

PROJECT THINKING ON DESIGN

# PROXIMITY IN DESIGN RESEARCH

*People, Processes, Products, Philosophy*

EDITED BY  
RITA ASSOREIRA ALMENDRA



# Proximity in Design Research

*Proximity in Design Research* explores four constituents of design: people, processes, products and philosophy, and their potential to bridge contemporary gaps through multilevel synergies.

The book brings together a variety of design approaches on several scales developed in the collaboration of different agencies and within diverse contexts. Proximity prompts us to explore the challenges and opportunities for research in design, with the widening and closing of distances in unpredictable times such as those during the COVID-19 pandemic. Despite the social distance imposed during this unprecedented global health scenario, researchers and professionals across different areas of knowledge have engaged in an extraordinary interdisciplinary and transdisciplinary global cooperation. This reinvented proximity enhanced the ability to cross fields, remove boundaries to collaboration between disciplines and accelerate processes towards an overarching goal: to overcome adversity. This edited collection reflects on what designers have taken from this experience so far and the possibilities that are foreseen as the concept of proximity is redefined.

This book offers critical knowledge related to both design practice and design theory. It will be of interest to researchers, teachers and students working in the design disciplines.

**Rita Assoreira Almendra** is a full professor at the Lisbon School of Architecture (FA-ULisboa) where she is Head of the Design Department and coordinates both the Design Doctoral Program and the nucleus of Design at the CIAUD research center. She holds a PhD in Design (2010) from FA-ULisboa, a master's in design management (2004) and an MBA with marketing specialization (2002), both from the Catholic University of Lisbon. Rita has worked for more than 20 years as a design researcher and educator, with numerous publications and master and doctoral supervisions in this field. She is the founder and coordinator of the Research & Education in Design research group [redes.fa.ulisboa.pt] and was responsible for two editions of the International Conference on Research and Education in Design.

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People, Processes, Products, Philosophy

Edited by Rita Assoreira Almendra





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**Part I**

**Design proximity(ies)**



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# 1 New design knowledge for a new philosophical thinking: a speculation on the concept of proximity as a lens for critical thinking in creative education

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## Introduction

The act of “designing” inherently involves mediated proximity, whether at the scale of an object or an entire city. Creative leaders must balance their projects with the relationships they generate. This paper adopts a broad understanding of design as a creative practice and explores the concept of proximity within contemporary society, where overexposure and closeness risk diminishing the significance of creative practices. To support this perspective, the paper introduces the idea of a “society of transparency”, a framework that sheds light on societal dynamics. This concept is then applied to analyse relational art and creative installations that explore the transformation of the body and interrogate dynamics of control, power, and ownership in urban public spaces. The discussion demonstrates how philosophical insights can intersect with design approaches to generate new interpretations of proximity, redefining and enriching our understanding of distance in an overexposed society. The conclusion highlights the potential of integrating reflective philosophical perspectives with practical design methodologies as a means to advance creative research and education in this domain.

The lack of physical proximity and the translation of the social relations to “phygital” environment, forced an excessive closeness to the image of the other. In the art and creative disciplines, the distances are part of the thinking process and enable the practitioners to switch from enacting a creative process to the reflective gaze of the public viewer. In this sense all the disciplines of the creative practice are essentially activators of relational dynamics and enable the engagement of both the participants and creative producers, in a dialogic conversation mediated by the designed artefact.

In this chapter we introduce and compare the understanding of proximity, distance, intimacy and transparency in two different stances: a reflective, philosophical stance in which the excess of proximity is underlined as an anomaly of the transparency society, and a practical stance in which creative practitioners reintroduce the distance and re-propose proximity in a relational context.

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#### 4 Proximity in Design Research

In the first part of the chapter, we propose a new philosophical view on the loss of the undertones and subtlety in the modern society and introduce the prevalence of transparent dynamics in the contemporary society. Some of the most prominent philosophy writings regarding the exacerbated desire for transparency come from the Korean-German philosopher Byun-Chul Han, who explains how the excessive exposure brings a devaluation of the intimacy and reservacy:

Distance and shame refuse to be integrated into the accelerated circulation of capital, information, and communication. In this way, all confidential spaces for withdrawing are removed in the name of transparency. Light floods them, and they are then depleted. It only makes the world more ssshameless and more naked.

(Han, 2015, p. 4)

The second part of the chapter inquires on the creation of relational spaces in a society in which distances and confidentiality are slowly disappearing and transparency is regarded as an important value. In this part we argue that relational art practices react to the overemphasis on the transparency generating “designed” objects that act as intimacy prosthesis for the overexposed bodies.

To sustain this assumption, we will present and analyse the work of three international artists that interpret the body and its presence in the context of the urban environment in three different conditions: as a dynamic carrier of a custom-made “design” structure that edits the perception of the reality in the work of Benjamin Vandewalle, as the generator of alternative identities in Peju Alatise’s work, as a living module which reveals new spatial interpretations in Willie Dorner’s work.

We will show how the three interpretations of the human body bring back the context, the reflective stance of the participants and the public and the power of appropriating hidden or unseen spaces.

In the third part of the chapter, we will discuss the juxtaposition between the reflective, philosophical perspective of the “transparency society” and the practice of designing intended as the activity of “making” and giving shape to meaningful artefacts. Finally, we indicate that the fluid transfer of inspiration between philosophy and design discipline has an ambivalent value. In conclusion we show how the overlap between the philosophical inquiry on reality in the hypothesis of dystopian scenarios advanced by Byung-Chul Han and the concreteness of the designed body artefacts opens a space for new creative leadership education opportunities.

#### **Transparency and social structures**

The participation in the social life of a community implies the negotiation of proximity both in physical and abstract terms and the social organization of a community of individuals has different characteristics according to the level of social engagement of the individuals that form it. As such, Witkin and Altschuld (1995) individuate three types of social structures as follows: *co-actional* structure, in

which the role of each individual is well determined and act as a collectivity; *inter-actional* structure, characterized by social differentiation and interdependence; and *intra-actional* structure, in which the members of a group construct their social identities in relation to each other. Drawing from Witkin and Altschuld, later on Riley proposes a *multi-actional* structure, in which, as Riley explains:

the constructions of an individual identity were complicated, not only by the fluctuating states of possibilities of relationships between individuals but also by an expanding range of available social positions made possible through an expanded awareness of the multiplicity of ideological positions.  
(Riley, 2013, p. 209)

The present society migrates towards an overwhelming digitalization, which shortens the distances between the viewer and the audience, limiting in this way the viewing angles of perception. This mutates the dynamic of personal relations, and as a consequence transforms the intra- and inter-group relations into superficial connections. In the next part we will discuss the deviations brought by the increased transparency in the contemporary society in three instances: the understanding of intimacy, distance and overexposure, and we will argue that negotiating proximity is an essential factor to maintain the equilibrium of a multi-actional social structure.

### ***Transparency and intimacy***

While the *multi-actional* structure is a characteristic of the contemporary western society, due to the present global crisis, the physical closeness rules have been changed and the new rituals of social interactions have modified the perception of our physical and psychological identities. As a consequence, to the increased isolation, part of our social life has migrated to the digital environment, acquiring a higher level of visibility and exposure in an effort to re-establish intimacy. Achieving intimacy to the other, as Han notes, ensures the authenticity of the relationship (Han, 2020) and helps maintain and tighten the social closure. Intimacy is therefore the keystone to authenticity, and the instrument that leads to it is the level of transparency that a person is disposed to offer. In Han's words, "Intimacy is the psychological formula of transparency. One believes that one attains transparency of the soul by revealing intimate feelings and emotions, by laying the soul bare" (p. 35).

At the same time, reducing the distances and maximizing the level of intimacy confuses self-perception, to the point of almost total detachment from the surrounding social context. This leads to the loss of ephemeral social interactions and pushes the individuals towards a self-referential view of reality.

### ***Proximity and distance***

In Han's view transparency is expressed by the lack of distance in proximity, and this alienates the individuals from the public sphere. Exposing the individual



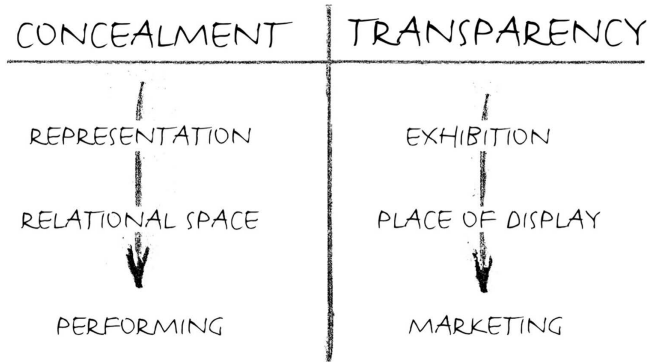


Figure 1.1 Concealment vs transparency

intimacy and cancelling the distances between the viewer and its subject, the interpretation of the identity is lost. In his words:

The loss of the public sphere leaves behind a void; intimate details and private matters pour into it. Publicizing a persona takes the place of the public sphere. In the process, the public sphere becomes an exhibition space. It grows more and more distant from the space of communal action.

(Han, 2020, p. 35)

It is important to underline the definition of the “exhibition arena” not as a relational space but as a “selling” point in which the body and individuals are passively exposed for evaluation. In this concern, quoting from Sennett, Han puts in contrast this type of neutral window display that lacks a significant meaning, with the “representational space” in which the meaning of the persona is constructed by negotiating the distance between the viewer and the persona (Figure 1.1).

Therefore a “space of communal action” is defined as a space that allows the re-introduction of the distance in the concept of proximity, in which the multiplicity of identities and social positions encourage the relational flow. Distances are not only a defining element of the proximity but also an essential factor in establishing the diversity as a relational trigger.

While in the transparent society the diversity becomes an obstacle to the rapid flow of the capital of information (Han, 2018, p. 50), in a relational space the strangeness of the other opens a possibility for interpretation. In order to maintain the fluidity of the *multi-actional* social structure, we suggest that proximity has to be understood as a mediation tool for negotiating distances.

***Overexposure of the body image in the transparency society***

The image of the body is closely connected to personal identity, being the first sign that indicates if an individual may be accepted as part of a social group. The

close-up and the editing of all the parts of the body is perhaps the most common manifestation of transparent exposure. Publishing his or her own body after having removed the imperfections has become a new ritual that alienates the image from the reality of the own identity. Han identifies this as a destructive self-alienation from the own self. He outlines how in the absence of negativity and as a way to perfect its own image, the body becomes the object of optimization and gradually alienates from itself (Han, 2018).

In the transparent society, this perfected image is prepared for a positive marketing evaluation in a place of display that doesn't allow interpretation but invites a neutral attitude from the part of the viewer. The voyeurism of the window display is against the negativity and denies the criticism of the other, for as Han explains, "negativity inheres in the event, for it brings with the reality, a new world, a new understanding of what is. It suddenly places everything in an entirely different light" (Han, 2018, p. 26).

The criticism implies taking a position in relation to the other and therefore invites a debate that comes from putting in contrast what is known with what is foreign to one's understanding. Strangeness for this reason may induce a wide array of emotions and feelings and induces curiosity. Instead, in the lack of distance, the overexposed body presents itself emptied of the meaning that comes from wanting to interpret the unseen and imperfect.

### **"Designed" artefacts in relational spaces of grounded actions**

The loss of distance, the exaggerated intimacy and body overexposure are only some of the issues present in the "transparent society" and addressed in Han's philosophical reflections (Han, 2015). The ubiquity of the mobile and digital technologies on one hand and the desire to maintain the own visibility as a member in the community on the other hand have opened a breach in which transparency manifests as an anomaly (Han, 2017). Furthermore, we speculate that new philosophy trends may provide educational spaces for new design practices.

In order to contrast the "transparency" characteristics, we previously proposed the concept of "concealment" (Figure 1.1) and counterposed "relational spaces" to "places of display" as a way to re-introduce the value of distant gaze and balanced proximity. In the next part we acknowledge the potential of behavioural deviations as creative suggestions and show three examples of installations and performances in public spaces, which react to the aforementioned issues. The common thread that links the three case studies is the interpretation of the body as a "designed" artefact and the way in which the artists act as creative leaders who manipulate the physical appearance of the body in order to achieve an alternative awareness of the surrounding reality. The installations determine three temporary relational spaces linked by the interpretation of the body as a working material for new creative thinking proposals (Figure 1.2).

#### ***Benjamin Vandewalle – the human body as a dynamic carrier***

In his series of installations Studio Citè, the Belgian choreographer Benjamin Vandewalle questions the perception of oneself in relation with the environment and

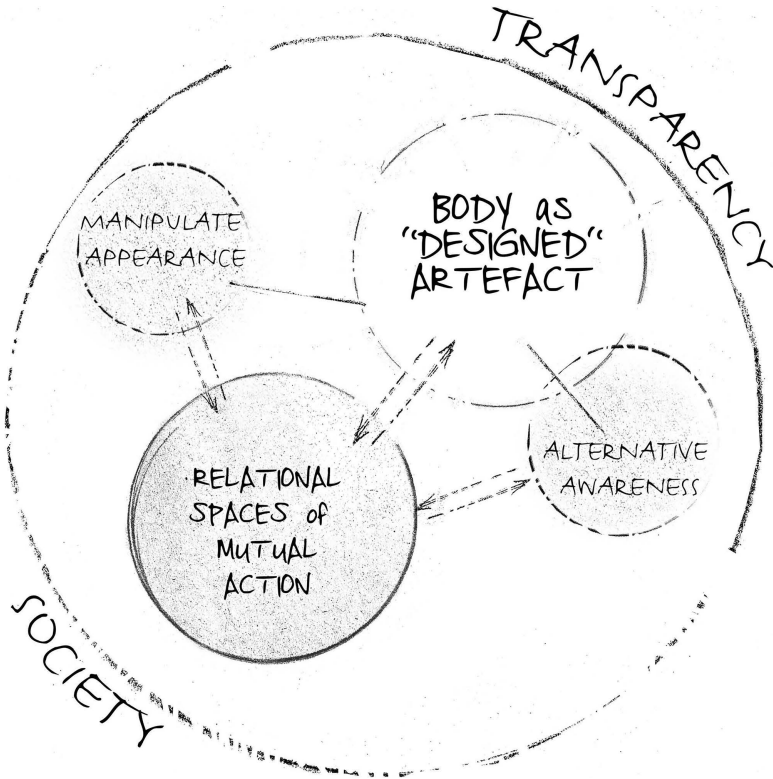


Figure 1.2 Transparency society and creative thinking

with the public. The whole project dispatches eight different viewing analogue devices which can be worn or inhabited by the public and that vary in size and complexity (Figure 1.3). Vandewalle’s “itinerant artfair”<sup>1</sup> sets up choreographed and distorted views of reality, challenging in this way the idea of visibility of the human body. This multiplicity of viewpoints expressed in Studio Cité is anticipated by Peri-Sphere, a single installation, which as Brusselsaers and Julian explain,

defies ocularcentric logic, and through its reflection on the invisible, but still tangible ‘nearness’ of embodied presence, . . . also provides us with useful perspectives on open questions in the digital realm. As a theoretical automaton, Peri-Sphere opens up new points of entrance in contemporary debates on topics such as augmented reality, gestural interface and presence theory.

(Brusselsaers & Julian, 2021, pp. 315–335)

The body regains its physical weight through the use of designed, non-ergonomic objects, which impose their carrier to move and act at a slower speed. By wearing the wooden crafted viewing devices, the participants become partially unseen but in the



Figure 1.3 Studio Cité installations by Benjamin Vandewalle

same time extremely visible as ambulant anomalies in the public space. The designed object gains a social value (Raubenheimer, 2015; Miller, 2016) and is therefore used to provoke a relational engagement that challenges distances and proximity.

### *Peju Alatise – new bodies as generators of alternative identities*

The exposure of the human body is also expressed in the work of the Nigerian artist Peju Alatise, shown in the *New Bodies* exhibition at the Venice Biennale of Architecture. While in the work of Benjamin Vandewalle the body was simultaneously covered and made visible by the designed artefacts, Alatise transforms it into a carefully designed art object. The artist invites the audience to become the other, challenging the perception of the strangeness of the other and offering the possibility to merge into a different reality in order to introduce “moral inclusion”. *Doors for concealment or revelation* investigate the accessibility in the intimacy of another human being, as a therapeutic remedy against isolation. To introduce the notion of a shared, intimate space, the artist remembers the Nigerian belief that “people are like doors, if they permit you entry you become their keeper of secret”. The installation invites the audience to trespass the personal boundaries and expand one’s curiosity towards a strangers’ reality. In Alatise’s words,

Alasiri gives you the opportunity to experience what it is like to be an outsider coming into a space whether you’re welcomed or not, but experiencing the vulnerability within the space, expressing your own vulnerability, your being inquisitive it shows you the connectivity we have with one another.<sup>3</sup>

Similar to Vandewalle, the artist uses the body as an artefact and a pretext to generate a mutated perception of the other, in the relation to the environment. This deviation from the norm allows the audience to become aware of their own identity and to question the personal cultural preconceptions.

### *Willie Dorner – the body as a living module*

*Bodies in Urban Spaces* (Dorner & Thalmer, 2014) is a temporary performance in which a group of performers re-shape a built space by fitting in the interstitial or



*Figure 1.4* Alasiri: Doors for concealment or revelation – Peju Alatise<sup>2</sup>

leftover architecture spaces. The performers are moving through the city in search of intriguing places to inhabit and remain in the pose for several minutes. The performance challenges the “status quo” of the built environment and aims to express the artist’s political statement on how people are constrained to inhabit the urban spaces. As Willie Dorner explains:

Space is the place in which power is manifested in a symbolic way and in architecture and as well in the built surrounding in urban spaces. Architecture exercises power over us in a ‘silent’ way. It has a strong effect on us human-beings how and where we can move/walk, live and how we can meet and communicate. The project boycotts all these underlying commands and dictations that are poured in concrete. It points out all the conventions and agreements by breaking them.<sup>4</sup>

As Haedicke notes, the experience of encountering “objects – in – process of becoming something else, as stories and riddles in which performers and spectators are key players was completely unsettling” (Haedicke, 2015, p. 644). While the attention of the media and scholars focuses primarily on how the body pushes the limits of the architecture, it is interesting to note that intimacy of the human bodies is perhaps the most notable characteristic of his “installations”. The strikingly colourful body compositions challenge the perception of personal space and introduce an uninhibited closeness. Although the installations are ephemeral and don’t change the spaces in any way, as Dorner underlines, they “imprint in the eyewitness memory”.

Not only are the installations “co-performed” (Routledge, 2012) by the participants, the audience and architecture are included in a representation space in which proximity is mediated by distance in between the human bodies. While the performers become human modules, the viewers are gathered in a temporary relational symbolic space (Elias, 2012) by their shared testimony of the event.



*Figure 1.5* Willie Dorner – Bodies in urban spaces (photo credits, Lisa Rastl)

### **Discussion – new philosophy and new design in overlapped proximity**

Many literatures have indicated the relation between design research and philosophy, informing each other and influencing the creative practice. Among them, Galle draws attention to the relation between design discipline and philosophy, asking how the philosophy of design can draw insights *from* other fields of philosophy and how it can also offer new insights *to* philosophy (Galle, 2007, p. 7). Vial points out how design projects can become the “material to raise philosophical questions” and inform philosophic pedagogical experiences (Vial, 2015). Reviewing the advances of the digital technologies and their influence on the teaching and practice of creative disciplines, Redström and Wiltse suggest that “creative leaders” have to adopt new ways of thinking about their practice, and propose to “combine the methods and methodologies of philosophy and design research” in order to create a more updated design philosophy (2019, p. 4).

In general terms, although the importance of the philosophical reasoning in making sense of design practices emerges in many circumstances, there still aren’t definite knowledge transfer methods between the design discipline and philosophy domains. This is partly due to the different levels of abstractions on which creative practice and research refer to (Love, 2000). To support this argument, Love draws from Popper, who in order to clarify the theoretic and logical confusion refers to the relationship between three different conceptual “worlds”:

- W1- Physical and material objects
- W2- The subjective world containing minds and their contents
- W3- The objective world of theories, knowledge and problems

In Popper’s view each world has its own system of reference, language and semantic system and argues that “confusion arises when concepts from different worlds are conflated” (Popper, 1976).

In order to avoid the understanding gap and misinterpretation of theoretical concepts, we introduce the notion of overlapping proximity, in which the abstract, theoretical entities belonging to the W3 and the philosophical reasoning inspire the design “gestures” which manifest in crafted artefacts. In this way the confusion of

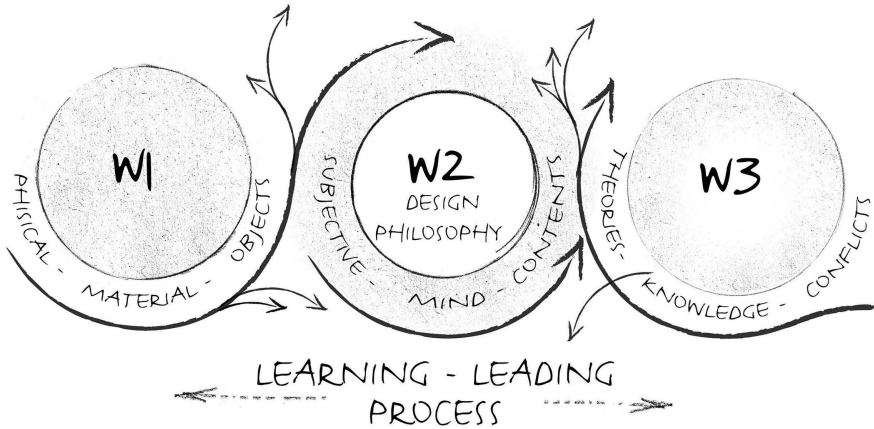


Figure 1.6 New design and new philosophy in the contamination between W1, W2 and W3

appropriating theories and vocabularies unrelated to the W1, physical and material objects is mediated through temporary, relational events (Figure 1.6).

In the second part of this chapter, we presented Byung-Chul Han's philosophical view of how the society is changing due to the increased exposure of human identity and how this influences the perception of one's own presence and the perception of the body. This reflection on the "transparency society" and the changing human interactions was then re-proposed in the third part as inspirational trigger for designing new visions of the human body in the work of three contemporary artists and performers. Without attempting to contradict or alter Han's ideas we speculated that the designed artefacts in the work of Vanderwalle, Alatisse and Dorner respond to the philosophy of Han with the means of the design practice. We also argued that by using the manipulation of form, shape and visual perception, the design practitioners addressed the issues raised in the "transparent society" and offered alternative takes on the interpretation of proximity and distance.

In this exercise of overlapping two stances (Figure 1.6), we introduce the figure of the designer as interpreter of relational events. Moreover, we indicate that the "zone" in which the theories, reflection and semantic concepts belonging to philosophy (W3) overlaps with the design language. It is the role of the designers to update their own practices by interpreting the philosophical thought and reacting to it with their own means to create new design visions. At the same time, the overlay of the two domains opens new learning opportunities for both design and philosophy.

### **Conclusion and future work – learning opportunities for critical thinking in new design and new philosophy**

In conclusion, in this chapter we speculated on the concept of "proximity" in different instances. Firstly, as a theoretical concept discussed in the

philosophical writings of Han as an *anomaly* which emerged in the abnormal use of technology and as a result of overexposure; secondly as a *reaction* to the disintegration of the physical identity, in close connection with the re-evaluation of the value of the distant gaze in the relational events. In this case the concept of proximity was addressed with the design methods and language in physical installations.

Thirdly we proposed a new conceptual framework in which the overlay between design and philosophy allows the interpretation of relational events from both a design and philosophy perspective. In this case we argued that a learning zone for new design and new philosophy can be generated in a *proximity space* generated in between the two disciplines.

We suggest that in this proximity zone learning and leading processes can be empowered by critical thinking that brings together scholars in the two domains. Although proposing new philosophy teaching formats is beyond the aim of this chapter, it is important to stress the difference between “learning” and “doing” philosophy. In a pedagogical experience, as Rudisill remarks,

A student who “does philosophy” is a student who in a self-directed way, exercises a set of intellectual skills in the service of reading greater clarity with respect to a broad range of issues. Included among this range of issues are those of how to best understand certain concepts and the logical relationships between (and sometimes, metaphysical implications of) various concepts.

(Rudisill, 2011, p. 243)

In this sense, future work may outline new directions in which the new philosophy education takes into account the “design” of relational moments that mediate practice and reflection in a continuous learning-leading exercise.

## Notes

- 1 [www.caravanproduction.be/artists/benjamin-vandewalle](http://www.caravanproduction.be/artists/benjamin-vandewalle)
- 2 [www.pejualatise.com/press/](http://www.pejualatise.com/press/)
- 3 [www.youtube.com/watch?v=FU4Mlx2zdn8](https://www.youtube.com/watch?v=FU4Mlx2zdn8)
- 4 Mentioned in an email conversation between Willie Dorner and the authors on 24/08/2024.

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## 2 Amplified experience through temporal proximity

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### Introduction

When regarding definitions of proximity in design contexts, the comparison between nearness and togetherness opens a space for inquiry. Where nearness is easily understood as spatial distance, togetherness brings a richer variety of options to mind. What does it mean to *be together*? If two parties are *apart* and then *together*, what changes were necessary to achieve this togetherness? Can two people sharing a bus seat be anything other than together? Can two individuals separated by an ocean have the experience of togetherness? If we consider an individual and a service provider – such as a patient and a healthcare provider or a student and her university system – can one be together with a large corporation? How might we experience thresholds or ranges of togetherness in each of these examples?

Proximity is the term we use to describe degrees of nearness one to an *other*. Proximity is regularly thought of in spatial terms where one is nearer to an *other* in a physical space, such as a room, car, train, etc. Spatial proximity is an objective fact, measurable, tidy, and clear. One key concern of the discipline of ergonomics is understanding spatial proximity from the perspective of efficiency. From 1895 on through the 1920s, Lillian and Frank Gilbreth used stopwatches and cameras to study the most efficient proximities between the human body and work materials in the environments of bricklayers, carpenters, surgeons, and a range of clerical employees (Price, 1992). We can now set guidelines for ideal distance between a bench and a table at a fast-food restaurant or for the most productive distance between two cubicles in an office set-up. These decisions are easily measured, tested, revised, and published (Tilley, 2002), and can provide frameworks for designs that engage the body.

However, there are multiple ways to note proximity. Proximity might be thought of as a quality of *emotional* closeness or distance. How is it that I might “feel close” to a partner miles away or share an excitement with a colleague on the other side of an ocean? When we consider proximity as a quality of *relatedness*, which relations are more salient to people? Familial or “blood” relations is one example. Siblings might be thought of as most closely related – sharing the most genetic material – then parents and children, then further precedent and antecedent relations.

In this investigation, however, we would like to draw attention to *experiential* distance, the resulting aesthetic of distance or closeness noted in a social interaction. In a given context, what is the ideal proximity in an unfolding interaction? Might there be ways to arrange social interactions *just so* that would afford a richer engagement one with an-*other*? To answer these questions, we will start by recognizing the particular qualities of a *space* where experience is created, how social constructs of proximity manifest within that space, and then explore how designers might manipulate the relevant variables at play.

### **Body + time – the next frontier**

If we are to comment on an ideal proximity in interaction, we first offer a definition of the *space* within which interactions exist. Rather than searching for a space to measure physical distances, interactions take place in the 4th, or temporal dimension. While the design fields have been working with time as a designable variable for some years now (Latour, 1996; Pschetz et al., 2016), the discourse is still being defined (Höök, 2018; Rapp et al., 2022; Yildiz & Coşkun, 2020; Krippendorff, 2021). It is common to find practitioners in time-based design treating the concept through seemingly objective universals. Common strategies for constructing a view of the user’s experience regularly include analysis using (a) stopwatches marking hours, minutes, and seconds and (b) the recording of user journeys through snapshots of instants in time (touchpoints). Both strategies direct attention away from what we offer as the primary elements of temporal design – namely that (a) these designs are about shaping subjective experience and (b) such subjective experiences do not align to ticking clocks or to frozen static pictures. Experience is (a) embodied (subjective and situated) and (b) unfolds in time, impossible to reduce to a snapshot without destroying the actual lived experience.

The ancient Greeks had two words for time. The first, *chronos*, notes the mechanical time of your clock or ticking metronome. Seconds turn into minutes turn into hours turn into days, and years, and millennia. The time of *chronos* is inexorable, and always consistent, regardless of any outside factor. Measured out by robotic chanting of “one Mississippi, two Mississippi . . .”, gravitationally controlled swings of a weighted pendulum, vibrations of electrons in a quartz crystal watch, or most precise, a selected number of vibrations of electrons exposed to a specific wavelength of radiation in an atomic clock, a *chronos* perspective towards time is disembodied in that the mechanical measuring of time does not bend to align to the living body.

