research

design. A researcher will study excerpts from previous research and analysis on communication in an agile project management approach and interpret existing theories associated with it. Then screen the research hypotheses that have been generated. A researcher will deduce meaning from the phenomenon in order to draw rational conclusions about it.

7 Conceptual Framework and Hypothesis Development

The primary study hypothesis was tested using the conceptual framework, which was created to examine the link between communication processes in agile project management and the projects' success in the UAE's utility sector. The research's conceptual framework in the following figure demonstrates a causal connection between communication processes in agile project management (independent variable) and the project success of the UAE's utility sector projects (dependent variable) (Fig. 3).

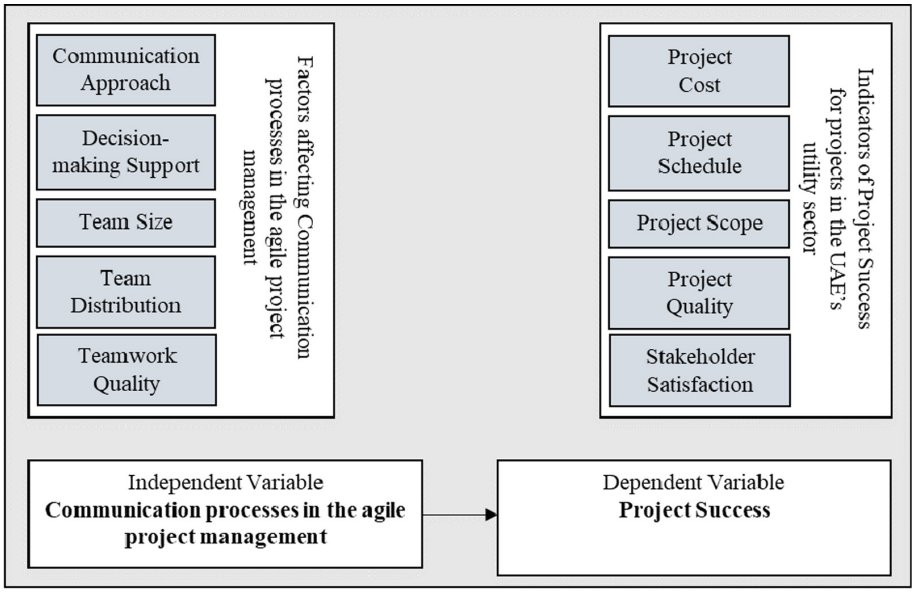

Fig. 3. Conceptual Framework

7.1 Factors Affecting Communication in Agile Project Management

Researchers in the field of agile project management have discovered and explored a number of factors that have an impact on communication. The following table summarizes the results of a systematic literature study conducted to discover influences on communication (Table 1).

Table 1. Factors Affecting Communication in Agile Project Management

Authors	Focus of Research	Research Context	Factors affecting Communication
(Hummel, Rosenkranz and Holten, 2013)	Provide a comprehensive understanding of the function of communication in agile systems development via an organized and thorough study of the literature. Despite its accepted significance, the authors found that the understanding of communication and agile systems is limited since only a few researches facilitates the communication process	General context	Team distribution
			Team size
			Project domain
(Ochodek and Kopczyńska, 2018)	Examine and rate agile practices depending on how their relevance is seen by professionals for software development	Worldwide context	Scope of Project
			Effective workspace (culture)
(Gemünden, Lehner and Kock, 2018)	Identify various elements that are crucial for project management and can further help in development of project-oriented organization	General context	Organizational structures
			Decision-making
			Quality of Teamwork
			Team distribution
(Salameh, 2014)	Compare traditional project management and agile project management based on various disciplines, such as communication, change, scope, risk management, and leadership approach	General context	Team distribution
			Project requirements
			Communication channels
(Alzoubi, Gill and AlAni, 2015)	Develop an agile strategy from the architectural body of knowledge for addressing the hitherto unexplored distributed agile development communication difficulties	General context	Internal team conflicts
			Team size
			Communication approach
			Team distribution
			Organizational structure
			Project domain
			Quality of teamwork
(Liubchenko, 2016)	Analyze practices linked to communication and develop an agile project management framework	General context	Team size
			Decision-making support
			Project scope
(Cunha, Moura and Vasconcellos, 2016)	Identify various factors that are involved in agile processes in software project management	General context	Communication approaches
			Decision-making skills

In agile project management, communication strategy, decision-making support, team size, team dispersion, and collaboration quality are all important factors in communication processes. These characteristics were selected because they significantly impact employee communication and company performance.