The second word for time is *kairos*. *Kairos* is in many ways the polar opposite of *chronos*. *Kairos* is all about the lived experience of time. When attending to the *kairotic*, one may note the subjective feeling of time speeding up or slowing down regardless of the objective markers on the stopwatch. *Kairos* recognizes the vast spectrum of value one might assign to neighboring periods of time. One moment can feel drab and mundane while a juxtaposed moment is climatic or heavy or powerful. The *kairotic* is wholly wrapped up in the felt motion toward and away-from these *crucial* or *opportune* moments of life – the moments when

things come together – arrivals, or *when stars align*. The kairotic is not defined at an *instant* of arrival, but rather, it is only understood in the *unfolding gestures* that bring one toward and away-from these touchpoints.

Temporal proximity should first be explored through a paradigm of kairotic temporality. An infant pays no attention to the ticking clock when they decide it is time to eat. Instead, they are swept up in the unfolding gesture that yearns toward the impending crisis of fulfillment of hunger. The rhythms of the body are paramount. Experiential time is personal, intimate, subjective.

### **The feeling of time unfolding**

One can kinesthetically entrain to a chronos beat. If you set a metronome at a tempo or follow the second hand on a clock, it is a simple task to join in the tempo of that steady beat. One might walk or tap or nod or internally feel the pulse from the external prompt. However, while we might easily begin such an entrainment, the result of prolonged entrainment to the disembodied mechanical is a lessening of our humanity. To *be turned into a machine* is to exist in a space with only the most routine of tasks (Shotter, 2019), an assembly-line process with no opportunity for personal expression, for discernment, no manner for individual contribution, no beginning, no ending, no directionality, no dialogic engagement with other humans; these environments force a deadening of the kairotic experience. There is no fundamentally human chronos experience. Chronos is, by definition, inhuman, and as a result can only be initiated by something outside of the living body.

In contrast to a chronistic entrainment is the possibility for active kairotic entrainment. In these situations, a kairotic gesture (the drive toward or away-from a crusic moment) can be initiated in a certain actor and a second actor can join in the unfolding gesture, creating an enkinaesthetic reality (Neely, 2019; Radman, 2013; Stuart, 2012). A simple example of this is noted in the “high five”, the common playground action of two playmates reaching out and hitting hands high in space. The high five is initiated in the shared momentum of the two participants. The playmates have to feel something of the other’s active momentum and compromise their own inertia to meet each other in a beautiful confluence. While we are often tempted to see the high five as a simple instant of hands touching, a kairotic analysis of the high five foregrounds the aligning of two individuals’ momentums yearning toward and away-from the instant of contact. It is in the anticipation of the compounding moment and then the release of that anticipation where the experience is created. The kairotic instant or “opportune moment” (McNeill, 1999, p. 46; Wittmann & Butler, 2016, p. 48) is dynamic by nature. It cannot be held in place or forced static. It is understood better as a progressive, swinging reality from light to heavy to light. The yearning toward the crusic moment builds in weight, climaxing in the achievement of togetherness and then lessens in weight as the gesture dissipates in anticipation of a future moment.

Kairotic time is principally defined by the yearning toward and away-from significant moments or events in our personal embodied experience. The kairotic happening may be thought of as a crossroads, or the coming-together of two separate

gestures. These gestures can be found at various levels of scale<sup>1</sup> (macro, micro, nano). One can experience the kairotic heavy-light cycle in short gestures like the high five, medium gestures such as finally receiving an anticipated correspondence, or very long anticipation/release cycles such as a child growing tall enough to reach the tap, the remission of chronic illness, the birth of a baby, etc.

### **Temporal proximity**

By recognizing the embodied kairotic cycles of heavy-light in our lived experience, one can examine the experience for alignment of self with an-*other*. Temporal proximity is not determined by the spatial closeness of physical bodies, but by the closeness of kairotic cycles, experienced as entrainments, or alignments of movement in time. When choosing to align physical bodies in space, one can bring the elements only so close together. Certainly, two bodies cannot inhabit the same literal physical space. However, when considering the temporal experience, the threshold for success lies in the jointly inhabited experiential space – the deeply entrained experience. A successful high five where each party can meet the other, at just the correct time in an entrained gesture, registers not as two separate actions, but as a shared enkinaesthetic experience. It accomplishes oneness, the ideal in temporal proximity.

In order to comment on, or design for, the lived experience of an interaction, the designer can search for the kairotic and then note the opportunities to design for proximal entrainment. The interaction that is experienced between two entities can first be noted in the separate participating bodies as solo gainings and sheddings of visceral weight – noting anticipation and arrival as a tension and release. However, if successfully entrained to an-*other*, the result is an amplified aesthetic experience accomplished through this shared interaction.

When attempting a high five, I begin my literal gesture, yearning toward a future forecasted crisis (the hit, an aspired-to opportune moment). I gauge and compromise my momentum through space-time with the other in an attempt for oneness. If I attend closely, successfully, to my partner, I reap the reward of amplified experience as my personal isolated crisis is compounded by the shared oneness with an-*other*, resulting in a more-than experience, impossible without the shared entrainment.

(autoethnographic description of a high five by the author)

For the high five to manifest in a beautiful moment of shared momentum, the participants have to be aware of each other and aware on multiple levels. The mates are (a) each likely aware of a cultural norm that places hitting hands in the air as a distinct possibility. They also have (b) to make some kind of emotional connection in advance of the literal motion – this is likely contained in a moment of shared eye contact followed immediately with the beginning of a shift of weight toward each other. Only then can the raising of arms carry the meaning of the impending high five and the promise of the shared experience. Once all these entrainments are

accomplished, the final and most significant entrainment begins – (c) the entraining of momentums one to another. If the two parties are to meet at the center with matching velocity and perfect timing, there is some amount of adjusting necessary. Using live data, the partners must attend one to another in order to compromise their default assumptions – their assumed trajectories and velocities – to those of their mate. Without an attending to the unfolding motion, and an aspiration to align evolving expectations, the hit will arrive awkwardly or miss altogether.

The wish to entrain to our surroundings is part of the base human experience. Obviously, one needs to adjust their gait when attempting to entrain to the timing of an escalator, and we are at the mercy of predetermined schedules when trying to entrain to the subway schedule. But we are also entraining with simple head nodding to cue we are listening to our spouse, or in the joy of approaching all green lights when completing our morning commute without having to stop at multiple intersections, or being pleasantly surprised when the downloading – installing – registering – and launching of a new app on our phone goes just as smoothly and quickly as hoped.

In each of these successful entrainments is evidence of ideal temporal proximity, or oneness. The individual and the *other* entrain through awareness and expectation. Together, they compromise to align momentums, driving toward opportune moments. Yet, for every one of these examples of successful entrainment, one might name numerous ways that two parties can be misaligned, or proximally distant. To miss the escalator, miss the subway, miss the point of my spouse's story, get stuck at a red light, or find myself stalled when installing a new app are all failings due to misaligned momentums.

When Jimmy decided to take the afternoon to visit the DMV, he knew of their reputation for long lines and poor customer service. He was prepared for a long wait and uncomfortable chairs. What he could not prepare for was the feeling of being lost. If the service design team had only found ways to cue Jimmy as to his place in line, the timing of the wait, the progression of his motion toward the arrival at a customer service representative, he would have been able to adjust his internal momentum to match the momentum of the DMV, permitting a less frustrating (if not beautiful) entraining to the inertias of the day. However, without any way to perceive unfolding motions, Jimmy not only could not find compromises for alignment, but he was also utterly lost in the process, unsure where to look for any motion at all.

(autoethnographic description of a visit to the DMV)

Entrainments can be understood as the confluence of momentums arriving together at an opportune moment. The majority of our examples so far have consisted of two thinking, feeling beings attempting to arrive together and depart from an opportune moment. However, perhaps a majority of designerly work engages with connecting a being in motion with a technological object. The temporally aware designer might ask “What are the rhythms of this experience?” or “How might I best cue people in this situation to help them understand the arc of this experience?” or “In what ways is progress made manifest to people?”

### **Designing for the opportune moment**

The opportune moment is a moment when the participant's possibilities are most fecund. Possibilities for action, engagement, connection, conversation and persuasion can all be understood as a kind of experiential proximity. Sales persuasion often attempts to precipitate an opportune moment for purchasing a product or service. Salespeople have attempted to align the stars of a customer's desire with a product for sale since before currency existed (Cialdini, 1984; Graeber, 2014) creating a moment where, to be consistent with their own stated desires, a customer has to say "yes" to a transaction. Packaging designers discuss the moment of choice that a customer might make in front of the store shelf. At the point-of-purchase, packaging attempts to persuade the customer at the moment of decision (Wybenga & Roth, 2012). Packaging might offer information, or the graphic language of the package might cause the client's product to "stand out" in a crowded grocery store shelf (Areni et al., 1999). There are numerous examples of advertising attempting to reach potential customers with their persuasive messages at just the right moment. Freeway billboards are placed *just so*, notifying drivers of the last chance for food, gas or other services in the hopes of spurring an impulsive decision. In 2018 a Cannes Grand Prix award was given to a McDonald's billboard campaign which simply used strategically placed billboards with directions to nearby restaurants (Horn, 2018). Vendors of seasonal merchandise time promotions and product production schedules carefully to both maximize sales and minimize the time that products will need to be stored in warehouses or kept in store inventory – both attempt to tighten entrainments.

Social media are designed to algorithmically create these opportune moments through notification timing, perhaps delaying informing you of engagement with the content you post to extend a session of engagement. Like a skilled teacher who creates opportunities for a classroom reset of attention (Benner et al., 2022), or the consecutive advertising technique of Burma Shave road signs in the US from the 1920s to the 1960s (Heike, 2021), the social media technique of timed notifications attempts to engage users at an opportune time to continue engagement with the platform. As attention is waning, offer the user a notification that a recent post has been "liked" to catalyze a new burst of attention.

In his book *Persuasive Technology*, BJ Fogg (2003) discusses the growing area of digital suggestion technologies that leverage people's extant motivations to provide suggestions for relevant behaviors. Fogg offers the example of SMART trailers placed at problematic areas of municipal roadways where people are tempted to speed. The notification is implicit: if you are speeding, the trailer urgently flashes your speed in 3-foot-high numerals so that you and the other surrounding drivers and pedestrians can clearly see the violation. Effective placement of the trailer determines the timing of the notification – inspiring slowing as a driver approaches a school zone, a heavily used crosswalk, or a dangerous curve in the road.

Similarly, Apple's Siri (2021) offers the functionality to set reminders that are tied to particular geolocated coordinates. "Siri, remind me to get more jalapeños when I am at the grocery store" or "Siri, remind me to email Thomas about our project when I get to work." In these instances, the kairotic moment is assumed to occur at a particular geographic location, with the assumption that when I am next near the grocery store

will be the opportune time to replenish my supply of jalapeños. Yet, as Fogg states, the technology doesn't (yet) have the ability to identify a wider range of opportune moments. Digital agents are currently not configured to have the perspective to know whether I am quickly driving by the grocery on my way to an appointment or am approaching the grocery store to do my shopping for the week.

The ability for technology to identify *inopportune* moments exists and is being explored in a nascent way at the time of this writing. Apple laptops will now, by default, mute notifications while screens are mirrored to a projector. The screen mirroring to a projector is likely done only during a presentation – an inopportune moment to have notifications of personal text messages from one's children appear. But while these types of opportunities for engaging the kairotic currently exist, they are rarely being leveraged. Any mobile computing device could be aware of the user's schedule – automatically muting calls and notifications in meetings for example. Devices might be aware of a messaging chain that contains a significant text string like "I'll pick you up at 5:30" to contextually update driving directions and update each party with the other's location when the pickup time is approaching. A timed reminder to "Pick up Sara from the airport" might induce prompts to add Sara's flight information and note whether she has checked baggage. The service might then collate her real-time flight information, as well as traffic and weather conditions and your own history of driving speed, to determine the opportune time to leave for the airport. Depending upon flight length and whether Sara had dinner, devices might offer restaurant suggestions near the airport.

Certainly, these types of push notifications have been discussed at length in recent years, yet, if not carefully considered for the kairotic embodied entrainments between user and *other*, it is likely that the designers are overlooking the root of the amplified experience reaped when the stars align *just so*. Rather than framing "geographic text alerts" just as clever timing, or efficient use of geofencing, the authors want to point out that temporal proximity – oneness of self with an *other* – is the actual goal. Clever timing is only clever or successful if it succeeds in capturing the mounting lived experience. The text alert to buy jalapeños is not successful because the user stepped on a given tile at the grocery store (a snapshot or chronos analysis), it is successful because the alert arrived in concert with the user's motion toward a mounting climatic or kairotic peak. The user wants jalapeños, not because they passed a particular point on a monitored geofence, or because it is 5:15 p.m., but because they are on the way home from work, Aunt Janice is coming over, and she loves homemade chili, for which fresh jalapeños are an essential ingredient.

Lessons on designing for kairotic engagement might be drawn from hospitality design. Perhaps without verbalizing it as such, excellent hotel and other hospitality services understand that their guests arrive already in mid-momentum and trajectory. These service providers make it their calling to adjust their own momentums and trajectories to tighten the temporal proximity between their services and the needs of their guests. Great service recognizes the current kairotic moment of the guests as imbued with momentums and trajectories to entrain to. Yet, in prominent service design texts, authors continue to frame the service as a sequence of "snapshots" rather than an unfolding experience.



Service design is about choosing the most relevant touchpoints for service delivery and designing a consistent customer experience across these many touchpoints. It looks for opportunities to introduce potentially new and more effective touchpoints, remove weak touchpoints, and coordinate the user-experience across touchpoints in relation to brand message and user needs.

(Stickdorn & Schneider, 2011, p. 210)

It is not simply a misleading metaphor or a misunderstanding of the nature of experience that allows these misconceptions to persist – the technologies themselves have been organized around the precise cycles of chronographic time, thus reinforcing a disembodied perspective. A designer attempting to design a rich and kairotic experience in current conception of digital media is, in effect, designing counter to the architectonic qualities of the medium. Current options for designing opportune moments are largely limited to engaging one of these streams of chronos-oriented timing or digitized geographic understanding. The question of how time *feels* is left largely unaddressed in both design rhetoric and in technical innovation.

Rich experience, innately rewarding, can be designed for. The recipe in the high five appears obvious enough: (a) acknowledge that experience is centered in a subjectively feeling body; (b) notice/find/foster feeling through kairotic gestures ever yearning toward crucic moments; and (c) recognize the opportunities for amplified experience through temporal proximity where entrainments of one to an-*other* can be so well aligned as to accomplish oneness between the participating bodies. While *oneness between participating bodies* is simply stated and even common on most playgrounds, the actual accomplishment of designing for amplified experience remains difficult to author in many designed interactions. Addressing this will require a reorienting of mindset for the designer and technological engineer alike. As we explore opportunities for future research into temporal proximity, the gaps surrounding the designer's understanding of and attention toward kairotic time, *in time* lived experience, and ontological assumptions regarding the recording and reporting on shared experiences, are each potent areas underrepresented in design scholarship. The present investigation offers extensions of the current vocabulary for designing in time, yet still falls short of offering a comprehensive theoretical approach. Regardless, it is through these kinds of explorations: engaged observation and attempts to collate a new language for designing for experience, where paradigmatically altering shifts in the practice can emerge.

## Note

- 1 See also Christopher Alexander, *Fundamental Property 1: Levels of Scale* (Alexander, 2002).

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### 3 Designing the proximity

#### Temporary exhibition of a research project's constellation

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#### Introduction

We question ourselves about many parts of our life when the world is being affected by the COVID-19 pandemic, and we wonder most of all whether some of our behaviors and habits will remain the same or whether they will undergo changes in the next years. In this uncertainty we sway between the desire for stability and the desire that this can be read as a situation so extreme that it leads us to reflect radically on some established habits, pushing us to change what up to now has also been the cause in some way of what we are experiencing, and therefore an extremely dangerous and anthropocentric exploitation of nature and its resources. In this panorama we try to imagine future scenarios for our cities, for a different use of public spaces, more inclusive, which responds to the needs and desires of different urban populations: children, elderly, animals, non-human agents, etc. It is estimated that by 2050, “70% of the population will live in cities” (Bebbington & Unerman, 2018). This leads both citizens and local authorities themselves to realize that there is a need to find a way of dealing with these numbers and transformations. With an ever-increasing global population and rising urbanization, creating safe, resilient, and sustainable cities is right at the top of the green agenda. The United Nations included this mission among its 17 Sustainable Development Goals, which together form a blueprint for collectively addressing the challenges the world faces. The possible futures of cities must be linked to the issue of sustainability, which is no longer one of the possible choices but is the only reasonable approach to be able to continue to imagine different scenarios.

#### Future cities over the spatial proximity dimension

Nowadays, cities face the challenge of improving the quality of life of their citizens by adopting the best technologies, forms of communication, and advanced infrastructure. Though technological solutions are available, they do not appear to be sufficient in dealing with concerns such as population increase, food and water sustainability, and mobile populations. By placing citizens at the center of the future of cities and thinking that urban services and spaces gravitate in some way around man and his daily life, the issue of proximity, spatial but also relational, which allows us to live, has become increasingly interesting. The 15-minute city

(Moreno et al., 2021) derives from the concept of the “neighborhood unit”, developed in 1923 in a national architectural competition in Chicago, as a proposal for a layout to build new, compact residential neighborhoods. It was believed that the proximity between services, public facilities, and housing could build communities with a recognizable social and cultural identity on a local scale, capable of contrasting the anonymity typical of large cities. The intention is also to create a new relationship between citizens and the rhythms of their cities, to reconnect them with the areas that are closest to them (Bontje, 2019). This is a concept that should change the idea we have of living spaces, because it is a return to living in the city in a pleasant way and no longer as a source of stress. In general, each city should set the vision or rather understand what the identity of each district is and define what it has in common. The effects of the COVID-19 pandemic might further challenge the established principles and practices on urban infrastructure planning and management (Nahiduzzaman & Lai, 2020): ‘territorialized innovation’ is linked to the enhancement of proximity networks (Tricarico & De Vidovich, 2021). The city is a resilient entity, and “each critical episode has presented an opportunity to shape and rethink urban planning to evolve after critical episodes” (Megahed & Ghoneim, 2020). Recommendations by C40 Cities suggest that the idea of the 15-minute city could help urban areas recover from the financial devastation of COVID-19<sup>1</sup>: it is intended to function as a model of reconnecting people to their neighborhoods and localize city life, in terms of accessibility, walkability, density, land use mix, and diversity. The functional mix of spaces is necessary to make the cities surrounding the inhabitants more accessible and livable places.

The urban space can be considered a scenario, a place of action to which each of us attributes meanings and identities through perception: even the most specialized approaches have difficulty in restoring the complexity of perception and of the synthesis that our perceptual system is able to make. The reference to perceptive psychology in the reading of the urban environment is, in fact, the approach already proposed by Kevin Lynch in “Image of the city” (1960). In its formulation of the criterion of the figurability of urban design, the text defines the reading of the environmental image of a city as referable to three different inseparable components: identity, structure, and meaning.

In its essence, the theme of the city of proximity is not a new one: it can be observed that there are cities, or more often parts of cities, which already come close to this condition (having inherited neighborhoods from the pre-modern past in which the limitations of means of transport meant that the whole of everyday life had to be proximate). Barcelona exemplifies urban efficiency. A dictionary was created to study complexity in order to aid in the growth of the metropolis. Indeed, under the urban plan, urban density is envisioned as the primary aspect that allows for proximity. Planners have examined how to have six basic activities every 350 meters, which is possible due to the grid on which the city is structured. The city’s superblocks function like cells, thus they have their own functioning yet work in tandem with the other blocks. And this is the most important aspect in favoring the nearby city. In Barcelona, it is possible to find six essential categories of activities, including food, health, and culture, within a five-minute walk. Furthermore,

one of Barcelona's strong points has been its capacity to establish new regions of centrality and then develop areas that had not previously been well developed. Also Paris, the capital of France, is the city that has what it takes to put the 15-minute city model into practice. It is a city with a very large surface area and a very large population, plus it is a city with a great history, but what makes it powerful is that it is very much geared to innovating for the future.

Furthermore – under various names as, for example, ‘smart city’ or/and ‘walkable city’ (Speck, 2018) – this theme has come back into circulation and, driven by environmental (traffic and pollution reduction) and social (combating loneliness and improving quality of life) motivations, a range of cities have launched projects and programs that refer to it (Hammer et al., 2011). Given this, there is an urgent need to take up the theme in light of what has been happening in recent years. In the background there is growing evidence of the intertwining of the environmental crisis (Folke et al., 2021) with the need to question the ways and timescales in which it should be addressed, and the social crisis caused by the increasing distance between those who accumulate wealth and those who have less and less with the need to regenerate the urban fabric (Furlan & Faggion, 2017).

Could reframing new contemporary settlements based on a new idea of proximity be possible?

### **Exhibition of proximity declinations**

In the last years, the concept of proximity has been seen as a trend that everyone talks about and for which everyone experiences, maintaining the basic meaning that also Manzini in his last book (2021) reconfirms as “the condition of being physically close in space”, and a feeling deriving from the awareness of sharing something with someone. But at the same time, it is a subject that has always been investigated, especially in the definition of its meaning, which is never unique but full of facets, starting with Boschma (2005): “in the field of social geography – originally used in the study of the territorial location of organisations”.

It proposes five dimensions of proximity: geographical, cognitive, social, organisational, and institutional.

Accordingly with Balland and Boschma (2021), he pointed out that optimal social proximity may be a prerequisite, as embodied, for instance, in a balance between embedded relationships within subcultures and strategic ‘structural hole’ (Fleming et al., 2007) relationships among cliques. Scientific analysis for the existence of such an optimum for various proximity dimensions has been discovered.

Following, it is now possible to justify the choice of staging an exhibition with the title *Designing the Proximity*. *Designing the Proximity* is the topic that the Design System of Politecnico di Milano – a unique research and training center comprising POLI.design, the School of Design, and the Department of Design – has put at the center of Milan Design Week 2021, in collaboration with BASE Milano.

During the period of the Fuorisalone, as part of ‘We Will Design’, the spaces of BASE Milano hosted the exhibition *Designing the Proximity*. It investigated

different points of view on as many issues related to the city of proximity: a collection of ideas from which a clear scenario for the city of the future emerges.

The exhibition was organized based on a call for projects addressed to all the students of the master's degree courses of the School of Design and the master's courses of POLI.design. The collection of projects and materials was carried out in two phases. Initially, a selection of courses in which the concept of proximity had been dealt with was made and all the respective professors were contacted. The collection of preliminary information about the various projects allowed us to make a general overview of the type of projects, the materials developed, and the design areas involved.

The next step was to select the final projects according to three different parameters: thematic coherence, degree of innovation, and definition of the disciplinary field of intervention of the project. The selection led to the definition of a heterogeneous group of 30 projects, which in different ways investigate the theme of proximity, embracing different areas of design, from spaces to products, from service design to communication design, from interiors to urban systems. Some students design health services a short distance from home; others recover abandoned urban spaces and transform them into inclusive places, dedicated to children and the elderly; and there are those who design new scooters to enhance slow mobility; those who provide places for the different identities of a neighborhood or a specific area of the city and look to build new communities around common interests; who enhance the delivery of local services, design new pedestrian areas, transform the streets into meeting places, and collaborate with neighborhood shops and local producers. Starting from this constellation of ideas, we extrapolated 15 keywords that could concisely and directly define the various interpretations of the concept of proximity addressed in the projects presented: spaces for people, living streets, local productions, communities, local cultures, playful environments, new sociality, care services, small business, non-human inclusion, slow mobility, walkability, short distance, inclusive neighborhoods, and commons care.

In the following paragraphs we have defined five sub-thematic clusters and presented a selection of projects by defining the corresponding keywords and declinations of proximity.

### ***Urban spaces for sharing, meeting, and cultural exchange***

Public space is one of the focal points of the concept of proximity because it is the element most accessible to all citizens and should automatically activate collective participation. In the future, the neighborhood will certainly have to offer more living and hybrid spaces for participation. Experiencing proximity also means sharing and confronting each other outside one's own home.

With the keyword Spaces for People, it is possible to conceive the consideration of public space, exacerbated by the experience of the current pandemic, is key to more sustainable and inclusive development at the urban level. We need to design neighborhoods in which not only all essential services are available and easily accessible, but in which public space can become an actual opportunity. This is reflected in

the thesis project ‘Farsi Spazio’ for the Nolo neighborhood in Milan. Living Streets, conceived by the creation of temporary urban structures, gives the possibility to act in synergy with the city, adapting spaces to new functions. In cities lacking green spaces and places to stop and socialize, the aim is to interact with local services by offering new social functions. The aim of final thesis project ‘TownHome’ was to encourage the inhabitants of the city of Milan to make the most of the public space on their doorstep, acting in a capillary manner throughout the territory with urban installations in the areas of street parking, offering spaces for agile work, areas for children, and meeting places for adolescents. The third keyword of this section is Local Productions. Proximity economies are developed by creating a synergy between third-sector enterprises, citizens, and institutions. Intervention models can be summarized in two actions, bottom-up and top-down. Both are needed and very often have to be hybridized, as happens in the ‘Merano’ master project. It is a place of connection, a street art intervention and an open-air gallery. A center for socializing and artistic experimentation and an area dedicated to daily work-study activities.

### ***Community: people, territory, and culture***

Communities today, through experimentation, have the role of bringing out new answers to new needs. People come together around needs, ideas, frustrations, and desires, generating new relationships and shared values. Listening to each other stimulates not only active participation but also develops a specific community culture.

When the community is at the heart of the design process, you design with and for the community. *Communities* are made up of people, and people change according to the context. It is therefore impossible to do the same things over and over again without always questioning and adapting to the context. ‘The plant’ project is located in the heart of Milan, in the city’s financial district. Surrounded by banks and offices, the main objective is to create a space that could offer a series of outdoor activities and an exhibition space for Milan’s new industries (start-ups). With *Local Cultures*, proximity means creating new centers of interest, finding space among what already exists, including all forms of local culture, and exploiting architectural and natural constraints to offer the world of culture new spaces where it can express itself through coexistence with other activities. The ‘To be Continuum’ project dialogues with the pre-existing building, the ruin of the former Istituto Marchiondi di Vittoriano Viganò in Milan. The project has made the constraints such as the present vegetation and the rich articulation of the architecture, its own, stepping into the interstices of the architecture and giving them new life.

*Playful Environments* convince children to share with us a functional vision of urban space. According to this logic, children should play in playgrounds, but what happens is that as soon as they have the opportunity to play freely, children tend to play in all public spaces. It is their natural way of getting to know the space and making connections, making it their own. The ‘Back to childhood’ project is based on this concept. It consists of a city-wide game whose aim is to foster genuine interaction with urban elements through simple activities in contrast to the increasingly popular digital interaction.

### *Activating new forms of relationships in urban public spaces*

Proximity combines the physical-spatial dimension with the relational one in a double bond. Although “relationships cannot be designed, we can provide a series of conditions, platforms, and physical contexts to generate the possibility and probability of certain relationships happening” (Manzini, 2021). We should not only focus on relationships but on the elements that allow these relationships to happen.

All cities were based on platforms that created proximity, both economic and relational. They were built on the idea that everything had to be within walking distance and in this way people’s lives were also intertwined. The pandemic reminded us how important it is to relate to others, with a *New Sociality*, to one’s neighbors. The ‘Magazzini Raccordati’ project in the Nolo district of Milan aims to ensure livable spaces for the neighborhood’s inhabitants. The street has been reorganized into green areas, rest and play areas, equipped for sports and spaces available for organizing mini events. This makes it possible to have areas inhabited by people and children away from cars, and therefore safe. The second keyword of the section is *Care Services*. In elderly populations, one of the main problems, which is not often taken into account, is access to urban opportunities, i.e., access to services but especially to spaces for relationships. Aging in an active way represents a great challenge for both elderly people and city governance, which should adopt significant policies in order to include the former in contemporary and future societies. The project ‘Cucù’ refers to a specific user – elderly women – and to a growing trend in the next decades – the beauty kitchen. ‘Cucù’ is a product-service system for the production of cosmetics with the simplest kitchen ingredients which consists of physical touchpoints within the city and digital ones.

The fast rhythm of urban life sometimes contrasts with the physical and psychological well-being of its citizens. Our cities must increasingly combine these two aspects by offering services and spaces where people can enjoy a more comfortable and relaxed life through a variety of experiences as *Small Business*. The ‘Mudha’ project addresses this issue related to the history of the Martesana canal in Milan. The aim is to restore a condition where water is free for public access, as in ancient baths. The project aims at enhancing a simple element like water through its spectacularization, including it in its variety of states, characteristics, and possibilities of use.

### *Exploring and moving in the city*

The pandemic has taught us to consider the city as a collective space. Citizens are the active metamorphosis of our cities; together with their movement, cities change. It is necessary to connect and link the urban parts of the city, not only by moving but also by designing the ways in which we move through space. So we need to understand how to use these transitions by trying to fit into urban transformations and enrich them with identity. This means using public space with characteristics that identify it in a powerful way.

Now, we can introduce the *Non-human Inclusion* keyword. There is a growing awareness that human interrelationships with nature are geared more toward



exploiting it than living in balance with it: “humans are increasingly recognising the effects they are having on the planet” (Bennison, 2010). It is therefore crucial to understand how citizens can relate to nature in a more inclusive way, especially with non-human animals. ‘ReFuse’ is a system that aims to change the culture behind waste in the act of disposal. In fact, it wants to intervene in the awareness and education of citizens through a system that is developed both digitally through an app and on a physical level with a series of games. “The rise of concepts such as the 15-minute-city represents the growing importance of accessibility by active mobility” (Pajares et al., 2021) and *Slow Mobility*. This system requires not only transport infrastructure but also holistic solutions that take into account both the spatial perspective and the concept of proximity. ‘Kick-Cruiser’ is a project dedicated to commuters. Its aim is to give travelers, students, in particular, a new means to improve and speed up their commute: it combines the practicality and comfort of the ordinary scooter with the compactness and cool look of skateboards and surfboards. Mobility is becoming an increasingly important issue in our cities. To promote a higher level of *Walkability*, it is necessary to reduce the obstacles to active mobility, to work on the concepts of walking in the city, crossing in the city, and sitting in the city. ‘TurnMiOn’ is a hybrid product that combines ambient lighting with the dissemination of useful information, thus improving the perception of safety and the inclusion of senior citizens. The project aims to enhance vacant spaces around the railway, such as tunnels and unused parking spaces, improving the perception of safety and the attractiveness of these places in the eyes of citizens.

### *Shortening distances*

Rethinking proximity today is important from the point of view of enhancing the sphere of social services. Proximity also means connecting with the city, looking at those exposed to fragility, building paradigms of social security. Imagining made-to-measure spaces, taking into account the time people live. This historical moment we are living in brings with it a theme of social suffering, of loneliness, and it is, therefore, necessary to undertake actions that also look at democratization and facilitating access to resources that can be for everyone.

We live in a city where the urban infrastructure is designed for cars rather than for bicycles or pedestrians. Designing proximity today means designing through integrated planning projects in which the design of space is accompanied by that of mobility, which means creating settlements with services accessible within a 15-minute walk or in a *Short Distance*. The ‘O-City’ project aims to move from a city that follows the rhythm of cars to a city that follows the rhythm of humans. The challenge has been to design a city that meets everyone’s basic needs, which differ from person to person. Through this application, each citizen will be able to get to know their neighborhood better and learn what they can find within 15 minutes of their home.

Proximity as *Inclusive Neighborhoods*. The concept of proximity also translates into inclusiveness in terms of space, services, and relationships, taking special account of vulnerable groups. Designing for a very small community does not mean

designing for a closed niche, it means designing for everyone. By enabling services for specific needs, you also inevitably enable activities for all other citizens. The ‘Be Tortonian’ project tells of human beings eager to share and discover personal worlds, aware that the intersection of different cultures can create a new and strong multicultural identity. Looking at oneself becomes an extraordinary act, to highlight unexplored spaces, unpublished stories, hidden glimpses, to build an itinerant manifesto that doesn’t stop at appearance. The final keyword is *Commons Care*. How do people accept interaction with technology? The phenomenon we are experiencing with digital acceleration has to deal with what the level of acceptance will be. It is very important to design user, space, and technology interaction. Keeping in mind the introduction of artificial intelligence (AI) in urban management, the ‘AIM’ project reflects on the possible consequences related to it: AI is already able to collect thousands of related data on our way of living in cities, but will it be able to grasp intangible data, i.e., feelings, emotions, and memories of the places most dear to us?

### Proximity matrix

When we talk about proximity, we refer to a human scale, “where space is dense and diversified in functions, where everything that could be desired is close” (Manzini, 2021). Through the analysis of the projects, however, we have seen how the concept of proximity takes on different forms depending on the context, the users, the intervening agents, and so on. Its declination, therefore, depends on the project scale used to design that situation. The keyword-project definition presented earlier has been analyzed in depth in the following matrix. We have identified four different levels of design scale: spatial, actors involved, mode of action undertaken, and mode of use. Each level in turn is divided into different subcategories that specify the design direction of each keyword-project. The division into categories and sub-categories was determined by a careful analysis of the themes of the individual projects, which target groups were taken into account, which methods or tools were applied during the design process, and the contexts in which they were manifested and declined.

Starting from this constellation of ideas we can envision a possible scenario(s) for the city of the future, based on a strong network of services that are spread throughout the neighborhood and can be found “just around the corner” in various urban communities. The concept of proximity as we have seen can take different declinations. In fact, the different interpretations depend on the project scale that is used to design that specific situation of proximity.

Cities are complex systems. But they are incomplete systems. In this mix lies the possibility of making – making the urban, the political, the civic, a history, an economy. Further, this mix of complexity and incompleteness has allowed cities to outlive more formal and closed systems, such as republics, kingdoms, corporations. The urban may not be alone in having these characteristics, but these characteristics are a necessary part of the DNA of the urban.

(Sassen, 1994)

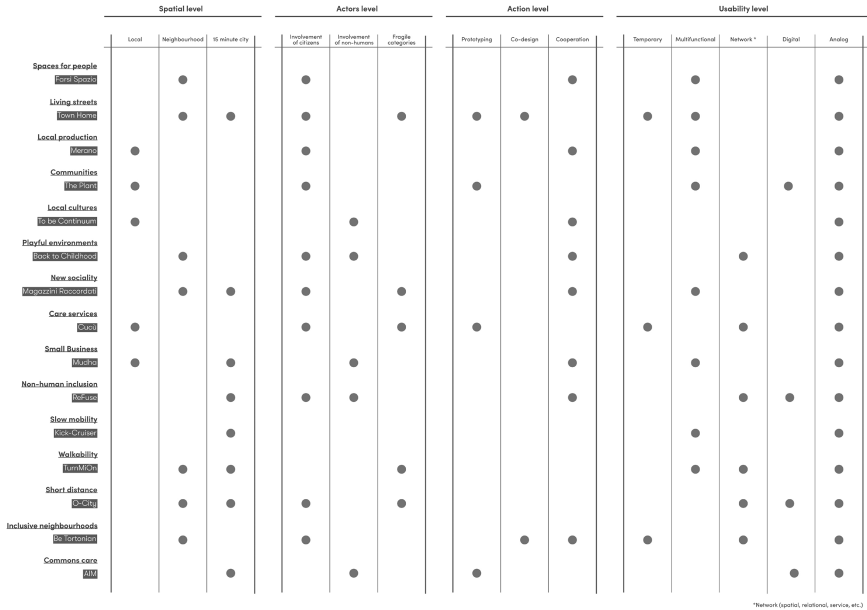


Figure 3.1 The application of proximity matrix

Proximity is made possible by common resources, such as public spaces, services of variable scales, and activities for socialization and regeneration.

### Conclusions

When proximity in an urban context, therefore, is made possible by common resources, such as public spaces, hospitals, universities and public transport, it means being close to where decisions are made, where discoveries are made, where new fashions are born, and where culture develops. It also means increasing the possibilities for those spontaneous and unpredictable encounters that occur within the city. Encounters that imply exchanges, new connections, and new collaborations. The application of the concept of proximity, understood as the physical proximity of people to services, but above all to others, is such when it succeeds in triggering phenomena of cohesion and social innovation, thus bringing communities back to the center of a public space with a human dimension. The XXX exhibition investigated different points of view on as many issues related to the city of proximity, with a preliminary and not definitive constellation of ideas from which a clear scenario for the city of the future could emerge. The concept of proximity is still ambiguous and difficult to confine in a single meaning: through this type of application – *Designing the Proximity* exhibition – words have been found to narrate, to communicate, to explain, and to stimulate a discussion on the topic in order to then activate future theoretical scenarios and multiple cities of proximity.

## Note

1 C40. (2020). [www.c40.org/other/agenda-for-a-green-and-just-recovery](http://www.c40.org/other/agenda-for-a-green-and-just-recovery)

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# 4 Virtual proximity in the factory processes

## Designing interfaces between industrial equipment and human operators

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### Introduction

The future of Industry 4.0 will see increasingly significant growth in the use of intelligent machines, which will have to be able to interact with humans and ensure mutual synergy. In this scenario, human-machine interaction will have to consider the physical and psychological effects of a massive use of technologies on users, namely, the workers and employees, thus being increasingly human-centric, in order to establish a new level of collaboration (Casarotto et al., 2021).

With this in mind, the state of the art of human-machine collaboration is investigated in a current industry-leading intelligent factory system to see how it influences not only the pragmatic point of view but also, as Aranburu et al. (2018) observe, the emotional sphere of employees, which is not truly considered.

The Fourth Industrial Revolution has been included as a strategic intelligence in the proposal for a rebuilt global economy during the 50th annual meeting – named “The Great Reset” – of the World Economic Forum, held in June 2020. One main reason lies behind the growth projection for the Industry 4.0 market size estimated at USD 116.14 billion in 2021 to USD 337.10 billion in 2028, with a CAGR of 16.4% in that period (Fortune Business Insights, 2021).

Focusing on the geographical area of inquiry, the value of the Italian market relating to products and services for Industry 4.0 has reached EUR 3.9 billion in 2019 (Industry 4.0 2020 Observatory, School of Management of the Politecnico di Milano, 2020). Advanced human-machine interface (HMI) technologies represent one of the main areas of investment (EUR 55 million), witnessing a +25% trend in respect to the year 2019. This shift highlights how the HMI can be a strategic sector in the development of the industry, introducing exciting opportunities for the design discipline to start new conversations with the actors of the production process in a broad way.

The first automated machine in an industry environment appeared during the 1930s with the earliest known industrial robot, but the real automation introduction

is datable to the 1980s with the vision of “lights-out” manufacturing: the idea of factories considered to be able to run “with the lights off”, thus without humans on-site. This continues with a progressive computerization that led to a continuous automation improvement from planning and supervision of the production process (orders, supply chain and warehouse management, such as the introduction of just-in-time production) up to fault diagnostics and the reconfiguration of production segments, for instance, predictive maintenance and mass customization. This increasingly technological perspective is driven by Industry 4.0 with the introduction of new innovative integrations such as machine-to-machine communication (M2M), Internet of Things, machine learning and human augmentation. Over time the operations have become more and more programmed and therefore not immediately transparent, guided by invisible algorithms and augmenting the concept of “black box” (we can mention the recent introduction of the discipline of XAI, which goes precisely to explain to humans the result of the solution derived from artificial intelligence). This rapid growth towards a machine-centric evolution highlights the necessity for a shift in the perspective of intelligent factories, which are not only made of more efficient machines but a more effective and collaborative relationship between humans in proximity with highly automated and potentially dangerous processes. As the production processes will be increasingly automated, the machine and the human actors of the process will need to effectively cooperate in order to guarantee successful performance and results, which is particularly essential in critical events that might occur in unpredictable or unprecedented scenarios.

In these specific and inconvenient events, the proximity of highly qualified figures is crucial. Therefore, the development of Industry 4.0 factories is not merely a matter of introducing new technologies but also redefining the relationship between the human operator and the industrial machines which are increasingly automated, complex and therefore opaque.

This also means an increasing need for collaboration between production engineers and designers with a more human-centred perspective.

This contribution wants to offer a panoramic view of the state of the art in human-machine interaction in Industry 4.0 environments, taking into consideration one specific case study in one of Italy’s Lighthouse Plants, ABB Frosinone Facility,<sup>1</sup> selected by the Ministry of Economic Development (MISE) as a model for other companies that want to activate digital transformation interventions as part of the Industry 4.0 national strategy.

Leveraging a design thinking approach, through research based on interviews and field observations, quantitative and qualitative data were collected in order to build a comprehensive understanding of the work environment and the relationship between operators and machines in the production line. Analysing the data allowed to identify a design opportunity in the event of a machine failure. The design and prototyping of an ergonomic interface were then carried out, with the first demonstration deployed to the managing team in ABB.

This chapter ultimately aims at sparking interest and starting an open discussion on the role of the design discipline in highly industrialized and automated environments.

### **Human-machine interaction in smart factories**

Interaction design for HMI can be seen as a means of renewing the smart factories we know nowadays, in a reality where machines populate industries and replace men, acting separately and autonomously from each other, and understanding each other little.

A dominant idea in the field is to create a collaborative way of working between humans and machines, where they understand each other and cooperate, increasing each other's skills and augmenting the human and machine capabilities through this relationship.

The sense of this research resides in the fact that employees don't have to be trained to receive the outputs of their machines, but have a direct and also physical communication, something natural that could not be taught, with the help of an efficient interaction.

This aims to depart from the current methods of interactions based on Window-Icon-Menu-Pointer observed on-site, defined by gestures aimed at the use of input systems based on buttons and screens. The focus of these models is on a type of interaction related to the functionality of the appliance itself rather than to the relationship it has with those who must use it. Hence the consideration of interaction models that go beyond this concept, favouring rapid learning and improving performance by referring to interaction styles with design considerations such as colour choices and direct manipulation (Shneiderman, 1997). The relation to this model concerns the attention to the presence of physical operations and the direct supply of visual feedback for the user, making the experience usable even by the less experienced, enhancing the concept of usability from the development stage (Gimnich, 1990). The clear understanding of fruition is linked to the cognitive method of the mental model, which allows to interact with a device even without knowing how it works. The creation of representations referring to external realities helps understanding through metaphors, linking the abstract function to a physical behaviour, starting from an interaction model to a functional cartography (Saffer, 2010).

From the psychological point of view in this way the operator is facilitated, "accepting the idea of having an industrial machine at his side more easily" (Casarotto et al., 2021, p. 234).

Indeed humans and machines could co-exist in the moment where a structure of relationships is provided, in which each one has the possibility to contribute by a network of biological and digital interactive connections between components that will drive towards the innovation that aims to evolve organisms "whatever nature they are or will be" (Valpreda & Cataffo, 2019, p. 150). Focusing on this direction, smart factories offer a broad experimental ground for the development of future HMIs, which represent the primary medium of communication between humans and machines, as well as an essential asset for effectively performing tasks, processing information and taking informed actions in the manufacturing activities. To what extent these HMIs will seamlessly connect the two components will depend on a human-centric design of interactions.

Preece et al. (2019) define interaction design as “Designing interactive products to support the way people communicate and interact in their everyday and working lives. It is about creating user experiences that enhance and augment the way people work, communicate and interact” (p. 9).

The extensive efforts of manufacturing industries in driving and following advancements and innovation in their production processes should correspond to a deepened focus on the investigation and improvement of the user experience around HMIs. The dialogue between operators and machines is set to rely not only on physical interactions, but also on their cognitive (perceptual and emotional) implications, which include autonomy, problem-solving and decision-making power (Gorecky et al., 2014; Cohen et al., 2018). The role of interaction design in smart factories is to provide the tools and methods to make this dialogue not only as functional and efficient as possible, but also seamless and intuitive: the evolution of HMIs has been spanning from machine-centred interactions, such as batch interfaces (BI) and command line interfaces (CLI), to more human-centric interactions, such as those provided by graphical user interfaces (GUI) and natural user interfaces (NUI), with an increasing engagement of the user’s senses. Disciplines such as human factors and ergonomics (applied to study human behaviour for increasing productivity, reducing error, enhancing safety and comfort during the experience and use) and cognitive psychology (that explains human behaviour such as memory, perception, attention, reasoning, creativity and problem solving) are intrinsically involved in the design of interactions. User research offers an insightful layer of analysis to the design process, with emphasis on the user’s needs, expectations and goals.

Each of these instruments of investigation aims to drive towards an easy and clear understanding and use.

This communication acts for having a better, easy and natural experience: adjectives that could not be further from what an industrial environment can represent, where aspects like emotion and naturalness are overcome by cold concepts of productions and mechanical/practical meanings.

What conciliates the spheres of human and machine with making a direct relationship between them is the interaction study that poses an accent on it as the worker constantly interacts with multiple machines that speak different dialogues between them and who has to use it every day.

Here the designer plays a central role, since this process of constant change in the transition of Industry 4.0 with the increase of technology and automation make it necessary to understand the main transformations in development processes, in particular in the process of “man-machine hybrid” (Campagna et al., 2017).

### ***Design for Industry 4.0 processes***

The question of the relationship of man-machine has generated a significant investment in scientific/technological research. This fast growth doesn’t give time to allow getting used to such innovations: in this situation design is fundamental to bring in companies for the deepening on future scenarios rather than markets, through “the study of extreme situations and sectors . . . in order to extract ideas and stimuli that



are innovative” and with the “attitude of continuous innovation” giving time for research that goes alongside the project development (Celaschi, 2017).

In the last decade, with the evolution of Industry 4.0, the field has been explored by designers who identified the critical aspects of this fast innovation in the centrality of machines/technology without posing an accent on the human and perceptual/emotional one, in a workplace where the user experience has the responsibility of the final product produced, involving the status of the worker and procedures.

Di Nardo et al. (2020) deepen this concept linked to the quality of the worker, which in turn reflects the quality of the industry. In fact, in the framework developed, the reliability of the entire system is not given by the production but to the worker of which it represents the fulcrum and by the interaction it has with each component, establishing an efficient collaboration through HMI, highlighting human skills as an “accelerator in the Industry 4.0 universe” (p. 32).

Minhat et al. (2010) identified the necessity of a clear HMI in the workstation primarily for workers who had to face emergency situations (in this case a reactor plant as case study) since a good interface would have reduced time for thinking and to handle his/her psychology that would have influenced the way of action.

The same questions are treated by Lodgaard and Dransfeld (2020), maintaining the focus on the time used by the worker and the emotional sphere associated that could have been improved by a digital interface that this time could immediately help during the emergency of a production line failure, giving clearer information, avoiding uncertainty of operators and receiving a faster response.

A case study conducted by Di Gregorio et al. (2020) with manufacturing experts highlights the impact that the scarce usability of industrial touch interfaces has during critical situations, identifying the need for a systematic guideline for designing advanced human-centred interfaces to allow workers to manage complexity in critical scenarios.

The importance of touch emerges in studies such as the Huber and Weiss (2017) one in which the importance of physical interfaces for more clear and human interactions are testified by experiments on different interactions with robotic arms.

The UX in those case studies changes between the arm remotely controlled and the one physically controlled, proving that the latter has improved “usability, temporal demands, and performance expectancy”, and enhancing the importance of ergonomics and human-centred HMI in human-robot cooperation in a factory environment.

Regarding the issue of little to no user experience principles in Industry 4.0, Beard-Gunter et al. (2019) analyse the importance that user experience design would have in industrial contexts, identifying possibilities of integration of game engagement principles into work tasks, introducing gamification as an explorative solution to enhance interfaces and promote rewarding involvement in the workplace.

Nguyen Ngoc et al. (2022) offer a comprehensive analysis of the lack of a shared structure in the study and research of human-centred HMI in industries. Reviewing

43 case studies on Industry 4.0, the research highlighted that around 63% of them adopted an iterative design approach. This allows to build knowledge through continued discovery on the field and encourages a process of idea exploration, testing and iteration.

The analysis of the state of the art of design research in Industry 4.0 environments underlines the value of adopting an exploratory and experimental approach in the investigation of the field under a design perspective. In particular, such an approach proves effective in regard to the evaluation of human psychophysical performance and behaviour in relation to intelligent machines and automated processes. User experience design in advanced industries is a relevant factor in the innovation shift towards human-centred production processes, as well as a disruptive element when referred to tangible interfaces rather than screen-based ones. This approach allows to build a deep understanding of the status quo in industrialized contexts, exposing possible criticalities in terms of usability on the production line.

With this in mind, leveraging the principles of iteration design, an experimental case study was carried out in order to better investigate the issues, needs and opportunities in the relationship between workers and machines, especially during inconvenient situations such as failures and breakdowns. Data collected through surveys and on-site observations offered a solid background of action for the design process.

The research approach has kept in consideration both the critical aspects of traditional industrial human-machine interfaces and the direct feedback offered by the operators and maintainers.

Therefore our work as design researchers aimed at offering a bridge between the human and the machine components through an experimental and exploratory approach.

## **The project**

The industry subject of the research was chosen due to the high level of technology and digitalization that permeate the whole production process. In this context, humans and machines are strictly related to one another, being the main actors of the success of the business.

This reality is an optimal fit for the purpose of the research, aiming at building a design process to better support human-machine collaboration.

The starting stage included a visit to the field to have a first-hand understanding of the real context aimed to investigate, and short user interviews, addressed to the employees working in the production line. This shed light on a deeper empathization with processes and people, in order to build a solid background of knowledge to identify opportunities for intervention.

Analysing the qualitative and quantitative data collected from the interviews and on-site observations has permitted to identify a major area of interest that could be improved through a design thinking approach.

This latter approach had already been applied by the company itself during the various internal research phases involving different projects and roles invested within it. As a matter of fact, the number of companies that adopt this methodology is increasing in a great variety of industries covering a process not only of innovation but of problem-solving besides implementing newly discovered possibilities (Liedtka, 2014). Brown (2008) proves how the most successful ideas come from a deep understanding of consumers' lives, regardless of which discipline is involved with using those principles, as this focuses not on the product itself but the whole context. In fact, this practice is constantly looking for feedback for each phase faced, in a collaborative and interdisciplinary way of working that allows for achieving new results (Del Giorgio Solfa et al., 2021). Having this in mind, the approach fits the context taken into consideration in which different scenarios ranging from maintenance to management converge towards the single purpose of an improved experience that could drive towards the increase of production through human-centered interfaces.

The identified area of interest can be described as the process related to the event of a machine failure, which has proved to be particularly controversial and unsettling for the users interviewed and with enormous consequences on the overall performance of the production line.

In this scenario, the improvements could be made in the process of maintenance communication through design, in particular:

the process around the request for maintenance  
the user experience behind the request for maintenance

Intervening on one of the most critical aspects of the production process in a company where each single minute wasted corresponds to thousands of dollars lost is a great challenge, but also an interesting starting point in determining the possible future of human interfaces in hyper-automated contexts and the role of human-centric design in building experiences that go beyond the mere interaction with buttons, levers and screens.

The methodology, as the design thinking approach teaches, follows first observation, in this case in the industry environment focusing on the ways of interaction in use and how it influences workers, with the idea of proposing new solutions of communications linked to user experience (1). This phase of empathization with the users involved in the process was crucial to gain insights on the challenges they face when interacting with machines, systems and interfaces, and to discover unexpressed needs.

The experience reported in the first phase highlights the importance of time involved in everyday shifts that highly impacts work performance (2).

A crucial and final aspect takes place once a new storyboard is created with the new solution proposed: the evidence of how much is important to give feedback to the user who is working with the machine and make it even more clear and trustworthy communication of who is doing what between them (3).

**(1) Interaction observations**

Field observations allowed us to identify different input methods in the workstations along the production line. These included buttons, levers, touch screens, pointers (mouse, pen) and keyboards. Such interfaces, which are widely used to perform various tasks related to machine operations, reflect the machine-centred approach that characterizes traditional user interface interaction models (Figure 4.1). In this sense, ergonomics and functionality are strictly related to one another and guarantee the possibility of managing large amounts of complex and differentiated actions, but do not consider the emotional and psychological involvement of the human component. In fact, it is possible to observe how usually it is the human component the one that has to adapt to machine interfaces, rather than the opposite. This results in a few basic gestures that can be defined as a 0–1 model (push, pull, tap, switch).

Repeating the same actions linked to different purposes on different machines can be confusing for operators, who have to remember a large amount of inputs and modalities. The first step considered was giving not only a differentiation of inputs available (helping also the perception of the different purposes for each, making it more direct and intuitive), but giving a physical interaction that could humanize the operator intervention on the machine. Indeed, speaking about InterAction Technology (IAT), the “A” is intentionally uppercased to emphasize the importance of physical action (Siciliano, 2019). This latter will be the main focus in the future collaboration with machines and individuals, giving infinite possibilities for design to intervene in the production field through interdisciplinary contexts in order to conceptualize and to make pervasive applications (Buono & La Rocca, 2019, p. 12).

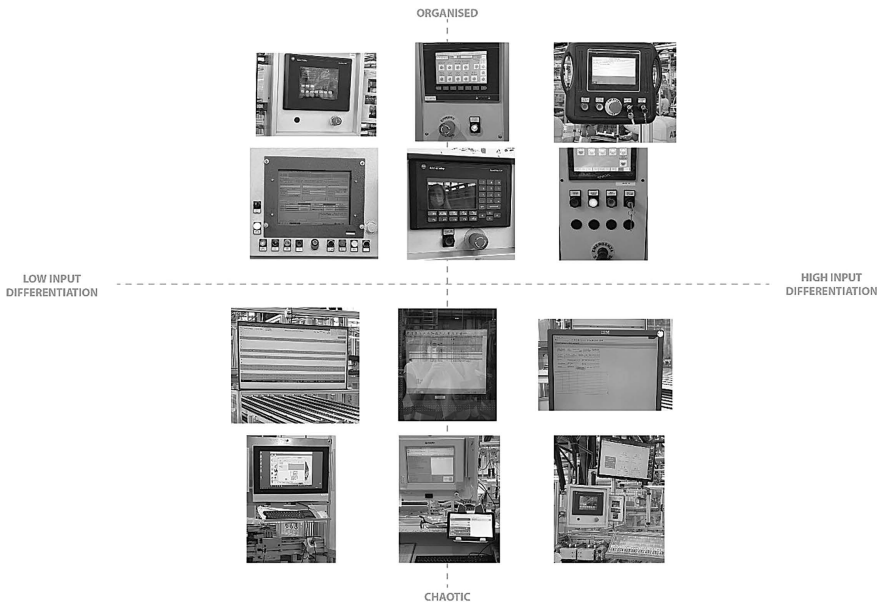


Figure 4.1 Classification of existing interfaces in the facility

**(2) The matter of time**

The interaction overview comes with the observations on processes and how they are experienced by people involved. The matter of time has manifested itself through the interviews concerning specifically the maintenance intervention and the machine failure event. This topic influences not only the productivity of the line, in an industrial context in which the stop of a process blocks the production (due to a way of calling maintenance not focused on time management) but especially on the psychology of the operator that have to face the problem, having to wait for the maintainer and respond to the personal workstation that results not in production without specifying the reason, placing all responsibility on the shift worker at that location. A study of time was done in order to effectively witness how it can improve due to different interactions on the event of call maintenance, with a clear differentiation of input modes and automatic calls for the maintainer (Figure 4.2).

The interface plays an important role not only in a call of maintenance more human centred, with no more buttons and 0/1 inputs but a direct communication of the intensity of how the operator is interacting with the physical interface translated in grade of urgency, but also the role of a better management of time with a clear understanding of how making the call and devices that manages each subject of call (electrical, mechanical, software) with the direct maintainer.

**(3) The importance of feedback**

The most positive aspect recorded by users on which this research was presented was the non-trivial presence of feedback communication during the use of the

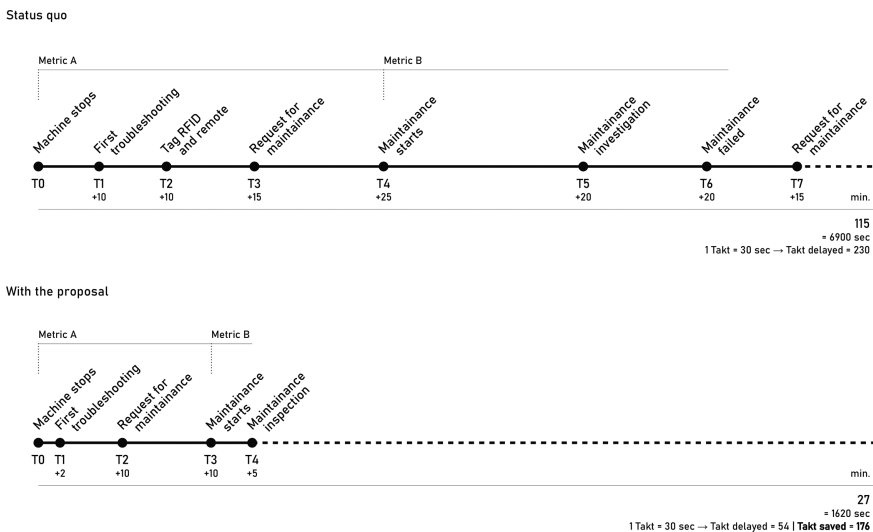


Figure 4.2 Evaluation of time involved in the actual way of working<sup>2</sup> compared to the solution proposed<sup>3</sup>

project. The experience of operators in the moment of machine failure can be psychologically challenging due to two main factors: the downtime of the machine cannot be accurately predicted and the availability/position of the maintainer called is unknown. The moment of waiting is the most crucial one for the operator, and giving feedback (in this case with different lights combination) of the state of the call (received/accepted/declined) contributes positively to his/her experience.