From the above table, it can be observed that the most common project success indicators are project cost, schedule, scope, quality, and stakeholder satisfaction, and each of these is discussed in the following sub-sections (Table 2).

Table 2. Determinants that can determine the project success

Authors	Focus of Research	Research Context	Determinants of Project Success
(Agarwal and Rathod, 2006)	Determine the perspective of what builds a successful project	Software industry	Cost
			Time
			Scope
			Customer (Stakeholder satisfaction)
(Koelmans, 2004)	Determine and evaluate the determinants of project success	South Africa	Budget
			Schedule (Time)
			Project Quality
			Scope
(Serrador and Turner, 2015)	Evaluate the project success factors, like budget, time, project scope, stakeholder success, team satisfaction, client satisfaction, end user satisfaction and their impact on project efficiency in general project management context	Worldwide context	Budget
			Time
			Project Scope
			Stakeholder success
			Team satisfaction
			Client satisfaction
			End user satisfaction
(Turner and Zolin, 2012)	To help management of major projects anticipate how different stakeholders see the project's success and identify and evaluate a list of project success indicators	Australia	Time
			Cost
			Performance (Quality)
			Client satisfaction

7.2 Relationship Between Communication Processes in Agile Project Management and Project Success

Every company relies on good communication. Better internal communication improves quality, earnings, innovations, and market share, which helps projects (Highsmith, 2009). Poor workplace communication may lead to worry, workplace irritability, lack of conviction, devotion, job-loss intention, and absenteeism (Miller, 2019). Communication is crucial to an organization's strategic objectives. Projects and organizations succeed with well-planned, proactive, and successful strategic planning-level communication

(Alzoubi and Gill, 2014). Business success requires communication. Modern company need effective communication channels to satisfy client expectations with less resources. An insecure workplace with insufficient communication cannot succeed. Thus, utility companies should eliminate communication barriers and establish structured, collaborative, and transparent project team dialogue. Structural theory suggests concentrating on several communication channels to improve project success. The UAE utilities business lacks an empirical study on how agile process management communication affects project success. A review of the aforementioned studies led to this hypothesis: Effective communication is linked to project success.

H1: There is a positive impact of communication processes in agile project management on the project success of the UAE's utility sector projects.

7.3 Hypotheses Development

Based on the above conceptual framework and a critical review of theory and literature, the following hypotheses will be tested in current research.

H1: There is a positive impact of communication processes in agile project management on the project success of the UAE's utility sector projects.

8 Discussions

Descriptive statistics based on the aforementioned study showed that effective communication is significant for project success. Correlation research reveals a favorable and substantial relationship between open lines of communication and the final product quality in agile project management. The data also exhibits no abnormalities in terms of skewness and kurtosis, as measured by the normalcy test. Moreover, a regression study showed that in an agile project management setting, the quality of communication significantly affects the outcome.

Discussion is conducted in accordance with the study's conclusions via comparison and contrast with other research found in the literature.

9 Conclusion and Recommendations

9.1 Conclusion

The first objective was achieved by doing a critical literature review emphasizing the importance of communication in agile project management.

The study's secondary objective was also achieved based on a critical review, and it was identified that a poor working environment, a lack of procedures, project complexity, team size, team distribution, and the quality of teamwork could all create communication-related challenges.

By using hypotheses testing based on linear regression analysis, the third goal of this study was accomplished; this time, the effect of communication in agile project management was assessed on the completion of projects in the UAE's utilities sector.

The fourth objective was also achieved through statistical analysis.

Based on the analysis, it was found that the communication approach, decision-making style, and focus on team-related aspects can really help leaders in the UAE's utility sector enhance project success.

9.2 Future Recommendation

There were many elements discovered to be connected. That's why it is vital to analyze whether each component can be evaluated as a variable in order to investigate the effect of one variable on another. Moreover, future researchers can also conduct in-depth, semi-structured interviews with project managers to gather their perspectives on why communication is so important to the success of projects, what factors should be taken into account to improve communication among stakeholders, and what kinds of obstacles can be expected along those lines. However, quantitative approaches may not be enough for studying the complex social and behavioral processes of communication, which might lead to faulty or insufficient findings. One of the limits of the study is its relatively small sample size, which calls for future researchers to build on the study's quantitative and qualitative foundations by evaluating a more representative sample. Future studies might also zero in on the topic of integrating technology, since this is one of the most important ways to boost project results.

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