If waitings are side effects of complex systems, and uncertainty can represent a common cause of destabilization in the equilibrium of human behaviours, there must be a conceptual model of feedback (in this case communication of emergency call status on the interface with simple lights) that defines expectations and helps to understand the actions that are taking place, giving a perception that the service provider is responding adequately to the demand.

The goal is to minimize uncertainty by providing reassurance and a demonstration of thoughtfulness, as Norman (2011) states in his observations about the design of waits.

### *Experimental proposal*

The proposal is composed of a system of objects of different shapes related to the interaction it requires (1). Each object represents a type of emergency call according to the topic (Figure 4.3). Every object is able to notify a machine failure through luminous output, and the operator can signal it through the interaction with the object related to the topic of the problem it observes (Figure 4.4).



*Figure 4.3* The four objects displayed. The portable device for the maintainer, and the three on the workplace (in order: software call, mechanical call, electrical call)



*Figure 4.4* The alarm visualization and physical interaction for the call. Each object receives different interactions according to shapes (which were designed following ergonomics principles and including semantic features)

The interaction with it will do a call on a personal device of the maintainer, which with different interactions can accept or decline the call (2). The maintainer can receive grades of urgencies according to the intensity of the call given by the operator. On the other hand, the operator can see the progress of the request and see if the maintainer is coming (3). Everything is designed first for friendly and physical interaction and second for improving the performance during emergency situations.

## **Conclusions**

The Fourth Industrial Revolution, or Industry 4.0, is having a deep impact on the global production system, with an essential focus on big data, automation, Internet of Things and advanced technologies at the centre of processes and business strategies.

As technological advancements have the potential to radically transform societies, economic models and scientific knowledge, new possible futures can be foreseen through the disruptive paths they create.

In these possible scenarios, what is still desirable is to ensure the relevance of the human component in decision-making processes, in which a design thinking approach can have a decisive impact towards the construction of inclusive, sustainable and affordable products and systems.

Human-machine interaction offers interesting opportunities of development because of its interdisciplinary nature, involving different dimensions of the industrial environment and addressing a multitude of differentiated actors and activities.

It is clear how the context of a smart factory represents an optimal fit for broad exploration and investigations regarding the human component in relationship with machines, offering vast possibilities of experimentation and development.

In this regard, tech companies and advanced industries have a great responsibility – if not opportunity – in taking into account the emotional and behavioural dimension of the human workforce, which will need to be as skilled and empowered as ever in order to best manage the complexity of intelligent infrastructures. ABB, as a leading innovator in Industry 4.0, offers a clear example of how investing in innovation and renovation processes can bring continuous improvements on operations, not only on a production level, but mostly on the well-being, engagement and centrality of the human component.

In this sense, what appears to be more challenging in the future development of smart factories is the enhancement of human capabilities rather than the upgrading of machines and systems. Designing interfaces that overcome the traditional WIMP model and instead leverage the sensorial and sensoristic spheres represents a starting point for building a common language between humans and machines. The design project here proposed has the goal to explore the theme of proximity in industrial environments through haptic interactions with machines.

Although the project is at a prototype and unfinished stage, it was possible to ascertain through temporal analysis of how, following the introduction of a more understandable interface to the user that welcomes human gestures and intensity, the response times in situations of emergency are reduced, resulting in a shortening of the times related to the management of alarms and shorter machine downtime, benefiting the production line.

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## **Notes**

- 1 The ABB plant in Frosinone, founded in 1969, is a centre of excellence for the production of low voltage moulded-case circuit breakers and open; the work cycle includes both the construction of the basic components and the assembly of finished products. With its 150,000 square metres, of which almost 50,000 are operational units, Frosinone is the most important plant of the business unit globally. It employs 800 people and produces 2.6 million switches per year. But it is also the most engineered one. Flexibility, lean production processes, ability to follow market demands closely and process innovation are among the most significant features of the site.
- 2 Status quo: T0-T1= time it takes to notice failure; T1-T2= time to decide maintenance is needed; T2-T3= procedure for request, request pending, request accepted; T3-T4= time for arrival, maintenance start; T4-T5= time it takes to identify the typology of the problem; T5-T6= time to attempt repairs/determine the problem cannot be solved; T6-T7= procedure for request, request pending, request accepted.
- 3 With the proposal: T0-T1= notification of failure; T1-T2= time to identify the problem and send a request; T2-T3= time for arrival, maintenance start; T3-T4= time it takes to identify the problem.



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# 5 Proximity of theory and practice

## Framing a research through design experience for design students

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### Introduction

Once viewed as a crafter or as an artist with a mysterious creative aura (Bonnardel, 2009), the comprehension of the designer's abilities has become multifaceted. Research in the past decades has helped us to refine our understanding of the various roles a designer can play when part of a project. These roles are diverse and vary according to the context in which they take place. Among the many roles that can be assumed by the designer, we identify the expert, the artist, the crafter, the explorer, the innovator, the co-creator or collaborator, the researcher, the strategist, the facilitator, the activist, and the reflective practitioner (Björklund et al., 2020; Paton & Dorst, 2011; Tan, 2010; Schön, 1983). Buchanan (2001) has expressed this transition in the roles of the designer through the "Four orders of design", which translates several shifts along with the evolution of the discipline. At first, design offered an increased attention on 'graphics' (for communication with signs and symbols). It then shifted to 'industrial' (with product development) and to 'interactions' (e.g., services, experiences, interfaces). The fourth order refers to 'systems' that consolidate all previous orders of design. The design of systems refers to organizational strategies dealing with complex problems. The evolution of the discipline has allowed for the attention of the designer to shift from designing an object (product, space, etc.) to deeper concerns for the problems, processes, and actors (Findeli & Bousbaci, 2005; Kuutti, 1995; Noël, 2020).

In relation to design education, this chapter proposes to reflect on the introduction of one of these roles, the designer-researcher, as part of design curricula. Generally, education in design offers theoretical and practical knowledge to students to build and contribute to their experiential repertoire as future professionals. As a starting point for this chapter, we build on Manzini's list of critical questions to improve how we teach design. He asks:

Does the institution (1) adopt a contemporary idea of what design is in the 21st century; (2) develop a greater sense of and sensitivity towards social and environmental issues; (3) cultivate a research approach and, in particular, a dynamic relationship between pedagogy and research; (4) focus on project-based research?

(Interview with Manzini in Frascara, 2020, p. 113)

Through our current research and teaching, we witness situations where questions 3 and 4 are particularly challenging. Thus, we feel more attention should be given to the training of designers as researchers. To investigate this learning context, we aim to look at a case study where we guide a team of students during a research through design situation – acting both as creative designers and as researchers of their own experiences. More specifically, we aimed to study if the introduction of a theoretical tool to orient the students’ research process can motivate them to produce deep and systemic understandings of their project experience. We recruited a team of two final-year students in industrial design to participate actively in our case study. Building on the participating students’ reflections, our analysis will disentangle their processes – the design process, the collaborative process, and the research process – as a contribution to the students’ learning to take a designer-researcher posture. In the end, this chapter seeks to answer the following question: how can we support the development of research skills in design students through project-based learning? To answer this question, we will build on previously published research that sought similar objectives as part of the authors’ shared ongoing research program (Tessier & Zahedi, 2021; Zahedi et al., 2018; Zahedi & Tessier, 2018).

### **Educating designer-researchers**

A more contemporary understanding of the designer is to interpret its role as an innovator or as an agent of change: “In recent decades, design has moved from a practice aimed at designing things to one that plays a part in addressing today’s complex societal challenges through social innovation” (van der Bijl-Brouwer & Malcolm, 2020, p. 387). Instead of being focused solely on techniques, tools, and processes that are mastered by the designer, this role supports the search for unprecedented solutions and innovation. In such cases, the relation between the designer and his client(s) are based on collaboration as “the designer is engaged in framing with the client in the light of some problematic situation” (Paton & Dorst, 2011, p. 580). Accordingly, the designer is given more space and opportunity to reflect, critique, and innovate as part of his tasks and responsibilities. Innovation implies a good understanding of the initial situation as well as process initiatives that encourage creative input. To generate new ideas for users, it is key to create new knowledge (contextual, experiential, or theoretical) by involving stakeholders and other direct or indirect actors. The following quote from Ken Friedman emphasizes the importance of developing research skills in the training of design students:

Most professional schools in design fail to understand or work with the dimension of research that involves creating new knowledge. . . . Creating new knowledge for a field benefits people beyond the immediate individual who creates the knowledge. This is the role of research. Research shares the knowledge, and it involves showing others how to develop, apply, and use the knowledge.

(Interview with K. Friedman in Frascara, 2020, p. 109)

Tan also identifies a few of the benefits that research brings into the design process in allowing to “look for inspiration, enabling insights for ideas and opportunities that fit into the context of people’s lives” (Tan, 2010, p. 42). In other words, similar to Tan’s view, we believe in the proximity of design research (theory construction) and design process (leading to practice), which suggests that research skills can bring much more to a design project. We explain this idea as follows: First, a thorough training in research ensures deeper comprehension of the initial context or the problem as one important basis of research is to understand the challenges of a situation to find ways to enhance it. Secondly, a research approach encourages grasping complexity and the multifaceted aspects of design problems. Thirdly, a better understanding of users and context contributes to more durable, meaningful, and adapted solutions. Fourthly, within the design process, the designer-researcher has more skills to overturn the status quo by implementing change through action and through the inclusion of specialized knowledge into a project by valuing other expertise and ideas. Finally, a research approach encourages the activation of analytical abilities, favors deep and rigorous investigations on complex questions and problems, stimulates the acknowledgment of multiple voices or perspectives, motivates the construction of a shared or collective conversation, and the activation of reflectivity and critical thinking skills.

Moreover, according to Hanington (2007), we can identify three types of research associated with the design process: exploratory, generative, and evaluative. The first two types emphasize divergence in the process through context and user understanding (exploratory) as well as the generation of ideas (generative), while the latter focuses on convergence by offering a critical judgment on the problem and its potential solutions (evaluative). Of course, one type of research does not prevent the other: they benefit from being used as part of the same project. We will get back to these different types of research and their connections to our case study later.

Design research can also be described more thoroughly by referring to Frayling’s (1993) three research modes: research *into* art and design, research *for* art and design, and research *through* art and design. Each research mode describes a different perspective to study design as a researcher. For example, research *into* design refers to the more traditional form of research asking for the adoption of theoretical standpoints to frame a research project. According to Findeli, research *into* design contributes to developing the scientific pillars of the discipline (Findeli et al., 2008). The second type, research *for* design, asks for the production of a design project by considering the research outcome “where the thinking is, so to speak, embodied in the artifact” (Frayling, 1993, p. 5). In such cases, the actors and the processes are studied to better understand how the discipline operates (Godin & Zahedi, 2014). Finally, the third type of research bridges these two approaches. Research *through* design (RtD) is a form of applied research (Frankel & Racine, 2010) or action research (Frayling, 1993). According to Godin and Zahedi:

“Research through design” is the closest to the actual design practice, recasting the design aspect of creation as research. Designer/researchers who use

RtD actually create new products, experimenting with new materials, processes, etc.

(2014, p. 2)

Authors conclude their 2014 article with some research paths to pursue in the future. They ask, “could we enhance the rigor of RtD and how?” A similar question was also asked in a more recent paper from Zahedi and Tessier (2023), which we seek to investigate further here. Next, we present how we organized research through a design case study (RtD), to investigate how design students can conduct their own research as part of a design project.

### **Case study**

The data collection process associated with this research sought to offer a framework to design students to encourage them to reflect on their project’s actions and processes as part of a research through design approach. One team was selected to participate in the study, as we wanted to look closely at their project process and their understanding of research (as opposed to studying multiple team projects). Over a 14-week project, the team of three fourth-year industrial designers worked together around the theme of interaction design. Through their project process, they came to propose an online platform aimed at facilitating interactions and discussions despite the distance learning context. More precisely, their project sought to propose an unprecedented solution to remote learning induced by the COVID-19 pandemic. At the start of the project, team members had little experience of working together. All steps of the project were done during the COVID lockdown, forcing the team to collaborate remotely. To guide them in their project, the workshop tutor met with the team approximately once or twice a week for two hours. This guidance was complemented with the comments of external experts, who brought specific knowledge into the project. The studied project is part of the mandatory curriculum of the industrial design program, ending with a final integrative team project during the last semester (winter 2021 in this case).

Parallel to their design project, the team members were invited by the researchers to use a datasheet template to collect data about their project development and collaboration daily. The datasheet template, which is briefly explained in the next section, is based on the designerly activity theory (d.AT) model (Tessier & Zahedi, 2021; Zahedi & Tessier, 2018) and serves as a structured placeholder to help the designer-researchers’ note-taking during research through design. The schematic information of the template was complemented with short paragraph descriptions that allowed synthesizing the most relevant information. Two of the three team members participated in collecting and analyzing data. They then participated in the interpretation of data. The datasheet template and its job-aid are annexed.

### ***Designerly activity theory***

The designerly activity theory (d.AT) is an adaptation of the original activity theory model for designers. As shown in Figure 5.1, the d.AT model adds a second

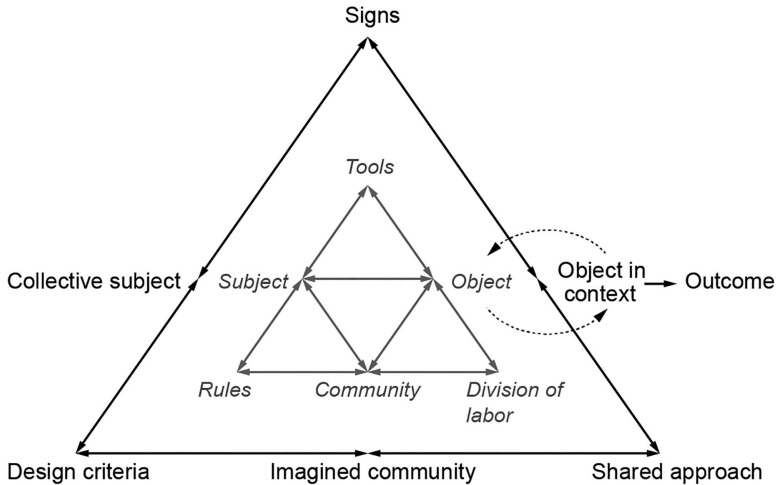


Figure 5.1 Designerly activity theory model (Zahedi & Tessier, 2018)

dimension (external triangle and components) to the original model (internal triangle and components). The interior model was proposed by Engeström in the 1980s (Engeström, 1987). It works as an object-oriented framework, for which all components are directed to the constructive development of the studied situation. The model allows settling the components of a problematic setting to study them, understand the systemic aspects of the problem (Engeström, 1987; Kuutti, 1995), and propose changes for the best.

The d.AT model was developed by studying closely the behaviors of designers throughout projects and refined through multiple applications. The model can be used to study the activity of designers while or after they conduct a project. It can also be implemented as a tool that is used by the designers themselves to structure their reflection-on-action. This view brought us to suggest the template as an appropriate tool for collection of data by designer-researchers during research through design activities. Based on the various tentatives that were put in action to test the use of the d.AT model, we note the flexibility of this framework and its adaptability to study design practice from the inside or outside of a project. Still, some limitations that are recurrent are identified in the complexity of the system, which can complicate the overall comprehension and the clear distinction between the components.

Each component of the d.AT model holds a clear definition that distinguishes it from its related activity theory components (see Zahedi & Tessier 2018 and annex 1). The use of the model allows a systemic understanding of complex, entangled situations by creating a synthetic picture of its key components. Components are interrelated in the sense that their relations are mediated by a third element of the system to translate the complexity of the interactions. Moreover, tensions or contradictions guide the system by emphasizing change and development in the studied situations.

### ***Collecting data with datasheet template***

With the aim of collecting data for a RtD activity, the two participants were invited to explore various ways of collecting data with the tool. During the first few weeks, they filled the template individually when relevant interactions or project development occurred. At the end of each week, they met to produce a shared document (using the same datasheet template) translating their week's most meaningful actions. After week 9, they realized that the documents which they created collaboratively were much more detailed and relevant for further analysis. The difference they noticed was that the documents created together encouraged discussions and the comparison of their perspectives, while the individual datasheets were strict accounts of their activities and actions. In light of this reflection, they chose to produce all their following templates as a team to encourage their reflection-on-action.

As a result, they filled 119 templates individually (71 for participant 1; 48 for participant 2) and 22 templates collaboratively. They were then invited to pursue the research by interpreting the collected data. They received a brief training on research basics by the researchers in order to frame their reflective process and then conducted multiple screenings of the data. They interpreted the data individually and collectively and discussed further their common interpretations. During this process, they highlighted the proximity of two dynamics, one related to the project, the other related to the design process (as explained in the next section). We also analyzed the collective datasheets according to our research point of view. In both data interpretations, the proximity of project and process are depicted.

### **Proximity of project and process analysis**

This section will discuss a multilevel analysis that was allowed by the RtD data collection process. First, we will share two perspectives based on our analysis of the collected data as external to the project. Secondly, we will bridge this interpretation with the conclusions of the participants as part of their own analysis. The emphasis will be placed on the framing of the project, the challenges of collaboration, and the proximity between these elements.

#### ***Project-related research***

To favor our comprehension of the team's project stages, we used Hanington's research classification (2007). By going through the 22 collaborative templates filled by the participants, we were able to distinguish exploratory, generative, and evaluative research phases within the data. As shown in the first three columns of Figure 5.2, this classification of the team's main activities translates the global evolution and iterations of the project.

For example, we notice that the first five weeks are mostly centered on exploratory research with activities like research of existing products, potential user interviews, journey maps, persona development, and context analysis. These activities allowed the team to grasp the complexity of the context for which they are designing. At week 6 we noticed a move in the project timeline toward generative research



as the team moved from the identification of design problems to various tentative concept ideation. Weeks 3 and 6 are classified between exploratory and generative research, as they represent a stage in between context exploration and generation of ideas. Week 9 represents a breakthrough in the project as the team shared their midterm presentation and received concrete feedback on their project. From that point, we witnessed a lot of back and forth between exploratory and generative research as the students tried to reframe their project according to their tutor’s feedback. Over this 14-week project, it was only on week 11 that the team arrived at their final reframing and started working on their final concept. The evaluative research phase is identified from weeks 10 to 14 with moves to other research types in a more rapid sequence. This description of the team’s evolution throughout their final-year team project is shared from our external point of view as researchers to ensure an overall comprehension of their process. Next, we wish to distinguish the use of research types during the project with the team’s collaborative challenges.

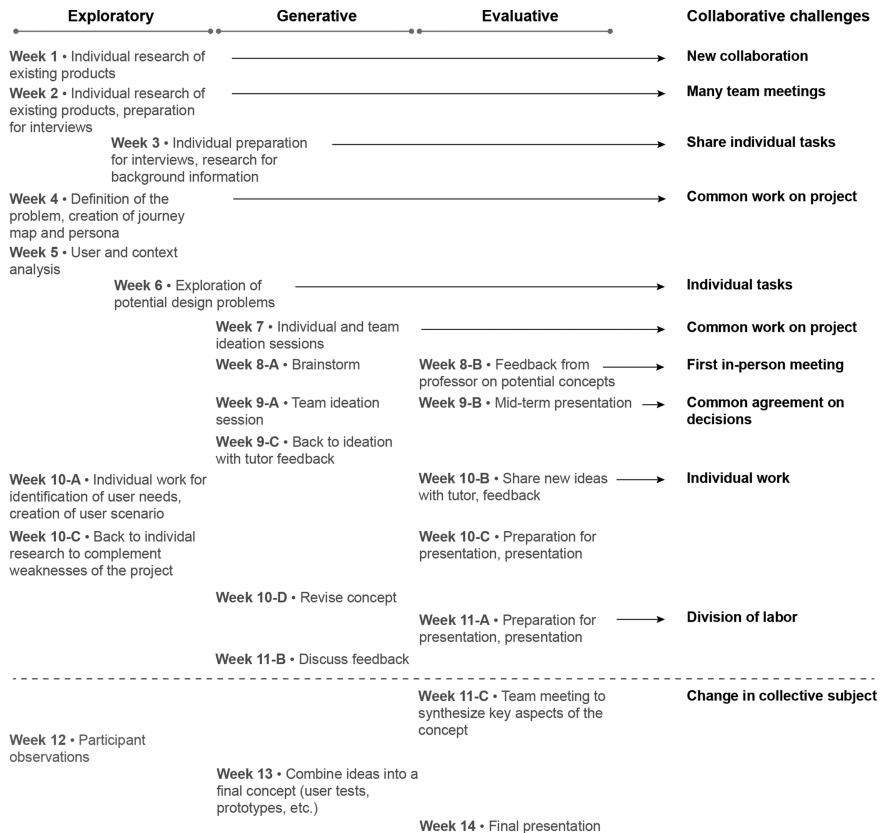


Figure 5.2 Project process analysis

### ***Collaborative challenges analysis***

The second stage of our analysis focuses on the team's collaborative challenges. As this was their very first opportunity to collaborate, more flexibility was needed from the teammates. Moreover, the team of three was imposed by the tutor, who added a third member at the last minute before the start of the project. These factors add to the complexity of the team's project experience, as they could not build on previous experiences or knowledge about their complementary skills (Tessier & Zahedi, 2021). The last column of Figure 5.2 emphasizes the collaborative challenges specific to the studied team.

Figure 5.2 shows that the exploratory research phase solicits more individual work with punctual team meetings to share the work done, while the generative research phase encourages more collective work and common decisions. Finally, the evaluative research phase brings external perspectives to the project with the critical comments of professors and experts. It is also focused on production and division of labor in the team to produce communication visuals more effectively. A particular problem presents itself around week 11 when the third teammate stops answering the tentative messages of his teammates. The team, which is working according to tight deadlines, has no choice but to continue working on his teammate's behalf. When looking at the weekly datasheets, we notice a change regarding the *collective subject* component of the d.AT. Until week 11, the *collective subject* in the d.AT model is identified as a team of three teammates. After this point, the participating students start identifying the *collective subject* as limited to just them two. It is not until week 14 that the *collective subject* is identified as the entire team again (only one week before the final presentation).

### ***Student analysis – the proximity of the project and process***

This last section will compare and complement our observations with the analysis produced by our two participating students. Through their common analysis, the two students were able to distinguish the proximity of two interrelated activities: the design project and the design process.

#### *Design project depicted according to the d.AT model*

On the one hand, the project model refers to the aim of the project (the outcome). In this case, it points to the final-year design project translating the skills and knowledge of the students. The *object* and *object in context* components relate to the framing of the project, while all other components contribute to the definition of the project. As an example, the participants describe the *sign* component as pre-existing knowledge and similar projects, and the *rules* as decisions or *design criteria* building through the project. Figure 5.3 shows the interpretations of each component within the project viewpoint.

On the other hand, the process model describes the stages and aims of the team and the learning context without focusing on the framing of the project. The students

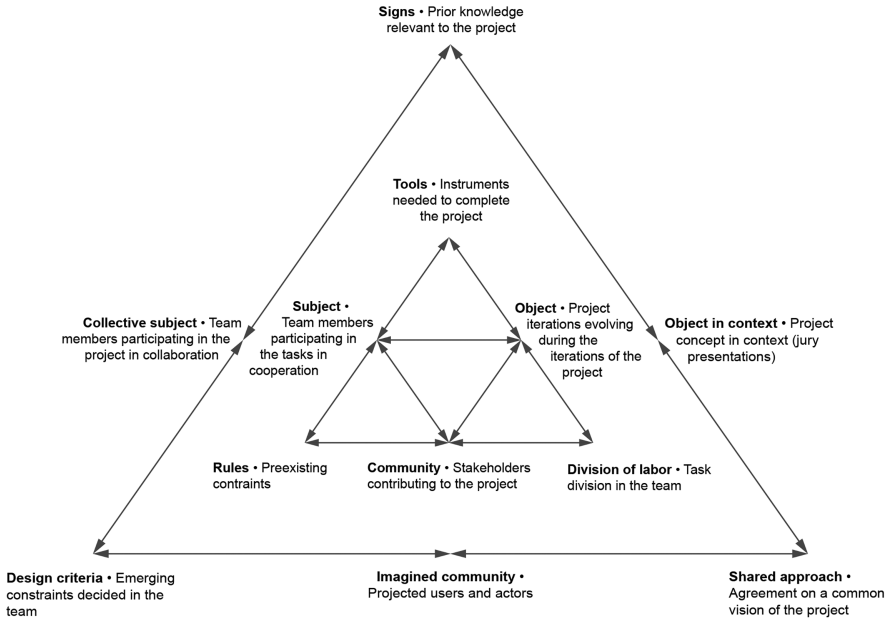


Figure 5.3 Student analysis of the project model

identify the *signs* as the soft skills that are necessary for teamwork and the organizational aspect of the project. The *tools* component is related to communication within the team and methodological choices during the project. The *rules* and *design criteria* components identify the limitations specific to the context (due dates, presentations, etc.). The *object* and *object in context* refer to actions taken by the team for the development of the project and result in newly acquired knowledge. *Division of labor* and *shared approach* components identify task distributions according to skills and efficiency within the team as a coherent whole (see Figure 5.4).

According to the two participating students, it is easier to analyze data by isolating project and process components. They argue that this way of analyzing allows identifying more clearly the problems related to the project by dividing the information to collect and analyze in relation to the closely entangled process. This proposition could allow to gain a better vision of two important aspects of a design project: its process stages and the evolution of the project. As part of their conclusions, the participants emphasized that they note constant interactions between these two levels of analysis. Although they worked to subdivide the d.AT model in order to facilitate their comprehension of the collected data, they understood and acknowledged the proximity between the two types of models.

## Conclusion

The two connected aims of this study were (a) to find out how the development of research skills in design students through project-based learning can

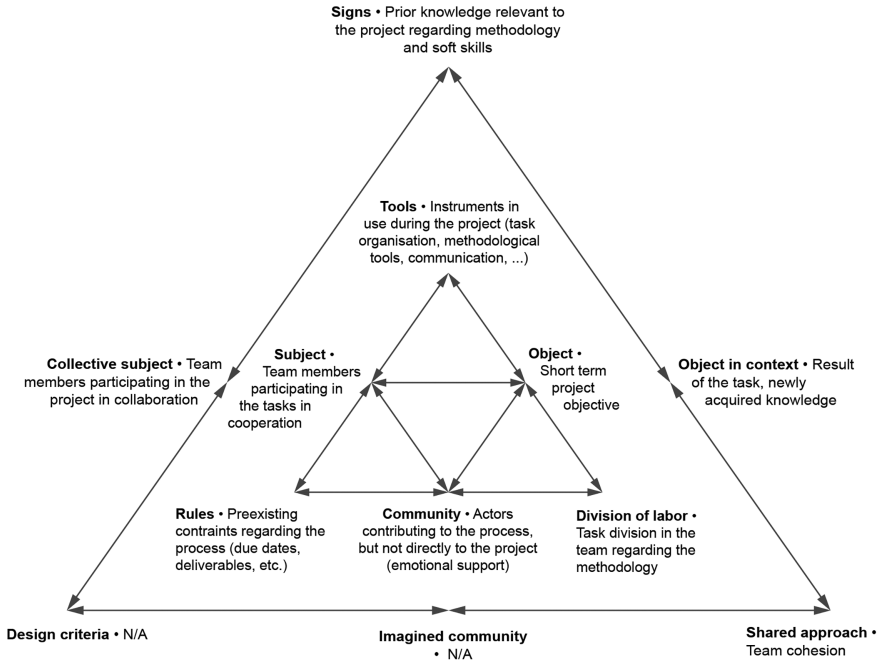


Figure 5.4 Student analysis of the process model

be supported, and (b) to find out the effectiveness of datasheet templates based on d.AT in supporting collecting and interpreting data within a RtD approach. With the introduction of the designer-researcher role, the participating students were regularly guided and monitored during their 14-week research project. They were fully implicated in their role, collected data collaboratively, and pursued data interpretation with interest. We conclude that the designer-researcher's role helped students to learn, earlier in their education, to be reflective partitioners (Schön, 1983).

As part of their RtD process, the students gained a deeper understanding of their project stages. Documenting actions and reflecting-on-action while working on a project was new to the participants. Interpreting the collected data was also a new task for them. A research attitude, rigor, and high level of implication were necessary to achieve what they did. From our point of view, through this complex research task, the students gained the following learning achievements: (a) a thorough understanding of the theory they were asked to work with, (b) the development of their shared perspective to use the d.AT model as part of their mandate, and (c) to propose a potential analysis approach more adapted to project-based learning and RtD. While the d.AT model seeks to identify the interrelations between the systemic components of a complex situation, the participants proposed two interpretations of the model to facilitate their analysis. Although the two variations of the models are separate, they are built from the same basic components and interact

as part of the same shared process. Also, we confirm that the d.AT model can be used to study Buchanan's Four orders of design (as mentioned in the introduction) since the systemic scope of the framework is fit to interpret situations of various levels of complexity.

Our ongoing study let us believe that the use of a theoretical framework to support RtD can offer structure, coherence, and perspective to the *in situ* data collection and analysis (Tessier & Zahedi, 2021; Zahedi & Tessier, 2023). With the additional work shared in this chapter, we note that a theoretical framework to guide a project-based data collection can allow a more thorough monitoring of the project.

### Acknowledgments

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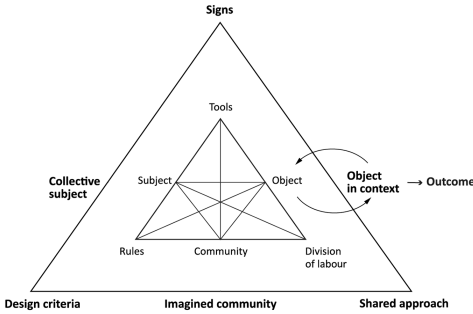
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**Designerly Activity Theory: Model and Definitions**

Job aid for collection and analysis of interdisciplinary collaborative design activities



**Activity Theory**

**Subject:** is an individual or a team central to the studied activity

*Example: you, the designer, or your interdisciplinary team*

**Object:** is an individual or team aim towards which are directed the activities

*Example: your goal for the project*

**Outcome:** is the intention of the subject's actions, specific to the project's activity system

*Example: the design of a product, a service or a system*

**Tools:** are components assisting human performance

*Example: a pen to draw, a list to organize, a mockup to validate*

**Rules:** are the norms, laws or constraints existing in the specific domains of the project

*Example: ergonomic standards, laws on materials, constraints imposed by a firm*

**Community:** expresses all humans linked to the project and their information verified for the project (knowledge, statistics, facts, etc.)

*Example: potential users and stakeholders impacted by the project and the data available on their roles and behaviours*

**Division of labour:** expresses task separation according to expertise

*Example: a team member makes a mockup while another works on a particular detail*

**Designerly Activity Theory**

**Collective subject:** is a team having a co-constructed mental model for the project

*Example: expresses agreement of team members on the definitions and vision of the project*

**Object in context:** collective understanding of the object in the circumstances in which it will be used

*Example: imagine a user making use of a certain mechanism in various situations*

**Outcome:** idem

**Signs:** are cognitive productions of the subject (or collective subject) to assist in the organization and sharing of thought about the object and object in context

*Example: a diagram, a concept map, a hierarchy of ideas*

**Design criteria:** are constraints emerging from the project supporting future decisions and choices

*Example: the decision to include a functionality, the choice of a certain material*

**Imagined community:** expresses personas and propositions or potential use scenarios

*Example: project a scenario on the use of a mechanism by a specific type of clientele*

**Shared approach:** expresses the agreement of the collective subject about a common vision of the process and of the project's dynamic

*Example: establish a sequence of actions, agree on a process*

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**Annex 1 – Job-aid: designerly activity theory, model and definitions**

**Job aid for collection and analysis of interdisciplinary collaborative design activities**



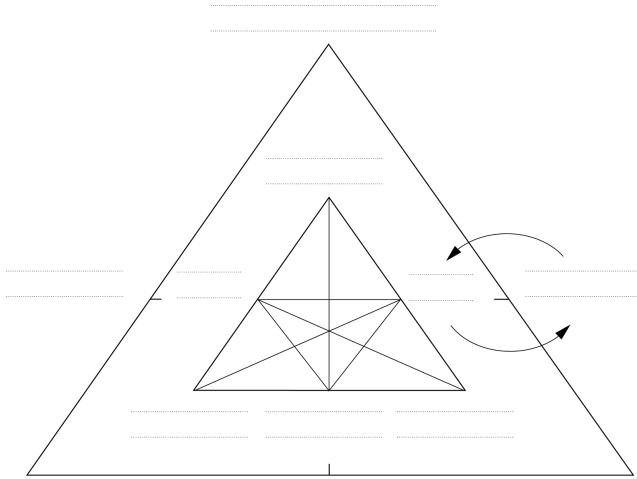
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**Annex 2** – Template for collection and analysis of interdisciplinary collaborative design activities





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**Part II**

**Design approaches**



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## 6 From information to re-information

The reuse of objects from the São Joaquim marketplace as a reference for the construction of a contemporary design

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### Introduction

The COVID-19 pandemic stopped the planet in the second decade of the twenty-first century, and contemporary subjects were forced to restrict their physical circulation as the world's access routes, its channels of symbolic and material exchange, became spaces of danger. We understand the global health crisis as a cry for help from the planet, and we are the ones responsible for the changes that will ensure the survival of the next generations. Driven by consumption, the current capitalist model and the project of technocratic modernity have exhausted natural resources and the capacity of the earth's ecosystem to accumulate what is left over from the cycle of extraction, production, consumption, and disposal. The relationship between citizens and the objects they produce suffocates the planet like the COVID-19 virus suffocates the human body.

Not only were capitalism and the project of modernity responsible for the current state, but also their relationships with design and designers, who should serve humanity and not only the market (Escobar, 2018). In *Design for the Pluriverse*, Escobar makes it possible to look at this failure, especially in the South Atlantic. In his opinion, the world is in transition and the distorted dream of an industrial technological paradise needs to be replaced by the presence of diverse human communities mutually enhancing relationships with each other and the planet. Escobar suggests a design for these transitions and for new paradigms in the universe of material culture so that it is finally able to connect the local and the global through infrastructures that are capable of redefining production, consumption, and disposal of objects. This chapter shows that some practices of reusing these objects, which were identified by Bo Bardi (1994) because of pre-art practices, of Afro-Brazilian

culture in the state of Bahia, can contribute to these future thoughts and practices as also updating relations with the objects.

We live in an ecosystem of objects in which species evolve and others become extinct, some with a long existence, others short-lived. Among these, human beings are the most stable since we simultaneously create and inhabit this environment and these other beings, who clothe us, transport us, shelter us, adorn us, protect us (Baudrillard, 2015). On and under them we rest, we love, we eat, we die. They are the useful things with which we produce other useful and, if possible, beautiful things. There are artifacts that store, reflect, shape, register, and illuminate other objects. With them, the tools, instruments, and occasionally the materials, we shape the physical and subjective roads we will travel during our existence.

These creatures extracted from nature and enlightened by human beings, which alter their original matter, say a lot about human beings because, as the philosopher Vilém Flusser (2015, pp. 36–37) argues, the converted, transformed objects, that is, the manufactured product react to the onslaught of man: a shoemaker does not only make leather shoes, through his activity, he also makes himself a shoemaker. So, if what we inform also informs us and what we use works on us as well, and if we have traveled this road of existence since the capitalist modernity, in which we are constantly projecting, producing, consuming, and discarding objects, it is necessary to ask where humanity will get to, what inevitable obstacle it will not be able to cross, nor even to turn back, since what used to be a road has become a dunghill that threatens to bury humankind.

About this mound, the capitalist logic and the designer's responsibility during the design and production of objects of material culture, Flusser warns that: "He who designs objects of use, . . . throws obstacles in the way of others" (Flusser, 2015, p. 196).

Thereby, the author wants to discuss the moral issues and ethical responsibility inherent in the design project for the capitalist consumption and disposal system, adding that the more the designer is concerned only with the product without paying attention to its impact on the present and future of its use and disposal (Flusser, 2015).

Decade after decade, package after package, object after object, the religion of capitalism (Agamben, 2007) diminishes the freedom of the planet and human beings to maneuver and sacrifice our common future on the altar of consumption.

Is it possible then to reverse this sacrifice, to save the objects and humanity from the end of the road? Well, if the designers are the professionals of this collapsed ecosystem, it is worth remembering that the actual processes that shape them matter, informing that the natural world is cultural and, therefore, mutable. And that, "it matters in design, like any other cultural aspect, that is how forms appear" (Flusser, 2015, p. 28). So, when one thinks of new uses or ways of making already informed objects appear and function, one has a change in the *design-use-disposal* chain that produces a re-information of those objects. The objects made of other objects that reappear are removed from the rubble and clear the way even if temporarily.

Between climate change and a global health crisis, the pandemic in Brazil put everybody in front of the reality of an underdeveloped country that, from the reuse of the discards of the dunghill, produces raw material for the reinvention of objects that are part of the material culture in our country. In this scenario, looking at the local became fundamental for the reflection academics present on the processes of object design and the critical thinking of its teaching in the context of a field in constant transformation.

Thus, this chapter proposes a reflection on the objects traded at the São Joaquim market, the largest and most important free market of the capital of the state of Bahia and one of the largest in the Northeast of Brazil (Figure 6.1). Having as a starting point the research and thoughts of the architect and designer Lina Bo Bardi about these objects and practices, about which she worked in the 1960s, the chapter establishes a critical conception concerning the Bahian and Brazilian material culture, hoping to contribute to the construction of a design that connects the global and the local, approaching production and consumption consciously. A design idea that understands the design business as a tactic that can attend global transformations.



*Figure 6.1* São Joaquim Market in Salvador-Bahia. From left to right: sea access, city access, religious articles, clothing store, and candomblé religious articles store (Photograph: Bruna Dória and Gil Maciel. Nov. 2021)

In a parallel through time, the concept of object as a way of enlightening led to the writings left by Lina Bo Bardi concerning the Brazilian Northeast, especially the architect's understanding of human production from discards. Bo Bardi believed that design in Brazil should grow from the encounter between the intellectual and the vernacular, which would reduce the distance between designers and executors. After living in postwar Italy, where everything was being destroyed, Bo Bardi discovered a place of possibilities in Brazil.

Brazil in Lina Bo Bardi's (1992) vision "is a wonderful country, and you can find precious stones in the street, amethyst quartz, crystals, wonderful and valuable silver, a wonderful climate. Formidable people." And yet in front of so many natural and cultural riches, there was a huge social inequality that led people to seek in what was used and discarded ways of surviving. For her, in a pre-artisanal way, there was a country here that, despite the misery, had a strong cultural richness, derived from popular knowledge and from the encounter between African, indigenous, and European peoples who settled here. In the text "Why the *Northeast*?" in *Times of Grossness – design in the Impasse*, Bo Bardi argues that the roots or the popular "soul" of a people can be revealed in the forms produced by its material culture. And that it is important to look beyond the precariousness of the materials or conditions of production of these objects, to be able to see . . . the deep structure of those possibilities" (Bo Bardi, 1994, p. 17).

These objects that Bo Bardi contemplated and garnered in the popular fairs of the Brazilian Northeast in the mid-twentieth century were for her neither folk art nor craftsmanship, in the sense of the historical construction of the work of European craft guilds. Bo Bardi classified them as pre-artisanal, which seems a Euro-centered view since it uses the historical ruler of European production to evaluate the conditions and particularities of the production of the vernacular material culture of a country in the South Atlantic.

To observe nowadays what Bo Bardi called pre-artisanal and seeking the use of vernacular design in the São Joaquim Market, where we find the reuse in the production of objects used in local daily life and Afro-Brazilian religious cults, could lead it to the path of understanding and learning practice of cultural resistance and the resilience of a whole people. *Design transitions* proposed by Arturo Escobar (2018) indicate resilience as an alternative to conventional notions of sustainability and involve boosting communities with diversity as well as socially and environmentally responsible self-organization, strengthening the ability to produce regionally what can be produced locally. In this context, the objects commercialized at the market fit perfectly into a design proposal for a world in transition. They point to paths of a design project that must include different worldviews as essential ingredients of these transitions (Escobar, 2018).

For Bo Bardi, pre-art forms and objects emerged from a culture based on survival and collective needs. This stage of production would cease and be replaced, as it had occurred in Europe after the Industrial Revolution, by machine objects, with the advance of Brazilian industrialization.

It happens that half a century later, Brazilian industrialization has not reached the popular markets completely. Even in metropolises like Salvador,<sup>1</sup> artisanship

as art, culture, and survival resists. The winds of industrialized modernity have not found their way there. After half a century, the great narratives of modernity were lost along the way, they didn't cause emancipation or well-being; on the contrary, we see the deepening of global North-South inequalities as well as the climate and environmental threat installed all over the planet. In this sense, the rearranged objects of São Joaquim are today like a gift, a lesson in resilience, resistance, and inventiveness.

Or as stated by the philosopher and researcher Maria Cecília Loschiavo dos Santos when reflecting on the vitality of popular material culture in Bahia, seeing "this civilizing dimension of the project and the autonomous creative making, of the world as a project that manifests itself as a great force of expression in Bahia's material culture" (Santos, 2004, p. 52). She also highlights the civilization dimension of this proposal, taking into consideration the historical and sociocultural determinants of this production, its functional, aesthetic, and ethical results. If for Bo Bardi helplessness is an engine of this production, for Santos, there is a moral component in this resilience, which takes shape in the vernacular project, understood as another way to deal with the forms designed for the machine.

By looking at the thoughts of Flusser (2015) and Bo Bardi (1994) we seek current references for the construction and understanding of the research. After visiting the exhibition "Museu de Dona Lina", on display at the Museu de Arte Moderna da Bahia with objects garnered by Bo Bardi during the period in which she lived in Salvador, it was found objects that dialogue with the pre-art crafts seen by Bo Bardi fifty years ago in Brazil, especially in popular markets in the Northeast of the country.

The five artifacts presented in this chapter are objects that, besides their functionality of supplying basic needs such as food, serve to nurture the worship of Afro-Brazilian deities. They are objects that serve for religious contemplation, help in the preparation of food offered to the Orishas or Orixás,<sup>22</sup> and support candomblé rituals.

These objects demonstrate the civilizing dimension of autonomous making and how the local material culture re-signifies the information processes of the machines, adapting them to functions not imagined by the capitalist project thought and its logic of production, consumption, and disposal.

### **São Joaquim – resistance, resilience, and survival**

This grater (Figure 6.2) is currently sold in the houses of objects for Orixás worship and, although used to fragment grains, seeds, and other foods for the preparation of ritual foods, it also serves everyday needs in kitchens. It is constructed from aerosolized tin metal, cut and shaped taking advantage of its concave shape and perforated to obtain the necessary tips for junking. So, what served to preserve liquids and disperse them under pressure, now collaborates with the preparation of food, for Afro-Brazilian gods – the Orixás of Candomblé and human beings.

The Turíbulo or Smoking Can (Figure 6.3) is another object that has a ritualistic function in the candomblé grounds, but also in people's homes and on the



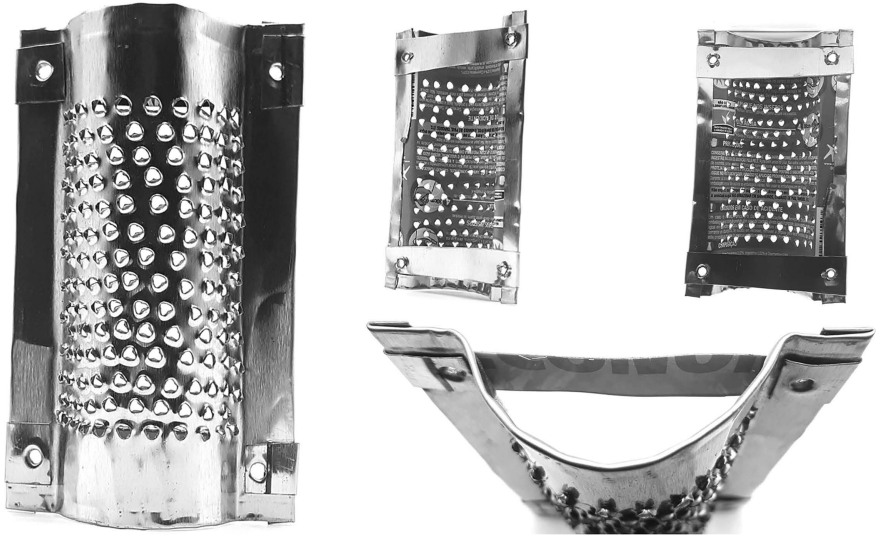


Figure 6.2 Reuse of metal packaging to create a grater used in candomblé cults and sold at the São Joaquim market – Bahia (Photograph: Bruna Dória and Gil Maciel. Nov. 2021)



Figure 6.3 Tin Turbulo – artifact assembled from aluminum cans and copper wire (Photograph: Bruna Dória and Gil Maciel. Nov. 2021)

city streets. It is made from cans of products such as powdered milk or other food supplements. In the new form it acquires, charcoal is placed in it, and, with access, it serves to burn herbs and powders, during *candomblé* religious rituals. It is also used to balance energies in the homes of devotees, including those of other religions such as Catholicism. Besides its function as a censer, the can is also used to sell pieces of cheese, usually curd cheese baked with the heat generated by the glowing charcoal, on the streets.

The lightness and portability of the material allow it to be carried in the streets to sell this food. The structure of the original can is cut with a knife at the bottom and sides, allowing the entrance and the fall of ashes during the process of coal combustion.

The main axle of this object (Figure 6.4), which is the body of the Exu, “The Orisha responsible for communication, who presumably helps the mail go through” (Walker 2007, p. 1), is made from the end part of the suspension of a bicycle, also known as the fork, where the wheel is traditionally attached. This flattened end area is sawn in a way that simulates two horns, and the eyes and mouth are perforated in the metal. The penis, arms, legs, and tail are made from iron alloy and welded to the body structure, and at the end, the whole piece is painted black.

The *Fifó* (Figure 6.5), also known as a lamparine or candlestick, is used to produce and maintain a flame in religious rituals in *candomblé* grounds and can be used to illuminate domestic spaces when there is a lack of electricity. Inside the bottle that used to sell coconut milk, the flammable liquid and cotton strings are placed, which will illuminate spaces at night. This is assembled using a glass bottle, on top of which is mounted a structure with tin metal, all built from cut metal fittings, as can be seen on the top of the structure and the hand strap.

The coconut grating machine (Figure 6.6) is a high-rotation electric motor, easy to find in specialized stores or junk stores, coupled with a grooved cylindrical instrument, called a scraper. The scraper is surrounded by an aluminum pan,



Figure 6.4 Exu Biciqueta – object made from junk; iron bicycle for use in Afro-Brazilian cults (Photograph: Bruna Dória and Gil Macie. Nov. 2021)



Figure 6.5 “Sococo” Fifó – artifact produced from the discarding of cooking containers such as glass bottles for coconut milk and aluminum used in canned food (Photograph: Bruna Dória and Gil Maciel. Nov. 2021)



Figure 6.6 Coconut grating machine: product made for grating as assembled from the reuse of a rotational engine and aluminum pan (Photograph: Bruna Dória and Gil Maciel. Nov. 2021)

which may or may not have a cut-out area where the grated coconut flows into another container to facilitate collecting the food after grinding. Although there are many brands of professional graters, these assemblies are dominant in the market because of their low production cost and reinforce the popular inventive and innovative potential.

### **Analysis of results and final considerations**

All objects found at the fair during the research dialogue had the essence of pre-artisanal making that Lina Bo Bardi found in the fairs of northeastern Brazil fifty years ago. The five *artifacts* presented in this chapter are examples of a design idea that reorganizes, re-signifies, and puts into motion new functions for discarded objects. This action of doing by inventing a way is present in any human activity (Pareyson, 1993). Thus, he distinguishes intentions from what he calls Operation in philosophy, art, and science. Each of these with a particular mode of forming by inventing or inventing by forming: “Every human operation is always either speculative, or practical, or formative, but specification it is always at the same time both thoughts, as well as morality, and formatively” (Pareyson, 1993, p. 24).

The resistance and inventiveness of the people in the Afro-Brazilian culture led it to know about new possibilities of references for design. If the junk taken from the trash discarded by the capitalist and consumer society is raw material for the maintenance of a people that survives from what apparently would be garbage, Bo Bardi (1994) defined this as hunger, Santos did it as a civilizing project (2004), and Pareyson said that it is the essence of human making in the world (1993). If those objects survive and change in their materials and functions, the designer of these objects is also responsible for the use, meaning, and destiny of these artifacts.

The São Joaquim market has already been in other places in the capital of Bahia during its history, it had different names as well as its reformed objects, different materials, and functions. If for Ezio Manzini in *Design Transitions* (Escobar, 2018) the contemporary landscape of social practice is full of examples of collaborative projects in which local actions create new functions, practices, and meanings, it is possible to conclude that the five objects described here present sustainable, resilient solutions and lead it to understand another dimension of artifact production. While discussing the paths to design in contemporary times, the production of reinvented articles found at the São Joaquim market reinforces Bo Bardi's ideas on the importance of bringing the architect and the industrial designer closer to the craftsmen, the project closer to the executor, the exchange of knowledge between the academic and the practical functions. Especially in a South-Atlantic country such as Brazil, which resists economic and social inequality by finding in discards the raw material for human survival and maintenance of faith, food, and an autochthonous material culture.

Design in the context of a plural country, with immense diversity of knowledge and unequal material conditions of existence, between the chipped stone and the computer (Magalhães, 1998), that way is essential to reveal new possibilities of project logic and other networks of relationships that establish connections between

past and present, the pre-artisanal and the academic. To broaden the assumptions in the understanding and teaching of design, in a way that, from this small cut, can unveil the diverse autochthonous practices of Afro-Brazilian material culture, constantly reinvented through necessity and faith. These objects, reinvented and collected at the São Joaquim market, reveal possibilities for the conception of a resilient and contemporary design model. This plural and artisanal objects ecosystem, the re-information of objects, can offer shortcuts and paths to other landscapes, far from the end of the road.

## Notes

- 1 “Salvador, Bahia’s capital and Brazil’s fourth largest city, has a population more than 70% of African origin” (Walker, 2007, p. 1).
- 2 “The Afro-Brazilian religion known as Candomblé in Bahia, Afro-Brazil’s spiritual and cultural epicenter, is based primarily on the religion of the Yoruba people of Nigeria and Benin, with influences also from Central African Bantu-speaking peoples, as well as from Brazil’s indigenous people. Yoruba religion in Brazil centers on the worship of the ‘Orishas,’ spiritual beings who rule and represent the natural forces of the universe and human life” (Walker, 2007, p. 1).

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# 7 A disciplined approach to abstraction

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## Introduction

Abstraction is ubiquitous throughout architectural education and practice. “Form is no longer the outcome of individual craft, but the result of a socialized ‘intellectual’ knowledge made of abstract conventions – such as the use of projections and precise systems of measurement” (Aureli, 2015). In architecture especially, abstraction is inextricably entangled with the real. Abstraction is also a nearly universal phenomenon in architectural education, especially at the beginning design levels, with highly mixed outcomes, and often very little critical understanding. Linguistically, it is a self-defeating term. This is because the moment abstraction becomes the singular objective of a project, it stops being possible. By definition, for something to be abstract, it requires an idea or concept separate from itself to reference. Without external reference, it creates an irreconcilable circular logic, as something cannot be an abstraction of itself. This is why it makes no sense when someone says that a project or drawing “looks abstract.” Yet, this is a common phrase uttered by students, academics, and practitioners alike. So, what is it to be abstract in a design process? Can it be used critically, objectively, and rigorously in a measured and disciplined way? Does abstraction have instrumentality that other more figural or literal representations do not? Is abstraction disciplinary, or is it a modernist vanity of architectural academia? Abstraction is fundamentally necessary for interpretation. Students think critically by challenging what they think they know and interpreting it in new ways. However, this is a thoughtful process, not absent-minded practice. It privileges choice and prioritization in design, not baseless form-making. Effective abstraction, especially at the beginning design level, requires strategy and disciplinarity. For example, the subtitle of this section is a disciplined use of abstraction. The abstract of a paper is a distillation of content. It removes supporting evidence, observational notes, contextual analyses, or anything else that might be extraneous to the singular objective of the paper. That does not make it less true, nor less real; it makes it more focused. This is disciplined abstraction. Perhaps abstraction is not the problem, but rather misunderstanding or misapplying it is. Additionally, this chapter presents common uses and abuses of abstraction in the design studio. It also seeks to present pedagogical strategies for abstraction to play a critical and instrumental role in beginning design education.

### **Hijacking abstraction**

In their first foray into the jargon of design, students tend to search for words to describe their work often utilizing and overusing words they do not quite understand. “Abstract” is one of the most egregiously abused. Frequently it is used sophomorically to supplant other, less academic descriptors of designed objects the student might be more inclined to use. Something that looks “cool,” “interesting,” or most likely “unlike anything I’ve seen before” becomes abstract. It becomes erroneously synonymous with novelty and complexity.

Hijacking this word is pervasive among students and academics alike. Much of the confusion is traced to the use of abstraction in other disciplines that require subject matter to be interpreted on the part of the viewer rather than the author shifting the focus from representational instrument to representational objective. In a 2011 column, art critic Jerry Saltz states that among other qualities “abstraction is one of the greatest visionary tools ever invented by human beings to imagine, decipher, and depict the world.” This capacity to simultaneously “imagine,” “decipher,” and “depict” constitutes the highest aspiration of abstract representation in any design or artistic process (Saltz, 2011). It permits the author to explore what is actual, imagine other possibilities, and communicate that gestalt thinking to others. Saltz goes on to say that “Abstraction is staggeringly radical, circumvents language, and sidesteps naming or mere description” (Saltz, 2011). This is simultaneously a value to be preserved in the design process and a source of misuse. Here it is evident that Saltz suggest the interpretive quality of abstraction. Abstraction requires interpretation of physical information in its representation of non-physical ideas that compose our understanding of a subject. But, in abstract art, the interpretation is left to the viewer. The medium is presented as a challenge to the viewer’s expectations, and it is the viewer’s responsibility to extract meaning from that novelty. However, to be useful in an architectural design pedagogy, that responsibility must be inverted and placed on the author. Representation in a pedagogy of disciplined abstraction constitutes an opportunity to inquire, speculate, and experiment toward greater understanding of a subject through what Saltz would describe as the “extremely flexible intricate syntax” that abstraction offers (Saltz, 2011). The interpretive act must be undertaken by the author as an investigation and represented results made explicit – concrete if you will – to the viewer.

Even experienced educators can become turned around when confronted by two vantages from which abstract representation is interpreted. If projects are crafted in a way that places the responsibility for interpreting content on the part of the viewer, expectations will inevitably be too vague for a beginning design student to engage the project critically. In this context, there is potential for abstraction to be misconstrued as taste and disregarded as inherently non-critical. Or, it may become an aesthetic objective – to make something that looks abstract – which cultivates compositional acts without any clear objective. Abstraction misused in these ways inevitably sows confusion among students,

especially beginning design students, as they struggle to hit a moving target that is not clearly defined or understood.

The term abstract is defined explicitly in the Oxford English Dictionary's first definition, which states something that is abstract is "existing in thought or as an idea, but not having a physical or concrete existence" (Dictionary, 2020). There is an important distinction in this definition that is often overlooked – abstraction represents concepts, theories, and ideas rather than physical objects. This suggests two common fallacies about abstraction in design education. First is irregular or intuitive composition without a basis in concept. The second is that abstraction represents the unreal.

### **Two fallacies**

To be an instrument in the design process, it is necessary to abandon the notion that abstraction can describe aesthetic novelty. Indictments of "abstract" looking compositions that are not governed by ideas is a critical conversation, and one that underpins the call to which this chapter responds. However, the definition as established earlier suggests that abstraction understood correctly is not the issue. Quite the opposite in fact, as by definition, anything not governed by ideas cannot be "abstract" at all. When understood in this way, even highly conventional constructs, with the accessible appearance of "real" architecture, have the same problems of thoughtlessness as compositions that establish outlandish novelty as their sole objective.

The second fallacy lies in the stigmatization of "real-world" design and that abstraction represents a kind of deviation from this accepted reality. This is also, by definition, untrue. To maintain the delusion that design exists on a spectrum between the real and the abstract, one must maintain that ideas are not real. This is, of course, absurd. The abstract represents something that is "not physical." That does not mean that it represents things that are not real.

### **Imperative instrumentality**

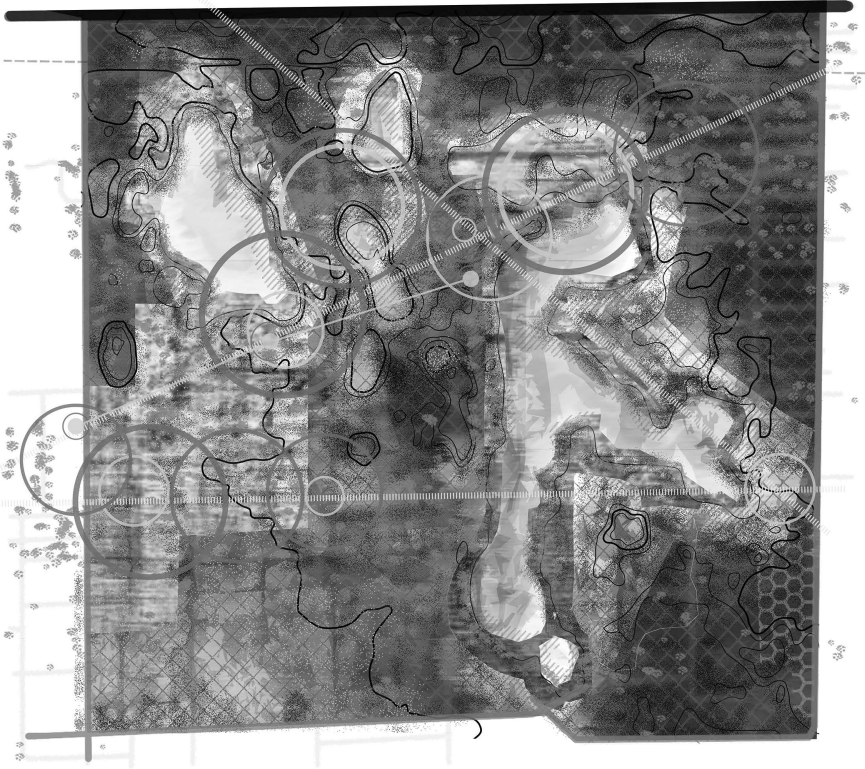
Abstraction is a tool, "no less 'real' than philosophy or music," Saltz writes, adding that "It can create beauty, alternative topographies, ugliness, and intense actualities from seeming nothingness" (Saltz, 2011). It is imperative that the role of abstraction in beginning design pedagogies be clearly defined as an instrument of inquiry, speculation, and investigation rather than an aesthetic goal.

When deployed by a beginning design student as an instrument of learning, abstraction presents a language of representation that acts as an intellectual filter. It provides a framework for prioritizing issues relative to a core idea. In their paper "Concrete Thoughts on Abstraction" Keiron Nicholson, Judith Good, and Katy Howland discuss abstraction in computer science as "the process of representing a subject in such a way that only information relevant to one's purposes is retained" (Nicholson et al., 2009). It is precisely this



capacity of abstraction to filter the essential from the inessential that provides a value to the beginning design student. It cultivates a notion that architecture is governed by ideas as the abstraction requires a core position on which to base itself. The authors go on to state that “Abstraction is a crucial tool for advancing human thought and communication, and has been so throughout our entire history” (Hirsch et al., 2015). From computer science to architectural design, it is the potential of abstraction to generate ideas according to a core position – “thought” – and represent those ideas without the distraction of inessential information – “communication” – that makes it invaluable in a beginning design pedagogy. It also establishes an instrumental use of abstraction to be imperative rather than a passive aesthetic use.

Disciplined abstraction, when it is used as an instrument of learning in the early years, places much of the responsibility on the configuration of the project to establish core objectives – the intellectual framework governing the project. This provides the students with a direction to their process in which they are working quite literally, but the result is an abstraction.



*Figure 7.1* Interrogation of site

## **Pedagogies of disciplined abstraction**

The instrumentality of a disciplined approach to abstraction is preparatory for a critical design practice. It is the basis for developing the conceptual underpinnings that govern decisions in a project. It constitutes an invaluable tool to isolate and study the issues crucial to the core ideas of a project. How does a beginning design student inquire through the use of abstract representation?

Although the curricula of today's architecture programs have certainly evolved, the imprint of the Bauhaus method, particularly its emphasis on abstract exercises, is still seen in many fundamental design courses. The Foundation Studio curriculum at Marywood University School of Architecture continues to find that this approach develops in students the powers of observation and perception, comprehension of proportion, abstraction of form, mastery of techniques and means of expression in both two- and three-dimensions, controlled development of the creative process, and critical evaluation of the results. This encourages the beginning design student to inquire through the use of abstract representation.

At the inception of the Bauhaus, Gropius and Itten agreed that greater theoretical training was necessary to raise the general level of student work. Intended to offer an introduction to issues of color, form, and materials considered fundamental to all visual expression, the preliminary course erased the boundaries between craft and fine-art education. Taught continuously from the fall of 1920, throughout the school's existence, first by Itten, later by Lazlo Moholy-Nagy and Josef Albers, with complementary color and form courses taught by Vasilv Kandinsky and Paul Klee, and required from 1921 until 1930 for students of all disciplines, it was in the end, the school's most defining pedagogical feature.

(Bergdoll, 2009)

The preliminary Bauhaus course established a series of shaping principles that became one of the school's most distinct premises that all students should be instructed in the principles of abstraction before moving on to specific areas of study. Evidence of this can be seen in the current description for the first Marywood University Foundation Studio Design course, which includes Bauhaus principles. The description reads,

An introduction to the fundamental principles of two-dimensional and three-dimensional design. With an emphasis on the visual and physical properties of shape and form, design strategies and their implications will be explored through a number of sequential studio projects. Drawing (freehand and mechanical), models, collage, and photography will serve as individual means of exploration, discovery, and presentation. Lectures and readings will supplement the studio projects.

(Marywood University Student Portal)

## **The projective tool – a didactic example of abstraction in a foundation studio**

### *Abstraction via writing*

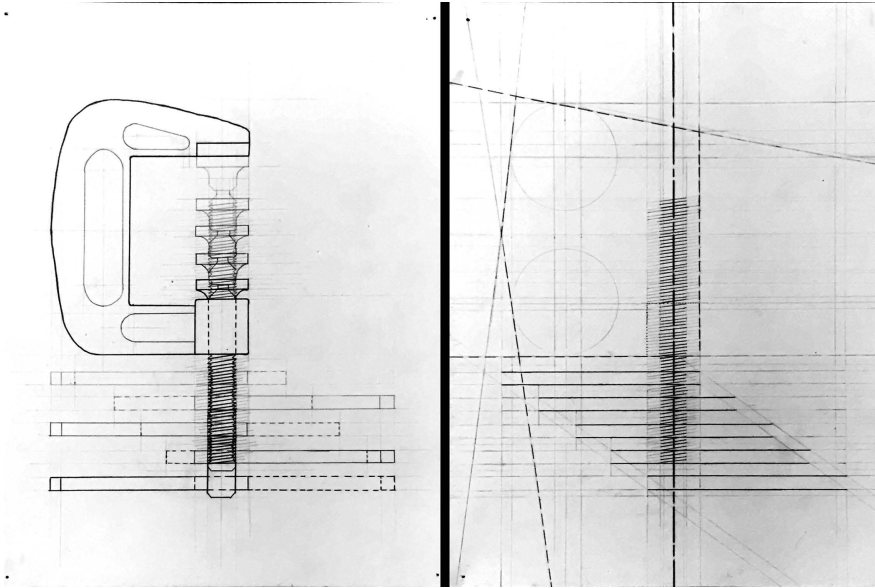
This project took students through a series of steps that moved from literal depictions of actual objects to diagrams of the same objects. In doing so, the project reinforced principles of abstract design, but also connected the abstract to the actual through the vehicle of the everyday. By acquiring a “projective tool” as the subject of analytical recording and design inspiration, students were encouraged to select objects that expressed their purpose while following certain requirements: be held with one hand, have a minimum of three component parts, be operable, and have two static vs. active states. This introductory exercise taught students to become acutely aware of *how things work* through abstraction. The students started the project by providing a written narrative. They observed and created a history of their object through a description of its construction, had to create a title for the tool, and “gracefully” composed the narrative on a piece of paper. Here, they were challenged to describe their projective tool without using the tool’s actual definition, but rather through important descriptors.

### *Abstraction via drawing*

This project also focused on capturing the projective tools’ exterior using two-dimensional representation. Students composed orthographic drawings to capture each aspect of the object at full scale. In Figure 7.2, students were then asked to “Analyze and record the mechanical device and reinterpret its role as an organizational tool through abstraction.” Here, the projective tool was viewed as the subject of analytical recording and design inspiration. After careful analysis, students were instructed to compose a hand-drafted representation of the tool on a sheet of trace paper in pencil, showing it from fully closed to fully open. Emphasis was placed strictly on *how* the tool operates, rather than what it *does*. Describing the difference between purpose and meaning was a critical step for students to identify any cultural connotations associated with either the object or the students’ own perception of the object. By analyzing a mechanical device in terms of its operative parts, principles of hierarchy and assembly were emphasized (Lin, 2012).

### *Abstraction via modeling*

This drawing became the generator to develop an architectural *bas-* or *bar* relief. The relief offered the opportunity to marry the process between two- and three-dimensional interpretations. It was used as a conceptual map to design a 3D display to describe the projective tool and focused on what the tool does through construction of various media. It ultimately registered the object’s movements and implied trajectories, and embodied the object’s operations, organization, and hierarchy of parts through material gestures created by the student. Ultimately, it no



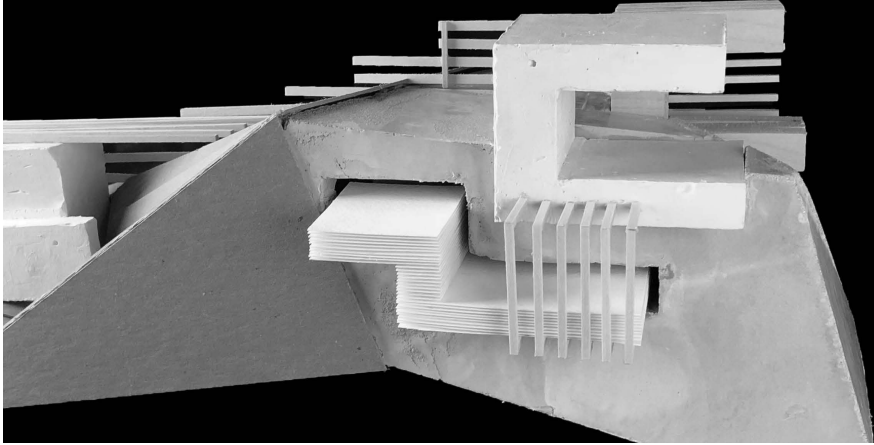
*Figure 7.2* Analyze and reinterpret (student Sarah Chiesa)

longer had the tool directly represented, but the “abstract” projections from the drawing exercise offer a language and set up guidelines for the student to prioritize and further their investigations.

The final Figure 7.3 was the creation that ultimately became the context model. The context model was assembled using construction methods informed by discoveries made through the drawing exercise. Students explored material manipulations through additive and subtractive methodologies, scoring, folding, cutting, and other gestures inspired by the operation of the tool.

Teaching the beginning design studio, with its emphasis on abstraction and fundamentals, introduced students to a creative way of problem solving through new and innovative methods of graphic discovery and inquiry through the use of abstract representation. This project introduced a process to connect each exercise to earlier abstract studies. First, that the space between objects is just as important as the objects themselves and that objects must be reconciled to their context. Second, that simple everyday objects hold many lessons for designers, but only if they take the time and develop the tools for understanding them. Lastly, that the ability to move between 2D and 3D explorations is a key skill for the beginning design student.

As demonstrated, to meaningfully and usefully deploy abstraction in pedagogy, it must be acknowledged that abstraction is a fundamental means of understanding the real. It presents the important opportunity to formulate priorities. A pedagogy of disciplined abstraction establishes what is important, disregards what is not, and explores the new condition. The result is both real and abstract. It is real in that it studies, measures, and manipulates qualities of actual things. It is abstract in that it does this according to a set of ideas and concepts that govern actions in the design process.



*Figure 7.3* The context model (student Sarah Chiesa)

## **Conclusion**

The argument of how to define “abstraction” is a bit problematic, as it relies on two assumptions that are not entirely true. The first being that anything that is unexpected or looks unconventional is “abstract” (a common seizing of the term by people both within and outside of the design disciplines) and the second that abstraction and “the real” are in opposition to one another.

An indictment of thoughtless composition can be prevalent in many beginning design architectural programs (not to be mistaken for a critique of composition in beginning design – which is necessary – just composition without a governing conceptual framework to structure and justify design decisions). However, considering the very definition of the word “abstract,” it represents concepts, theories, and ideas rather than physical objects, suggesting that “abstraction” is not the issue. Quite the opposite in fact. This is where the first fallacy is encountered. The indictment is of “abstract” looking compositions not governed by ideas. When in fact, by definition, anything not governed by ideas, cannot be “abstract” at all. When understood in this way (by the definition) even highly conventional constructs, with the accessible appearance of “real” architecture, have the same problems of thoughtlessness as “abstract” looking nonsense.

Additionally, as something that describes concepts not necessarily tied to a “concrete existence,” makes it very much a condition of the “real” just not the physical – an important distinction. This is where we confront the second fallacy. Abstraction is assumed in our own beginning design pedagogy because folks like Heidegger wrote so extensively and influentially on the liminal, but not physical, qualities we collectively use to define “reality” (Thomson, 2010). When understood this way (again, by the definition) “abstraction” is a condition of the “real,” not an opposition to it.

In conclusion, there is a trend of subverting language to the point that an alternate connotation is the predominant use proposing an alternate meaning, and therefore

losing clarity and honesty in the way the work is utilized. As an example, “abstract” becomes a linguistic stand-in any time we want to describe something that is novel to an extent that it is governed by no rules when in fact the word “abstraction” implies precisely the opposite. Similarly, something that is “speculative” is so frequently used to describe that which is so bizarre as to defy explanation when in fact “to speculate” is to seek explanation through inquiry. One might imagine this sort of linguistic pollution as happening in order to establish an inflated validity for under-examined ideas.

1. Everything we do as designers is an abstraction. To do otherwise embraces an architecture without ideas.
2. Learning especially is an abstract process – so removing abstraction from it seems counter-productive.
3. **Abstraction is not a goal. It is a didactic distillation of very real, sometimes physical phenomena that prioritizes and sequences content to be learned by the student.** Abstraction as a term can be very elusive since the moment abstraction becomes the goal, it stops being possible. By definition, for something to be abstract, it requires an idea or concept separate from itself to reference. Without external reference, it creates an irreconcilable circular logic. This is why it makes no sense at all when someone says that something “looks abstract.” An abstraction of what?!
4. As implied earlier, there really is no alternative pedagogy that abandons abstraction. But alternatives do exist in the strategic ways that abstraction is deployed in a design pedagogy. For instance, the goals of abstract representations as they correlate to valuing an architecture of ideas.

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# 8 Chance of designing

## Reframing aleatoric processes in design education

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### Introduction

The common and mutual essence of design and play has been studied within different aspects. In this respect, the design process is commonly associated with the activity of play.

In the article entitled ‘How designers play?’, Ham (2016) builds a strong relationship between play and design. He emphasizes ‘play’ as a fundamental state for creativity, and therefore actions, including ‘riddled with several acts of play’, could be very helpful for understanding the creative processes of designers. While Ham (2016) builds an explicit relationship between play and design, Schön (1993) refers to play in the design process more implicitly. Schön (1993) uses the term ‘play’ as an action when explaining designers’ construction of the design worlds as follows:

They constructed their own design worlds, as they played with and appreciated the materials in different ways, finding different things ‘interesting’, ‘neat’, ‘noisy’ or ‘disagreeable’, and selecting a few items, features and relationships from the daunting array of possibilities. Within their design worlds, they built particular structures.

(Schön, 1993, p. 58)

Similar to Schön’s idea, Farivarsadri and Alsaç (2006) examine the design process of an architect and claim that the design process “brings design very near to play” in which the architect “plays with masses and forms, functions and structures and may come upon an idea that may prove itself as a creative one then he/she may develop his or her design towards that direction” (Farivarsadri & Alsaç, 2006, p. 44). Concerning the interaction in the design studio courses, Ochsner (2000) asserts that “design is fundamentally related to the activity of creative play” and highlights several expressions used by design studio instructors such as “playing with design”, “playing with problems” and “playing with possible design solutions” regarding students’ design activities.

In the context of play and design, one can see that many studies have presented this relationship in different ways. Based on Ham’s conceptualization, we bring out the concept of ‘alea’ as the main issue to understand the play-design relationship

and go through the relevant literature by highlighting possible alea-related terms in design. In this respect, this current chapter attempts to shed light on the concepts of aleatoric process, risk taking and uncertainty and finds this question promising: How can aleatoric processes be seen and emphasized in design education?

The chapter includes two main sections: play and design and aleatoric process. The *play and design* section mainly focuses on Ham's conceptualization of play-design relation and gets help from the signature pedagogy model developed by Nørgård et al. (2017) to better understand and reframe the topic. The *aleatoric process* section explains the concept of 'aleatoric approach' and delves into the notion of *aleatoric processes* in design education. Through the literature review, this chapter finds risk taking and uncertainty as the most related terms, in this respect, the *aleatoric process* section highlights prominent studies on these terms. Common points of these studies are reviewed in the concluding remarks through mapping the concepts. In the discussion, the paper attempts to develop a conceptual framework with an overview of the relevant articles and revisits the research question.

### Play and design

Ham (2016) explicitly conceptualizes the relationship between play and design by getting help from the perspectives of Huizinga and Caillois, who are significant figures in the play literature. In the seminal book entitled *Homo ludens – a study of play elements in culture* (Huizinga, 2016), Dutch historian Johan Huizinga (2016) defines play as an activity standing outside ordinary life, not serious, extremely engaging, with no material interest and profit, bounded in time and space, based on rules, creating social groups out of ordinary life. Based on Huizinga's conceptualization, French writer and philosopher Roger Caillois (2001) asserts that play is free or voluntary and uncertain, which implies that the end of a game cannot be determined. Caillois frames play more systematically by classifying it into four categories according to the four dominant characteristics; competitive (*agôn*), chance-based (*alea*), simulation or make-believe (*mimicry*) and physically based (*ilinx*).

Play in *agon* includes rigid structures and rules to create competition among players as such in chess and sports. *Alea* suggests predefined rules and a structure based on chance and possibilities of movements and decisions in the game that cannot directly be controlled by players as such in the lottery. *Mimicry* offers free play of simulation and representation based on imagination and improvisation as such in make-believe play and role playing. *Ilinx* includes playing with bodily movements and changing perception as such in spinning round.

Regarding design literature, Ham (2016) describes this taxonomy of Caillois as "a great lens to understand the design process as a faculty of play" and suggests that *agon*, *alea*, *mimicry* and *ilinx* are all included in the design process (p. 20). Ham (2016) associates each category with different states of designing activity. Firstly, building processes of architects is an example for designing with *agon*. When the building of an architect separates him/her from other architects as a signature, 'agon qualities of play' stands out. In the context of design education, awarding the best



students in design school takes students in an ‘agon-mind set of play’. To understand alea in the design process, Ham (2016) puts forward ‘chance’ as a key element for the design process and then emphasizes risk taking of designers as a ‘certain level of alea at work’. While professional architects and artists take risk on public reaction, design students take risk by making decisions outside the boundaries of their critics. According to Ham (2016), sketches and models convey designers’ ideas, which is a common form of mimicry in the design process. Furthermore, role playing to understand the user is a type of cognitive mimicry in the design process. In the context of design education, design studio is considered as a type of mimicry where make-believe occurs to simulate real-world situations and practices (Schön, 1987, as cited in Ham, 2016). Finally, Ham (2016) considers the ilinx state of play as ‘the richest of the playful experiences found in design’, which comes from perception manipulation within the design process. Basically, two dimensional shapes on paper created by lines could be perceived as three-dimensional shapes due to ‘temporarily disrupted perception’, which is an example for designing with ilinx.

Ham’s conceptualization of play-design relation in design education could be reconsidered through the signature pedagogy model developed by Nørgård et al. (2017, p. 278).

Nørgård et al. (2017) investigate playful learning and teaching approaches in higher education and develop a model. The model frames interactions and experiences of playful learning in higher education by structuring them through three surfaces. While game pieces and mechanics are explicitly used for educational purposes at the surface level, the deep structures underpin the learning environment through play as such in gamification techniques. In the implicit structures, a safe space is created where students experiment with a playful attitude and become comfortable with risk taking and failure.

In this respect, while awarding successful students which involves agon quality of play can be considered surface (game) structure, designing with alea could be highlighted in the implicit (playful) structures because it involves and promotes risk taking.

Among the categories of play, this study focuses on alea and investigates the relationship between play and design in design education through the notion of aleatoric process.

### **Aleatoric process**

Alea is a Latin word that means game of chance. According to Ham (2016), all art making such as fine art, music, literature and film involve alea (chance) in different forms and in the guise of ‘aleatoricism’; on the other hand, the artists could especially feature alea at the forefront of their works in aleatoric approaches, which could be considered as special cases (Ham, 2016, pp. 21–22). In this respect, alea is prioritized as an element, as a tool or as a method. Ham (2016) introduces ‘computer-coded geometric modelling’ as an example of an aleatoric approach in which forms are created from codes and scripts that are “unknown to the designer who runs the program” (p. 22).

Briefly, aleatoric approaches can be seen in various creative practices. As a current example, Tynan (2020) investigates aleatoric approaches for music production and uses the plant's electrical signals to create virtual piano compositions in an attempt to generate a discourse on the Anthropocene. Through the notion of "option cancelling device" developed by Brian Eno (Red Bull Music Academy, 2018, as cited in Tynan, 2020), Tynan (2020) suggests the aleatoric approach as a "solution" for a problem encountered during the cycle of creativity in which he "became overwhelmed with options for music production technology, such as virtual instruments, sound libraries, effects, and the numerous variables available within each plugin" (p. 20).

In the context of design education, some practices and methods in the design process may have characteristics that can be seen in the aleatoric approach. As an example, specific material selection in the design process could be an aleatoric approach because the material directs the design process through its behaviours and potentials and thus excludes other options. Furthermore, the material limits the design student's control over the process and brings about unpredictable results and unknown forms to the design student. In this respect, discovering aleatoric approaches embedded in the design process could be helpful for attempting to understand play and design relationships in design education.

Based on the concept of *aleatoric approach*, this study suggests the notion of *aleatoric process* in design education that considers *alea*, *risk taking* and *uncertainty* as prominent elements. In this sense, by starting from Ham's understanding of *alea* in design education, the next two sections investigate the concepts of risk taking and uncertainty in design education literature.

### ***Risk taking***

*Alea* is initially associated with the concept of chance, and eventually, chance brings along risk-taking. Ham (2016) suggests an understanding of the concept of *alea* beyond chance by referring to games involving an extreme amount of risk and states that "when a designer takes a risk, there is a certain level of *alea* at work" (p. 21). According to Ham (2016), design students 'roll the dice with their design ideas', which implies involvement of chance and risk taking together. Risk taking has become a prominent topic in recent years. A special issue on risk taking in creative education published in an academic journal entitled *Art, Design & Communication in Higher Education* (2019) shows how important the topic is. Sussan Orr, the editor of the edition, states that "It is clear that the art, design and communication education community are keen to go beyond the casual valorization of risk-taking and to apply a critical and scholarly analysis of the territory" (Orr, 2019, p. 3).

Grocott et al. (2019) exemplify risk taking in design education similar to Ham's model (2016). According to Grocott et al. (2019), there is an inherent risk in design education when 'not-yet-developed ideas' and 'sacrificial prototypes' are shared and presented in front of colleagues and professors. Through an empirical study, Grocott et al. (2019) introduce different interventions in the design studio course

that might promote transformational learning, which is ‘an inherently vulnerable act’. In this respect, the study introduces ‘social risk of being vulnerable’ and highlights that taking risks personally and ‘communally transforms the learning environment.

To understand where and how design students experience risk taking, Giloi et al. (2019) develop an open-ended design project which creates a safe space encouraging students to take risk and fail. In the scope of the project, students communicate their personal life stories through recreating a used chair. The research findings indicate that students’ common experience of risk taking stands out during the stage of transforming the chair physically rather than during the conceptual stage. While ‘inspirational risks’ are considered as positive in the making process because they could offer ‘better final products’, practical challenges such as lack of necessary skills, knowledge, materials and tools are considered as risks with negative outcomes. On the other hand, this situation promotes ‘risk of learning something new’ (Giloi et al., 2019, pp. 43–44). While Giloi et al. (2019) identify types of risk in the design process, Ochsner (2000) highlights psychological risk that is initially involved in the decision to start design education. According to Ochsner (2000), freshmen in architecture programs have mostly mastered technical rationality so they need to set aside this kind of thinking and focus on the process of discovery that is unpredictable and without guarantee of success. Thus, the process in design studio courses includes psychological risk (Ochsner, 2000, p. 195). In this respect, risk taking could be observed in several phases of design education and in different forms during the design process.

### ***Uncertainty***

Another concept that becomes prominent in relation to *alea* can be regarded as uncertainty. According to “The Design Process Simplified” chart by Damien Newman (2008), the design process begins with uncertainty. While uncertainty in the design space is being reduced, the final design starts to appear more clearly. In this respect, uncertainty should be a distinctive aspect of the design activity.

Ochsner (2000) highlights the uncertain nature of the design process by comparing design education with science education, in the article ‘Behind the mask: A psychoanalytic perspective on interaction in the design studio’. In most courses in science education, such as in science lab courses, students already know that the given problems are determined by a solution or more than a solution according to methods that are learnt, while a design studio proposes problems with unknown results (Ochsner, 2000, p. 195). Tracey and Hutchinson (2016) define uncertainty as a “defining quality of the design space” and a critical element for designer identity. In the article ‘Uncertainty, Reflection, and Designer Identity Development’ (2016), they investigate the influence of uncertainty on design students’ experiences and attitudes through reflective writings of students in a course focusing on the role of uncertainty in design. They conclude that students’ attitudes towards uncertainty in general and experience of uncertainty personally construct designer identity in a unique way. While some students react to uncertainty in a more positive way, some students get

stuck in the uncertain design practice. On the other hand, safe environments could be constructed to eliminate or balance the negative effect of uncertainty on creative processes of students. Additionally, Gelmez and Bağlı (2018) reveal that uncertainty is one of the common emotions evoked during a long-term design learning journey.

Based on a research on “the journey of industrial design students towards successful entry to their professional community of practice”, Tovey et al. (2010) define ‘the toleration of design uncertainty’ as a threshold concept which accepts that uncertainty is an essential and routine part of the design process and it offers transformational learning when it has been crossed. As a key change for the industrial design curriculum, the research suggests the notion of ‘creative space’, a supportive and safe environment where students become able to study with the toleration of design uncertainty and intensely experience uncertainty. On the other hand, Kornilova and Kornilov (2010) establish a relation between uncertainty and creativity from a psychological point of view and ask the question “which processes mediate the generation of a creative product?” and investigate contributions of intellectual potential of individuals and personality traits of tolerance/intolerance for uncertainty. Based on two studies with students, Kornilova and Kornilov (2010) highlight tolerance/intolerance for uncertainty, which involves ‘unique predictive power’ for creativity and state that “Tolerance for uncertainty promotes creativity, whereas intolerance for uncertainty impedes it” (p. 240).

### Concluding remarks

Most of the articles reviewed in the context of risk taking and uncertainty are associated with design learning and they commonly refer to student characteristics. Gathering the common aspects together would be helpful to comprehend the relationship between risk taking, uncertainty and student characteristics. In this respect, Figure 8.1 attempts to map the relations of the concepts that are highlighted from the reviewed articles. In the scope of this study, ‘play and design’ and ‘design learning’ emerge as two areas in the context of design education. In the area of ‘design learning’, ‘student characteristics’ could be visualized as a subset that involves the issues of risk taking and uncertainty. *Alea* comes to the forefront in the intersection that establishes a connection between the two areas. In this regard, Ham’s emphasis on student characteristics when explaining designing with *alea* should be highlighted. Ham (2016) states as follows:

Design students are known to roll the dice with their creative ideas. More cautious students might approach design by attempting to tailor every decision to the perceived liking of their critics; others enjoy the *alea* of making decisions that push the boundaries of acceptance.

(p. 21)

While cautious students hesitate to ‘roll the dice with their design ideas’, others feel more comfortable who could be students with ‘a growth mindset’. Dweck (2006, as cited in Grocott et al., 2019) introduces a growth mindset and fixed

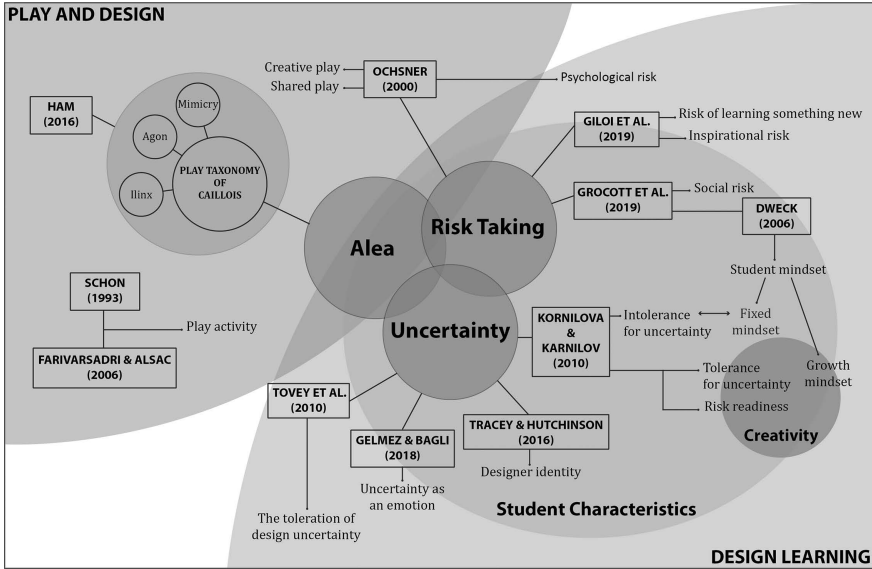


Figure 8.1 Mapping alea-related concepts in the design education literature

mindset based on individuals’ ability to take risk. Students with a fixed mindset accept themselves as ‘inherently risk averse’ thus unable to learn how to evaluate risk properly, on the other hand, students with a growth mindset are interested in becoming ‘more comfortable with embracing risk’ (Grocott et al., 2019, p. 101). Based on an open-ended design project, Giloi et al. (2019) conclude that not all students become able to take risk even if a safe space is created and categorize students’ risk-taking experiences into three themes, which are enjoyment, skills and student characteristics. For the categorization, Giloi et al. (2019) cite descriptions of Demirkan and Hasirci (2009) on student characteristics. In their study with design students, Demirkan and Hasirci (2009) aim to determine ‘the components of personality characteristics that are associated with creativity in the design process’. Demirkan and Hasirci (2009) introduce ‘risk taking’ as one of the factors that are responsible for creative acts and defines self-courage and humour as two items involved in risk taking as follows:

Self-courageous students were self sufficient, emotionally mature, able to cope with stress, willing to take risks and self centered. Humorous students were make use of the environment and were playful in accomplishing the task.

(p. 297)

While Demirkan and Hasirci (2009) investigate personality associated with creativity in a broader sense, Kornilova and Kornilov (2010) focus on uncertainty acceptance of individuals in predicting creativity.

According to Kornilova and Kornilov (2010), individuals' differences in creativity could be associated with 'tolerance/intolerance for uncertainty', 'readiness to rely on intuition' and 'risk readiness', which are personality traits included in uncertainty acceptance (p. 246). In this respect, *creativity* emerges as a main concept in the area of student characteristics as seen in Figure 8.1. While risk readiness and tolerance for uncertainty are critical for creativity, they could be characteristics of students with a growth mindset.

## Discussion

This study is an attempt to explore alea-related terms in design education literature to present an initial understanding of the relationship between play and design. The presented studies created a pathway which starts from alea in the design process then continues with risk taking and uncertainty. Alea is initially associated with chance in which the control over the process becomes limited, thus uncertainty and risk taking eventually reveal. While uncertainty creates conditions that require taking risk, risk taking brings out uncertainty. However, alea creates an atmosphere that encompasses these two concepts. In this respect, alea could be an umbrella concept for the presented literature that emphasize risk taking and uncertainty as essential in the design process and critical for developing designer identity. As visualized in Figure 8.2, while alea can be considered as a framework for the concepts of risk taking and uncertainty within design education, aleatoric processes frame alea, risk taking and uncertainty.

At this point, we can revisit the research question of this study: 'How can aleatoric processes be seen and emphasized in design education?' In this sense, aleatoric processes can already be observed in design education. As an example, design briefs developed by studio instructors create a frame where design students

## Aleatoric Process

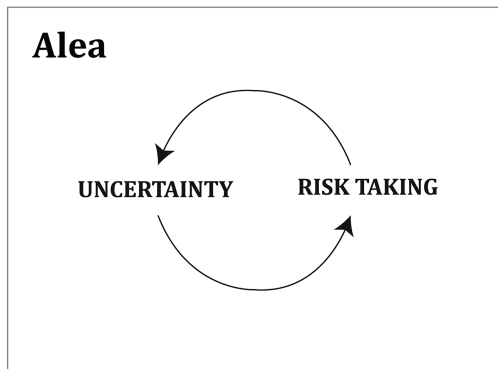


Figure 8.2 A diagram showing the relationship between aleatoric process, risk taking and uncertainty

experience uncertainty and risk taking via predefined tools, methods or materials. Moreover, instructors reframe the students' processes through critics during the design studio courses; thus, design studio instructors have a huge effect on students' aleatoric processes.

Furthermore, aleatoric processes could be developed as a powerful tool for interventions in the design studio courses that attempt to change students' attitudes towards uncertainty and risk taking. The studies of Giloi et al. (2019) and Tracey and Hutchinson (2016) might be a guide to implement aleatoric processes in design education. Giloi et al. (2019) developed a design project that encourages students to take risks. Tracey and Hutchinson (2016) investigated design students' attitudes towards uncertainty through reflective writing. In this respect, design teachers could organize design projects that highlight experiences of risk taking and uncertainty in the design process. Furthermore, during the project, reflective processes of the design students on risk taking and uncertainty could be stimulated through reflective writing.

Ochsner (2000) explores interaction between instructor and students in design studios as "a shared play" and suggests that the main aim of the work in the design studio is to "bring students to the point where they are able to play with their design ideas" (2000, p. 198). In this context, with an emphasis on aleatoric processes, design instructors might be able to create environments for 'a shared play' where students play with their design ideas or 'roll the dice with their creative ideas' in the words of Ham (2016). Although students' characters directly and deeply affect the 'play' activity in the design process, aleatoric processes could have a power to influence students' design approach and make them able to play.

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# 9 From critical friendship to design critique friendship

## Disclosing the mechanisms of informal design critique within a design studio course

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### Introduction

As acknowledged by many scholars, the design studio course is the center of design education (Ferreira et al., 2016; Goldschmidt et al., 2010; Oh et al., 2013). In the design studio, students conduct their projects by being guided by the studio instructors (Ferreira et al., 2016; Goldschmidt et al., 2010; Ochsner, 2000). In the studio, students present their projects in progress with their studio instructors and classmates, and sometimes also with guests, and revise their designs according to the feedback they received from their instructors and peers (Goldschmidt et al., 2010; Oh et al., 2013).

It is acknowledged that the design studio provides learning with social interaction. Within this dialogue, student-teacher interaction and peer interaction appear as the main types of design studio interactions. It is considered that the peers who share the same design studio may also be in a friendly relationship, which is inter-related with social interaction. In the literature, this issue is conceptualized as critical friendship.

The strong association between peer dialogue and the concept of ‘critical friendship’ is acknowledged by many scholars. According to the description of Costa and Kallick (1993), providing relative feedback to an individual or a group, a critical friend is a trusted person who poses inspirational questions, brings inputs to be analyzed through another perspective, and provides critique on the work as a friend. In this sense, critical friendship requires a mutual sense of trust that enables the success of the work to increase (Costa & Kallick, 1993). Considering these, this chapter acknowledges that informal peer-critique is significantly correlated with the concept of critical friendship, as it is free from power dynamics of the formal dialogue (Gray, 2013) and based upon a mutual trust (Costa & Kallick, 1993). In this context, it is believed that the presence of a critical friendship provides a foundation for informal peer dialogue. Thus, informal peer-critique is considered an important component of peer-learning and an indicator of critical friendship.

### ***Design critiques***

The dialogic event that involves giving and receiving feedback is called critiquing, and it can be regarded as the main pedagogical component of design studio courses (Dannels, 2005; Oh et al., 2013; Scagnetti, 2017; Uluoglu, 2000). Enabling a verbal exchange among the student, his/her peers, and instructors (Blair, 2007), the design critique facilitates the presentation of the project and the thinking process of the students (Blair, 2007; Dannels et al., 2008), communication (Dannels, 2005; Edström, 2006; McClean & Hourigan, 2013), knowledge exchange (Uluoglu, 2000), and collaboration and support (Dannels et al., 2011). Since the design critique is considered an integral feature of design education, there are various studies reviewing different aspects of the critiques in the design studio courses. As student-instructor communication is recognized as a crucial matter in design education (Edström, 2006; Ferreira et al., 2016), design critique is mainly represented as design conversations between instructor and student in the literature (Blair, 2007; Dannels, 2005; Dannels & Martin, 2008; Dannels et al., 2008, 2011; Goldschmidt et al., 2010; Ochsner, 2000; Oh et al., 2013; Peterson, 1979; Scagnetti, 2017; Smith, 2011; Uluoglu, 2000). Another prominent component of the design studio conversations is peer-critiquing, which will be explained in the next section.

### ***Peer-critique***

Offering a space for peer learning, peer-critiquing can be regarded as a valuable social aspect of the learning experience (Budge et al., 2013). More specifically, peer-critiquing allows students to be actively involved in design discussions by receiving or articulating constructive design critiques, participating in collaborative learning (Oh et al., 2013), using a specific language and terminology (Budge et al., 2013), and benchmarking their progress in relation to their peers (McClean & Hourigan, 2013). Additionally, due to the empathic nature of peer-dialogue, peer-critiquing significantly contributes to the development of students' skills of building empathic understanding, and therefore their design competence (Yılmaz, 2021). As Oh et al. (2013) state, group crits and informal conversations are two forms of conversations in which peer-critiquing occurs. By facilitating formal peer-critique through group crits, design studio instructors aim to incorporate students as active components of the collaborative teaching and learning processes. During formal peer-critique to foster discussion, students share their personal experiences and viewpoints with their peers who are tackling with the same design problem (Oh et al., 2013), and instructors play a role as facilitators or co-participants in the learning process (Budge et al., 2013).

### ***Informal and formal peer-critique***

It is noteworthy that design students tend to socialize in close pairs or groups since they work together and interact for long hours in a common design studio (Oh et al., 2013). This interaction also includes students' conversations for each other's projects

outside of the design studio. These conversations, called informal peer-critique, are described as a form of personal communication that occurs outside of the studio (Gray, 2013). As stated in previous studies, peer-critique takes place in a wide range of environments such as the design studio before or after the class, email or instant message, phone call, home, and various locations in the campus. As it happens outside of the studio, informal peer-critique operates freely from restrictions of the design studio together with minimized power relations among participants (Gray, 2013). In this context, it is important to account for how informal peer-critique differs from formal peer-critique and instructor-student conversations. Regarding informal peer-critique as a natural extension of the design studio environment, Gray (2013) defines informal peer-critique as a practice of mimicking the procedures that are intrinsic to the design profession rather than as a form of assessment. Additionally, McClean and Hourigan (2013) underline the valuable organic nature of informal peer conversations. In their study, since it has the potential to involve power dynamics in the conversation, formalizing peer-critique may significantly alter the structure and effectiveness of the conversation and therefore, the organic nature and authentic character of peer-critique can be lost (McClean & Hourigan, 2013). Correspondingly, McClean and Hourigan (2013) note that the open nature of the informal peer-critique is one of the most important aspects of informal peer conversations according to the students since it facilitates free decision-making on how students prefer to present and discuss their projects.

By considering the informal peer-critique as a genuine form of peer dialogue (McClean & Hourigan, 2013) and acknowledging that it occurs in a wide range of environments (Gray, 2013), this chapter aims at framing the informal peer-critiquing process within its complexity. This particular study investigates the design phases in which instant and planned peer-critiques occur, the steps of the peer-critiquing process, and the activities that peers perform within the critiquing process.

### **Field study**

With the aim of exploring informal peer-critique by understanding the design phases in which instant and planned peer-critiques occur, outlining the steps of the peer-critiquing process, and discovering the activities that peers perform while conducting the critiquing process, the study addresses three main questions:

- In which design phases do students perform informal peer-critique?
- How are the basic steps of informal peer-critique executed?
- What are the varying activities that peers perform during informal peer-critiquing processes?

To explore these questions we conducted a two-staged qualitative study:

1. Participant observation: A design studio course and jury of third-year students were observed by the first author.
2. Semi-structured interviews: Semi-structured interviews were conducted with a number of students who were volunteers to share their peer-critiquing

experiences. Since it is acknowledged that formalization of the process and intrusion of the researcher would negatively affect the organic nature of the informal peer dialogue, non-participant and retrospective methods were adopted for data collection.

### ***Research context: The design studio course***

This study was undertaken within the third-year undergraduate-level industrial design program of Istanbul Technical University Department of Industrial Design. A design studio course conducted on an online platform called Zoom was chosen for fieldwork. The course was being conducted online due to the COVID-19 pandemic. This compulsory course was conducted by an assistant professor and a research assistant. One of the authors participated in the studio classes and jury reviews as a visiting researcher. Throughout the semester, the researcher adopted a participant-observer stance by providing design feedback and critique to the students but not being included in the assessment processes. The main purpose of incorporating such a participant-observation method into the research methodology was observing and recognizing built-up critical friendship pairs or groups among the students without distorting the natural setting.

### ***Interviews***

The question set for the semi-structured interview was formed with an intent to understand the peers' routine critiquing practices. Acknowledging that the informal peer-critique is organically established with a critical friendship, basic questions that address the concept of critical friendship were also included in the question set. To facilitate the research process, a preliminary categorization grounded on the authors' design background and the relevant literature was specified. In the primary classification of informal peer-critique, two main categories have emerged: instant peer-critique and planned peer-critique. This presumption was confirmed during semi-structured interviews and the conversations continued following this framework.

During the classes, we made a call for participation in the interviews by briefly mentioning the aim and scope of the research. Depending on the concept of critical friendship (Costa & Kallick, 1993), it was clearly declared that it is preferred to conduct the interviews with pairs or groups who perform routine peer-critiquing.

Five undergraduate industrial design students participated in the study. In line with the declaration, the participating pairs were friends who had known each other before their current studio course and had a habit of peer-critiquing. Three interview sessions were conducted on Zoom with pairs of friends. The participants were debriefed about the research focus, and then they were informed to review the textual, visual, and auditory content cumulated in their communication platforms as a preparation prior to the interview. The duration of the interviews was between one and two hours. Before the interviews, written consent was obtained from all participants, and the interviews were recorded as audiovisual videos with the permission of the participants.

**Analysis**

This study is built upon verbal data that were generated through the interviews conducted with students. Qualitative content analysis was applied to analyze outcomes of the field study. Qualitative content analysis is a systematic way of specifying the interpretation of qualitative material. Krippendorff (1980) describes content analysis as a research method for drawing replicable and valid conclusions from data to the context of their use. For structuring a coding frame, main categories (dimensions) are determined, which are the aspects of focus of the analysis.

Among various ways for building a coding frame, Schreier (2013) describes data-driven strategy as an inductive strategy that includes categories and sub-categories based on collected data. Adopting a data-driven strategy, we conducted the analysis according to the framework, which consists of categories and sub-categories that emerged during the analysis.

**Findings**

Despite the limited number of participants, rich data was collected through comprehensive interview sessions, and therefore valuable outcomes were determined. This allows us to generate a preliminary understanding of peer-critiquing mechanisms. In this section, the outcomes are described with the expressions of participants. Pseudonyms are used for providing anonymity in quotations. The findings will be discussed in terms of design process, steps and activities held during peer critiquing.

**Steps of peer-critiquing**

Another focus of this study was outlining the steps of the peer-critiquing process. Initiating peer-critiquing, maintaining peer-critiquing, and terminating peer-critiquing were specified as the main steps of the process.

*Initiating peer-critiquing*

Initiating the peer-critiquing process implies a transformation of social friendship to critical friendship (Figure 9.1). The analysis showed that starting a



*Figure 9.1* Transformation of friendship within the design process

conversation particularly for critiquing is the initiative for instant peer-critique while scheduling time for critiquing is necessary for planned peer-critique. It was determined that instant peer-critique processes start with chatting on WhatsApp. The initiative communication of instant peer-critique may include sharing opinions or contents related to the design project, or asking for advice or feedback. As an example, one of the pairs mentioned that they sometimes negotiate about their studio instructor's critiques on WhatsApp right after the online class. Also, one of the pairs mentioned an instant peer-critique which they routinely perform:

One or two hours before the regular classes or juries, we send our presentation boards to each other on WhatsApp for double-check. It is for control and warning whether there is a typo, something looking bad or not understood on the presentation board. Sharing the presentation boards has become a routine practice for us.

According to the analysis, pointing out an issue related to the design project and setting a certain time to discuss it on the Zoom was noted as the main action of planned peer-critique. Participant pairs stated that they initiate the process for planned peer-critique and schedule a time by chatting on WhatsApp. In this context, the data presented three issues that initiate planned peer-critique practices: brainstorming, discussing the studio instructors' critiques, and receiving feedback about the recent developments of the project.

#### *Maintaining peer-critiquing*

While maintaining peer-critiquing, selecting a platform for critiquing is specified as the most important aspect. Analysis of the data revealed that WhatsApp and Zoom are the platforms preferred by students for peer-critiquing. Particularly, students use WhatsApp for instant peer-critique, while Zoom is commonly preferred for planned peer-critique. In terms of video-chatting, one of the pairs stated that they usually communicate through the video chat feature of WhatsApp as an alternative to Zoom.

Surprisingly, it was revealed that students sometimes utilize Zoom for instant peer-critique. Some of the participants mentioned the advantages of communicating on Zoom:

Since we can present our work by screen-sharing and talk face-to-face, we prefer Zoom when we want to receive a comprehensive critique.

I think discussing through a video or an image is a bit challenging when presenting the model from Rhino. I think it is easier and quicker when it is screen-shared on Zoom since it is possible to rotate the model or draw something with the annotate feature.

Similarly, one of the pairs stated that they sometimes carry out planned peer-critiquing on WhatsApp:

We also perform planned critiques on WhatsApp. We arrange a specific time for discussion which is conducted by sending images on WhatsApp. The process sometimes includes a comparison practice as we send inspiring contents we found on Pinterest and compare our projects with them.

Switching between platforms according to the needs for an effective peer-critiquing appeared as one of the important outcomes of this study. The analysis showed that starting critiquing on WhatsApp and then switching to Zoom is a common process of instant peer-critique. Participants mentioned that the lengthening and complexifying of the discussion led to the transition from WhatsApp to Zoom. In this context, Ecem stated that “When the issue is relatively simple such as modeling problems, it can be solved through chatting. But for more complex issues such as form development or brainstorming on technical details, Zoom is preferred.” With an intent to explain the reason behind the transition from WhatsApp to Zoom, Selen exemplified the advantages of communicating on Zoom: “I screen-share the model, show its views and stuff. Even as we negotiate about it, I simultaneously make changes on the model. You know, it’s like we’re talking together on a physical model side by side.”.

*Terminating peer-critiquing*

Once the process terminates, the social interaction of the peers resumes as friends. Termination of the peer-critiquing process indicates the transformation of critical friendship to social friendship (Figure 9.2).

*Activities in peer-critiquing*

Exploring the activities that peers perform while conducting the critiquing process was one of the main focuses of this study. Sending/sharing, discussing, selecting

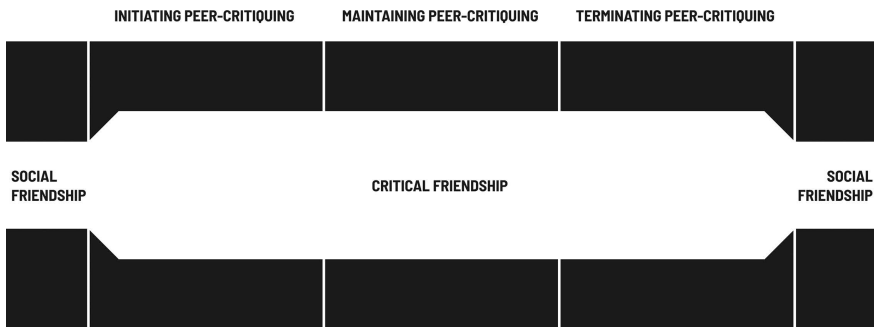


Figure 9.2 Transformation of friendship within the peer-critiquing process

media, and modifying/creating content are determined as the main activities that are carried out when peer-critiquing.

### *Sending/sharing*

Firstly, sending/sharing was specified as the main peer-critiquing activity. While sending/sharing textual or visual media (e.g., image, video, text, screenshot, or link), ideation materials (e.g., sketch, physical models, or digital models) through visual media, presentation materials (e.g., presentation boards, 3D renders, or physical models) through visual media, and voicemail were determined as the various activities that facilitate peer-critique on WhatsApp; screen-sharing of ideation and presentation materials, and showing a physical model were identified as activities that are performed during peer-critiquing on Zoom. The activity of sending/sharing textual or visual media (e.g., image, video, text, screenshot, or link) includes sharing and discussing useful and inspirational sources related to the project and design concept. According to the analysis, the activity of sending/sharing ideation materials mostly includes discussing digital models. In this practice, screenshots or images of the digital model were defined as the most frequently used visual media.

Additionally, images and videos of the physical model were specified as another visual media used in the activity of sending/sharing ideation materials. For example, Miray stated that “to describe her proposal, for example, she sends a photo of the model with play dough and texts you can do it like this.”

As the analysis shows, the activity of sending/sharing presentation materials is mostly associated with discussing presentation boards. Participants explained that they share and discuss their presentation boards through WhatsApp with an intent to check and enhance their presentations by discussing the graphical composition.

Another type of media used in WhatsApp for peer-critiquing is voicemail. When asked if it is difficult to communicate with only voicemail, not supported by visuals, Ecem stated that:

Since we know each other’s projects with all the details, we can communicate through voicemails. As we engage in continuous communication from the beginning to the end, we know all of the details of our projects. So, when she tells something to me, I can identify it quickly and give feedback.

### *Discussing*

Another activity of peer-critique is discussing, which refers to continuously chatting on WhatsApp and video-chatting on Zoom without using visual media. The discussing activity can be conducted with various focuses, such as negotiation, co-ideation or brainstorming.

As an example of discussing, one of the pairs mentioned that they recently used a group board on Pinterest for peer-critiquing on WhatsApp and said that they were mentioning the pins they added to the common board while chatting on WhatsApp.



*Utilizing media types*

The activity of utilizing media varies in two ways: utilizing a particular type of media and utilizing different types of media. While peers communicate by using a particular media type, they also conduct peer-critiquing by using multiple media types together. In the study, peer-critiquing by using different types of media on a particular platform was noted as an important aspect of the instant peer-critique. To describe their instant peer-critique practices, which includes both visual and auditory media, Selen stated that:

It's [using visual and auditory media on WhatsApp] like a quick simulation of Zoom. It does not consist of a single voicemail or a single image, rather it is a process that includes both of them mixed and occur one after the other. . . . It is more advantageous to continue working on the project or do something else on one hand. It enables communicating whenever you want and leaving when you want to isolate yourself.

*Modifying/creating content*

Modifying the content shared on a particular platform and creating new content were determined as valuable activities of the peer-critiquing process. In this context, Selen emphasized the drawing feature of WhatsApp:

You know you can draw something on the photo on WhatsApp. We always use that. We take a photo of the model and we draw on it. When Miray sends something to me, I draw my suggestion on it and send it back to her.

Also, one of the pairs expressed the advantages of WhatsApp's drawing feature:

[W]hen I draw something on the image and send it to her, she can also draw on it and we can overlap them. I think it is more advantageous than real paper and pencil, as we can move forward without damaging the sketch or model, and we can anytime go back to the original one.

Similarly, the same pair of participants specified that they effectively make use of the annotate feature on Zoom during peer-critiquing. Accordingly, WhatsApp's drawing feature and Zoom's annotate feature were qualified as platform features that facilitate effective peer-critique.

*In terms of design process*

One of the main focuses of this study was understanding the design phases in which instant and planned peer-critiques occur (Figure 9.3). For examining this question, the design phases articulated by participants were identified and utilized. It has been determined that instant peer-critique is frequently carried out at every design phase. Particularly, participants reported that instant peer-critiques are practiced

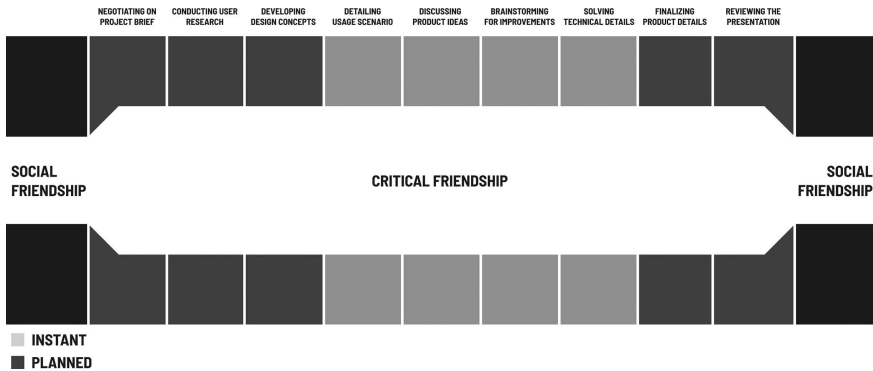


Figure 9.3 Occurrence of instant and planned peer-critiques in design phases

intensively at the beginning and the end of the design process. In terms of the initial stages, negotiating on the project brief and discussing the user research methods and design concepts appeared as the phases for instant peer-critique.

Regarding the final stages, finalizing the product details and reviewing the presentation materials were specified as the phases in which instant peer-critiques were performed. Participants also pointed out that the instant peer-critiques conducted at the finalization phases were mostly focused on generating last-minute solutions and improving the design presentation, they and emerged with a sense of anxiety.

Contrarily, it has been noted that planned peer-critique is generally conducted at the middle stages of the design process. More specifically, developing design concepts, discussing product ideas, and brainstorming for product improvements regarding formal and technical details are specified as the phases during which planned peer-critiques occur. In particular, participants emphasized that the planned peer-critiques conducted at the concept and product development phases addressed detailing the scenario of use, improving the formal features, and figuring out the technical details, and were carried out as a brainstorming session. Correspondingly, it is understood that since there is sufficient design development to discuss in the initial phases and no time to comprehensively discuss in the final phases, it is not surprising that planned peer-critiques do not occur at these stages.

Besides, one of the pairs mentioned that they practice planned peer-critique at the refinement of the different stages of the design process, such as finalization of user research or clarification of the design concept. They stated that they had planned and conducted a critiquing session for testing and final checking their cultural probe kits before delivering them to the potential users.

## Conclusion

This study is considered an introductory exploration for understanding the mechanisms of informal peer-critique. Adopting the concept of critical friendship, we

focused on design critique friendship that naturally invites informal peer dialogue, which is an essential component of design education. With analyzing the data that was obtained by conducting semi-structured interviews with student-pairs, (1) the design phases in which instant and planned peer-critiques occur, (2) the steps of the peer-critiquing process, and (3) the peers' activities within the critiquing process were investigated to grasp the mechanisms of informal peer-critique.

Depending on the decrease in face-to-face communication and the development of various types of remote interaction during the COVID-19 pandemic, this chapter focuses on comprehending informal peer-critiques that are conducted via instant messaging software (e.g. WhatsApp), phone calls, video chat software (e.g., Zoom or Skype), or social media platforms (e.g., Instagram or Pinterest). In this study, the aforementioned platforms were regarded as proximity channels where both regular social interaction are enabled and informal peer-critique is conducted. The use of WhatsApp as a main communication tool and the popularization of Zoom led us to focus on these platforms that redefine the concept of proximity in design education.

Particularly, Zoom has become a common platform integrated in our lives since the COVID-19 pandemic. During this period, Zoom has started to be utilized for educational purposes to conduct online learning. As it integrated into social interaction and online education, Zoom naturally turned into an enabler of peer-learning. Accordingly, this study accounts for how students utilize Zoom for informal peer-learning along with formal peer-learning.

The findings of the study are expected to contribute to these following points:

- evaluating existing platforms where informal peer-critique occurs,
- increasing instructors' awareness of such social interaction of students, and
- developing an understanding for design students of social interaction that facilitates collaborative learning and knowledge exchange.

At first, examining existing platforms where informal peer-critique occurs enabled us to specify the factors effective in platform selection. Accordingly, a number of criteria of evaluating the platforms are determined:

1. Relevance: being relevant with the design phase of the students.
2. Accessibility: being easily accessible by students.
3. Commonality: being commonly used by students.
4. Compatibility: being compatible with up-to-date technology and different devices.
5. Rapidness: providing quick interaction.
6. Adaptability: providing various types of interaction.
7. Open to sketching: providing features for sketching on the content.

By considering these criteria, existing platforms that offer remote interaction can be re-evaluated for informal peer-critiquing, or a new platform specific for design education can be proposed. However, it should be considered that using a platform developed particularly for critiquing may disrupt the informality of the process and transform it into formal peer-critique.

Secondly, this study may increase instructors' awareness of informal peer-critique, which they do not have access to since it is not a formal process. Thus, such social interaction of peers can come to the fore and the pedagogical extensions of this issue can be discussed.

Lastly, the outcomes of the study present an understanding of social interaction that facilitates collaborative learning for design students. Therefore, students may carry out informal peer-critique more effectively due to the increase in their awareness of the mechanisms and benefits of the process.

This current study has some research limitations. The research sample is quite limited, and therefore, it does not provide mass data. Although non-participant and retrospective methods were adopted, approaching the students with a research intent may have altered the informality of the process. Further studies may be conducted with larger sample groups and alternative methods of data collection.

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# 10 Mapping of the design process of the Luz e Cena Laboratory, LALUCE, linked to the Federal University of Goiás

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## Introduction

According to the text “A poética”, by Aristotle, the term scenography comes from Skenographie, a word composed of skené: scene; and graphein: writing, drawing, painting. In this context, for a long time, based on the Greek concept, it was defined that “scenography is the spelling of the scene” (Serroni, 2003, p. 32).

However, the scenography goes beyond a simple concept, it must be perceived as a cultural demonstration, where the teaching and training of professionals differ from each other because the scenographic creation process changes in time and space (Scheffler, 2014).

For Mantovani (1989), scenography is seen as a theatrical, three-dimensional place that goes beyond the building, as the scene can be inserted in a square, a shed or in any other space. Today we can understand scenography as knowledge that involves specific theory and techniques, and thus understand that there is a mutual relationship between environment and individual. Thus, an important challenge for a set designer is to create a space that creates harmony between the environment and the user within the proposal’s artistic metaphor (Mantovani, 1989). Scenography was seen before as the art of designing sets, later on it was understood that it is not just a scene design or space project, but also a dramatization of the environment, a dynamic-visual interaction of all aspects involved (Serroni, 2003). “Scenography is not just a visual illustration of a text, but a visual and spatial materialization of the theatrical event that involves the actor and spectator” (Machado, 2006, p. 9).

According to Mantovani (1989, p. 16), “Scenography is not a solitary activity. In fact, it’s impossible to be a set designer alone, as the work must be done with other people.” For the design of a good set, it cannot come unrelated to the costumes, the props, the lighting, the marking of the actors and their movements within the scene, as these characteristics are part of the same visual language and make up the entire space (Dias, 2004).

Thinking about how the scenographer expresses himself through visual language, it is clear that he needs to know about the history of art and spectacle, drawing, painting, sculpture, modeling, composition and scenography.

Once invited to join a team, the scenographer must get in touch with other professionals, if they find out about the work. It will then study and analyze the proposal until the execution of the model, which will be presented to the group and, if approved, will start the actual stage of execution of the scenarios. This phase, depending on what the scenarios are, needs other professionals to be performed. This work is generic, as each professional and team establishes their own.

(Mantovani, 1989, pp. 12–13)

In addition to all the previously described domain, the scenographer must master other areas of knowledge, such as construction techniques, knowledge of materials and know-how to execute and build; therefore, they must have a very detailed executive drawing (Ratto, 1999).

However, one might ask, why study the design process aimed at scenography? Why study these processes based on sustainability?

As the scenography happens very quickly and with a multidisciplinary knowledge and professionals, there is a need to follow design processes in order to ensure good communication between the professionals involved, and still, bringing quality and the certainty that nothing will be forgotten. These practices ensure customer satisfaction. According to Ullman (2019):

The design process is the organization and management of people and the information they develop in the evolution of [a] product.

(p. 8)

The design process implies a set of knowledge and actions that help in decision-making and, consequently, to a result that achieves a single objective.

According to Arceo and Rojas (2002), images, sketches, concept maps, case studies and diagrams, among other processes, can organize information and codify it for a good result in the creation and execution.

Although there is great debate about the concept of scenography, the creation and coordination of a laboratory dedicated to the design, execution, assembly and disassembly of scenarios (LALUCE, from the Federal University of Goiás) revealed a great lack of academic studies in the area of television set design. To overcome the lack of research on the subject, studies were developed to meet the demand for work in this area. This lack, particularly in the area of television set design, can be justified by the absence of a specific discipline in the Faculties of Architecture and Design.

## **Methodology and results**

The choice of the projects carried out by the Luz e Cena Laboratory (LALUCE) as objects of analysis in this chapter is in line with the link it has with the Federal University of Goiás (UFG), where the author is part of the faculty and also is

the founder and coordinator of the laboratory, where she guides students through the processes of creation, planning, execution and disassembly of set for the most diverse areas, including television.

The set created by LALUCE tries to reflect a thought focused on sustainability, through the materials used and reflection on the life cycle of the products, thus bringing to students of architecture, design and art direction the reality of professional practice, seriously and cohesively.

The work carried out by the LALUCE team followed a pre-established design process with a step-based creation method. However, this process had never been parameterized. To do so, five case studies were selected to understand how these steps are developed within the LALUCE design process.

The methodology adopted to analyze the LALUCE design process consisted of seven steps:

First stage: interview with students who have participated and those who are still part of LALUCE, to verify the job satisfaction rate within LALUCE and their understanding of the processes and methods used in the work they did with the laboratory and to analyze and understand points of improvement for the LALUCE design process.

Second stage: choice of the five LALUCE case studies taking place through an analysis of the relevant factors of each work.

Third step: analysis of the individual case study design process to verify the frequency of each step of the LALUCE design process and also the reason for the existing failures in the case studies.

Fourth step: creation of a LALUCE preliminary design process.

Fifth step: training of LALUCE members.

Sixth step: application of the LALUCE preliminary design process in two television set.

Seventh step: results and discussions of the LALUCE design process.

In the **first step**, laboratory members were asked 16 questions, 14 of which were multiple choice and two were discursive. The discursive questions were necessary to understand more clearly the degree of dissatisfaction with the work carried out at LALUCE and if there was a correct understanding of what design process is and its difference in relation to the methodology. At this stage, questionnaires were sent to 19 people, obtaining 11 answers. Among the answered questionnaires, four were still part of the laboratory and seven were already part of the laboratory before finishing college.

The results regarding the satisfaction index of LALUCE members in relation to the creation, design and execution process, it can be seen that 100% of the members are satisfied.

As for the assembly process, 12% think the process is bad and 75% answered, in an open question, that the assembly process should be changed.

When the question is related to the design process, even with 100% recognition by the LALUCE design process team, it is clear that members cannot differentiate process from methodology.



This result of not understanding the difference between design process and methodology, brings the need for training on the subject, foreseeing a good progress of the LALUCE design process that will be created.

In the question about what should be changed in all of LALUCE's work and why, it was freely described so that members could express the real need for change.

The answers found, again, place the LALUCE assembly process as one great dissatisfaction, reflecting some problems arising from the execution and also due to the lack of knowledge of the materials and their possibilities. The latter, in addition to bringing an inadequate choice, also brings greater waste and, consequently, an increase of residue. This issue is in line with the intention to study the most used materials in television set design, in order to bring suitable materials that do not cause so much impact on the environment.

Another study that was not foreseen in this research, but as a result of the questionnaire carried out with LALUCE members, was the sizing of an adequate team to perform well in each of the stages of the LALUCE design process.

The **second step**, choosing the scenarios for study, was made according to some degrees of importance they had for LALUCE. Thus, for each set, the criteria used will be explained: **Brazil Moment**, a joint production by Rádio Universitária – UFG and TV UFG, was a television program whose main goal was debates that elect a relevant topic on the agenda at each edition to be analyzed in its different aspects, from the perspective of specialists. From the observation of the need for a set that “talked” with the program's content, a proposal based on sustainability was necessary. **Young Connections**, a temporary program linked to the already existing Connections program. This proposal is in line with the political moment Brazil had at the time: its presidential election. The program proposed to bring to young high school audiences a debate about politics with recordings in an auditorium, outside the TV UFG studio. Due to its temporary nature, the biggest challenge was the lack of funds to carry out the proposed scenography, since the broadcaster would already have to have a high expense with its own equipment for filming outside the studio. **Study at UFG, UFG is for everyone**, this miniseries was composed of a small episode, idealized by radio broadcaster Michael Valim, in order to bring to young people who intend to enter a public university the step by step of all processes required by the Federal University of Goiás. In addition, a character from a lower social class was brought in who still has doubts about which course to take and who discarded the option for UFG, as he came from a humble family. The choice for this scenario was because it was the first television set focused on a miniseries; the reduced amount to be spent on the set; the costumes of the chroma key scenes having to convey personality through color shirts only; and recordings made at night so as not to interfere with TV UFG's existing programming. Besides the set having been assembled and disassembled at each recording, it is the responsibility of the LALUCE members to leave the entire set of the following day identical to the last scene recorded. Very well-structured logistics were necessary, as LALUCE was responsible not only for the set but also for the costumes, makeup and elements that made up the scenes. **FAV Fashion 2018**, an annual fashion show, linked to the Faculty of Visual Arts (FAV) a unit of the Federal University of Goiás, and promoted

by graduates of the Fashion Design course as a practical part of the course conclusion works. Due to the structure and great opportunity, students end up promoting their collection to companies in the fashion sector that are present there. This set was chosen because it was the set with the greatest repercussion of LALUCE within the UFG community, the community in general, and also had repercussions on the fashion companies present in the place. **Cocoon of Idea**, created for a part of the program *Live Science* on TV UFG, was responsible for bringing a playful and childlike atmosphere to a time when children were interviewed and answered questions related to the context of the edition. Previously, this program was done in outdoor shots with a lot of greenery and contact with nature, but there were many interferences in the final quality of the recording, which led Cocoon of Idea to be recorded in the studio. This set was chosen because of the partnership that was made between the locksmiths and the joinery of the Federal University of Goiás, giving students the opportunity to perform the entire scenario and being able to experience the process as a whole. For the **third stage** of the study of the LALUCE design process, it was necessary to create a summary table for each stage in order to help compare the five case studies (Table 10.1).

According to Table 10.1, it was possible to see a sequence of activities performed by the LALUCE team to produce a television set. According to the colors, you can identify which moment and which reason the activities for each of the five sets under study were not fulfilled.

For the **Brazil Moment** set, it is clear that the tasks subsequent to the executive project were not completed, in the analysis made at the time the project was delivered, it was noticed that the non-continuity would have been due to the lack of funds from the client (TV UFG) to complete the demand. At this moment, in a deeper analysis, it is noticed that the reduced number of students and the lack of experience in television scenography also helped for not having completed the services of LALUCE. In **Young Connections**, despite some tasks not being completed, it was verified that this was not the responsibility of LALUCE. The activities in red did not take place because the project included a standard measuring material (pallets) and that only the model would help in defining the set. These decisions were taken on according to the briefing, which pointed out the total lack of funds and the greatly reduced time for design, execution, assembly and disassembly. In the series **Study at UFG, UFG is for everyone**, there was a failure in the visualization and materialization of the script context, either by the producers involved or by LALUCE. Even after the approval of the realistic model and the set, everyone involved noticed that the set did not show the necessary veracity for the plot. Thus, it was necessary to step back and redo a large part of the process. This decision caused a delay in other sets, but it was necessary for a good result and, mainly, for the growth of the entire team. It was noticed that the lack of communication and of expressing themselves correctly could generate rework and bring not only financial losses but loss of time, as the team had to split in half and work additional hours. With the **FAV Fashion 2018** and the **Cocoon of Ideas** program, it can be seen that the increase in experience, a cohesive team and greater study in the area of scenography makes a lot of difference for the smooth running of the

Table 10.1 Table with activities related to the initial LALUCE process according to personal experience in the laboratory. (01) Brazil Moment; (02) Young Connections; (03) Study at UFG, UFG is for everyone; (04) FAV Fashion 2018; (05) Cocoon of Idea

EXISTING STEPS		01	02	03	04	05
Development	Customer interview					
	Briefing					
	Meeting with members of LALUCE					
	Photometric survey					
	Visit to the DMP					
Development of the proposal	Brainstorming					
	Case study					
	Moodboard					
	Concept					
	Color palette					
	Idea sketches					
	Electronic mockup					
	Presentation adjustments					
	Customer presentation					
Product development	Executive project					
	Budget					
	Purchasing coordination					
	Delivery coordination					
	Execution					
	Mounting					
	Tuning the lighting					
Delivery evaluation	Rehearsal general					
	Maintenance					
	Disassembly					
	Disposal and destination of materials					
	Analysis of the steps					
TASK NOT FULFILLED SUCCESSFULLY						
TASK NOT FULFILLED - LALUCE PROBLEM						
TASK ACCOMPLISHED SUCCESSFULLY						

(Source: Author)

production of a set. The results of this worksheet brought a deeper understanding of the design process used by LALUCE and enabled a better organization, sequence and understanding of each stage that a scenography requires.

According to the analysis of the case studies, it is possible to proceed with the fourth stage, where it became clear that the LALUCE design process is divided into four stages: generation of idea, development of proposal, product development and delivery and evaluation. Other characteristics that can be noticed were that the LALUCE design process did not have a beginning, middle and end and that it was a cyclical process, given the concern with the destination of the disposal of materials at the time of disassembly and the existence of an evaluation, bringing a great contribution to constant improvement throughout the process. This cyclical process can be seen in Figure 10.1, and each of these steps has its well-determined methods.

In the **fifth and sixth stages**, after understanding how LALUCE’s design process is characterized, it was necessary to present it to the members of the laboratory in order to train them so that, from then onwards, they could put it into practice and check for possible failures. The training took place with a reduced team, as the problem with the pandemic installed around the world made it difficult for new members to enter. The training took place all in virtual mode and was made in five stages: 1. theoretical training, through the exposition and explanation of the process in question; 2. reading how the process works to clarify all stages, tasks, obligations and duties of the team; 3. application of the process in the UFG World scenario for TV UFG; 4. application of the process in the recording studio set Marcello Costa and 5. assessment of the new process and its correction.

Four students were present at the process presentation training and also received the written material (Figure 10.2), one from the art direction and three from the environment design, in addition to one professor and the laboratory coordinator,

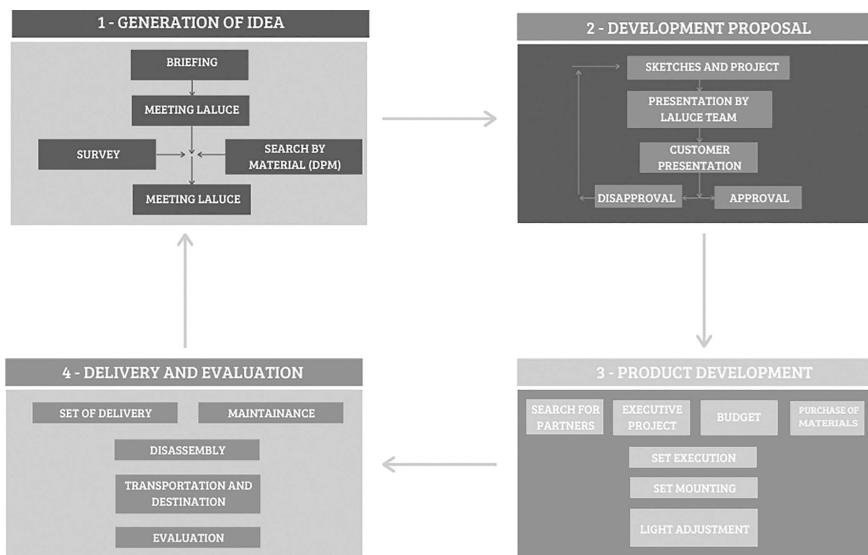


Figure 10.1 First LALUCE design process proposal (Source: Viviane de Sousa Cruz e Silva)



Figure 10.2 All training took place virtually (Source: Viviane de Sousa Cruz e Silva)

both from the Federal University of Goiás. A period of five hours was taken for the presentation, explanation and clarification of doubts. After all understanding, the descriptive material was distributed so that the members could have greater contact with the material and then start meetings to apply the LALUCE design process in the scenography of the Mundo UFG program (Figure 10.3) and later in the Marcello Costa Recording Studio (Figure 10.4).

As all training, creation, projects and execution of set relied on the interference of the COVID-19 pandemic, everything took place virtually, which resulted in greater commitment from the team so that the understanding of each step of the process was not compromised. This lockdown moment, for the evaluation of the process, was very important and positive, as it significantly interfered in the level of detail and clarity of each stage, since the understanding of the project as a whole would have to be done without the presence of team members. This problem brought some changes to the initial LALUCE process that were very positive even when the pandemic was under control.

## Conclusions

With the results found, it can be concluded that both in the training of the LALUCE team and in the design process there were no major changes in the idea generation process, only that the visit to the Heritage Materials Deposit (DMP-UFG) was only possible for sets linked to the Federal University of Goiás, requiring its removal from this stage.

Another important observation was that failure to comply with the schedule jeopardized the smooth running of the entire proposed process, causing an overload for the laboratory's members, since the delivery deadline could not be changed due to the rigidity of the television programming.

For the project development stage, where the sketches and projects were done at the same time, it was necessary to separate them due to the project period being longer than the sketches. In addition, in this same stage of the

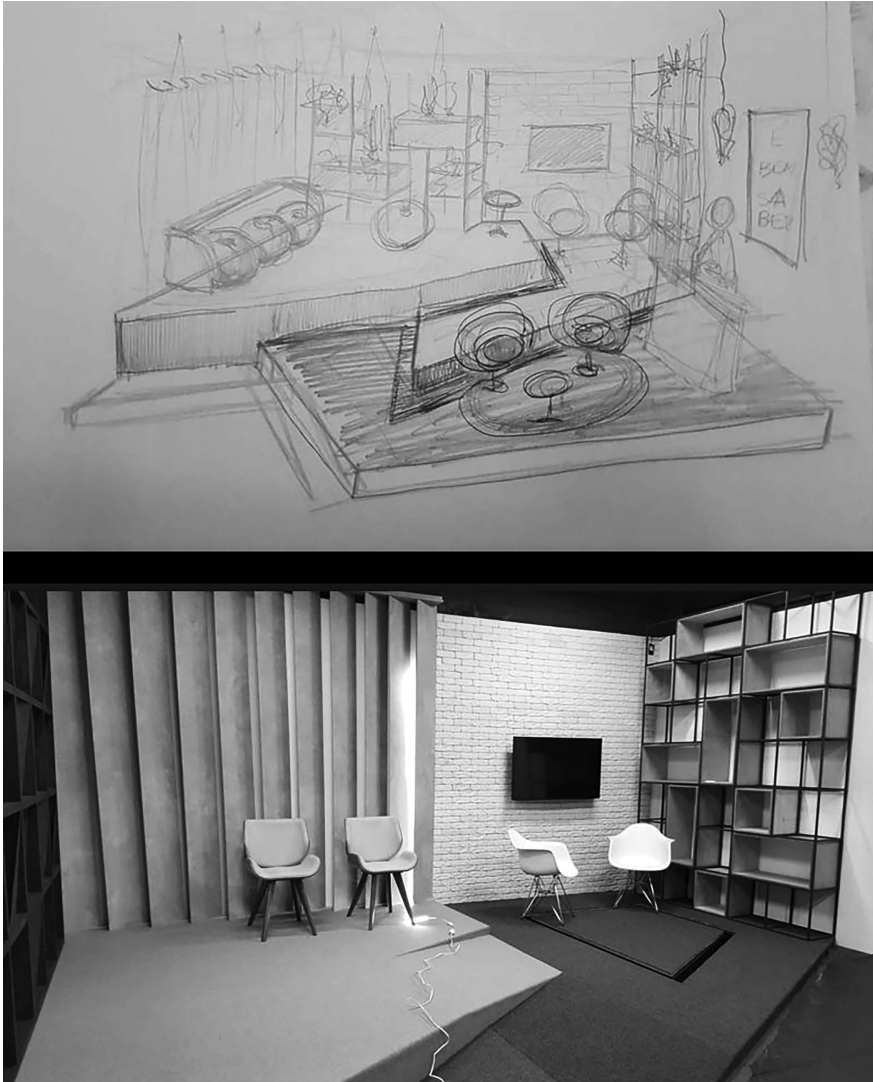


Figure 10.3 Creation and execution of UFG World (Source: Viviane de Sousa Cruz e Silva)

process, it was necessary to add the stage related to the model due to its importance for the presentation made to the client, since the entire visual part of the set was represented and could be better visualized through the realistic model.

In the product development stage, through the observations made by the team in the questionnaire and also due to a need for better understanding in the execution of parts for the set, as well as for assembly, it was necessary to add the executive model. This one presented, in a visual way, the step by step of the constructive

and assembly stages, facilitating the understanding and, therefore, streamlining the execution and assembly processes.

Given the necessary changes, according to training and applications, it can be seen in Figure 10.5 how the new LALUCE design process has been transformed:



Figure 10.4 Realistic mockup in the Marcelo Costa Recording Studio (Source: Viviane de Sousa Cruz e Silva)

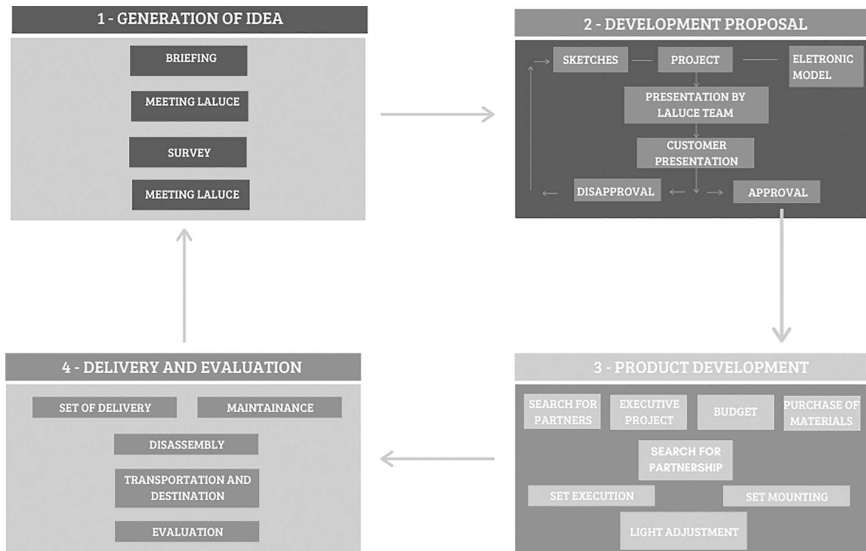


Figure 10.5 LALUCE design process after training and application (Source: Viviane de Sousa Cruz e Silva)

Another fundamental characteristic of this process is that it cannot be made a rigid process, as the critical assessment for each set created by LALUCE will bring different needs and, according to good management, this process will be in constant development to achieve a good result and a quality in the work of the entire team.

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**Part III**

**Design “in action”**



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# 11 Neighbourhood, community and public space

## Designing the proximity together

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### Public spaces and community engagement

This chapter starts with an introduction that frames the theory behind the interlink between the public space and community engagement by highlighting the role of designers as activators and facilitators of social innovation solutions. These premises are then declined to a specific context (the Nolo neighbourhood) where the authors applied methods and tools of design for social innovation to point out spatial scenarios aiming at improving the concept of proximity in the area. A set of codesign tools are then described through their application with the citizens of the district. These tools refer to the *Vocabolario di Quartiere* – the “Situated Vocabulary” action research project that helped the authors to validate some of the premises set in the introduction.

Today cities are facing severe uncertainties and challenges. Reflecting on public space and considering the experience gained from the pandemic requires urgent action of sustainable and inclusive urban development. In the public space, we learn to interact and respect the environment in which we are immersed. Today it is called upon to adapt to new urban and social forms, thus becoming a generating principle for positive changes in the urban fabric. It is necessary to re-establish the relationship between a territory’s physical space and its inhabitants, investigate the local scale, and propose new proximity models capable of placing the human dimension at the centre of a system of services, relations and opportunities.

Nowadays, there is a substantial increase in spatial projects characterised by temporariness, low cost and informality. These experiments aim to improve the quality of urban life by reconnecting people with their areas and finding opportunities for projects in existing public spaces – often interstitial or anonymous places hidden among the waste of the built environment that have great transformative potential (Pericu, 2013). Temporary urbanism initiatives are changing the appearance of cities: the recovery of interstitial places, the re-appropriation of degraded or abandoned spaces and spontaneous events based on citizens’ initiatives become new project practices in which temporariness is a fundamental aspect. Such interventions give “a strong mark on the city, but it is almost always temporary and reversible. They transform the urban image of the city, maybe just for an hour, but they have the power to change the image in a lasting way” (Di Prete, 2011 in Crespi, 2011, pp. 28–29).

The current health emergency has led many cities – such as Milan, Barcelona, Paris and Copenhagen<sup>1</sup> – to embrace adaptation strategies. By applying such temporary transformative processes, they have been able to reconfigure their public spaces, thus promoting models of territorial proximity that focus their range of action on the everyday scale.

Designers and researchers take on the role of facilitators in transformative processes, activators of new context-based projects. To start an inclusive urban development leading to new proximity models, it is essential to listen to the territory and voice those who live there every day.

Designers in the role of social facilitators and activators can experiment with new methodologies of codesign:

active participation allows people to reappropriate places of the city, to imagine new possibilities of use and to create new bonds. Design tools can lead to the construction of sustainable life scenarios, generate forms of social and systemic innovation with reference to the human environment.

(Manzini & Jègou, 2003)

In many urban projects that have provided for extensive citizen involvement, the role of the designer emerges as a design activist: a figure with transdisciplinary skills who remains active in all phases of the process, not only in the ideation but also in the realisation of the interventions themselves (Collina, 2012 in Fassi, 2012). Therefore, the designer is the one who can create convergence, realising people's needs and ideas.

Preparing the inhabitants of the territories through a participatory process makes them aware of project benefits and makes them actively involved (Fassi & Manzini, 2021). The application of participatory methods and the involvement of citizens in regenerative processes allows the creation of a new affective dimension towards the rediscovered urban spaces. The design of a sense of belonging – to a place, to a project or a community linked to it – leads to a more vital willingness to care for the place itself. It creates local communities that will continue to take care of the place over time, making the regeneration process effective and long-term.

Therefore, acting on public space is the first step to creating social cohesion and generating what we can call transformative social action (Manzini, 2018). A reinterpretation of space can create new social dynamics, give rise to new opportunities. New forms of community, belonging, and identity can be made; new social interactions constitute a concrete opportunity to regenerate urban areas often perceived as marginal and degraded. Involving users in the design process gives them the role of actors: citizens inhabit the space in their daily lives. They can benefit from the improvements made and be the creators simultaneously.

Collaboration is the necessary basis for creating social innovation: new conversations and new interactions can be made in public space, which are translated into concrete actions when involved people collaborate (Arendt, 1964). This kind of collaboration takes place when the common interest is made visible and contagious. Therefore, to regenerate a public space, it is necessary to start by nurturing a social conversation that can produce new ideas and shared visions (Manzini &

Tassinari, 2013) to generate new forms of collaboration and arrive at results that have value for each and every one.

### **The Nolo neighbourhood in Milan: a community-based context and a university hub place**

The research, investigating the issues of public space, proximity and participatory design, was carried out in the specific territory of Nolo, in Milan, where Off Campus is located. Nolo is the acronym of North of Loreto, a name that identifies a territorial area within the city of Milan. The municipality officially recognised this area only on 18 February 2019 (Comune di Milano, 2019). Until a few years ago, it was known in the city chronicles for episodes of degradation, drug dealing and illegal occupation of buildings. Nolo is at the centre of an urban and social transformation process that has opened new businesses, art galleries, creative studios and public spaces that have significantly upgraded the area.

Nolo is a dense neighbourhood characterised by multiculturalism, where the forced coexistence of very different realities often triggers spontaneous phenomena of aggregation and social cohesion. The formula “*Density x Diversity = Proximity*” proposed by Sim (2019) is already finding an actual application in this area: the idea of proximity is being strengthened thanks to the synergetic work of local associations, active citizens, creative people and public administration. The neighbourhood’s social fabric presents itself as a community that is in some respects already very united and predisposed to participate in collaborative actions. These various communities can be defined as project communities (Manzini, 2015). Public space also plays a crucial role in the social dynamics of this neighbourhood and is often the subject of local discussions and experiments. The urban fabric is rich in design potential, easily found in the numerous underused or degraded public spaces. Therefore, the territory of Nolo presents a strong potential from the point of view of the urban and social fabric. For these reasons, it has been chosen as an optimal territory for research and application experimentation.

The project proposed to investigate the effectiveness of the proximity neighbourhood model. It was decided to use participatory co-planning methodologies to obtain inclusive results and reflect the real needs of those living in the area. Moreover, the methodology applied makes it possible to trigger new interactions that can create new projects within a proximity area. At the end of the research, a temporary and experimental intervention strategy was elaborated to strengthen the model of proximity within the neighbourhood, filling the gaps in terms of services and suggesting new collaborations and projects. The research work was part of *Vocabolario di Quartiere*; a project carried out within Off Campus Nolo, the Living Lab of the Politecnico di Milano, which opened in September 2020 in the heart of the Nolo area, and which intends to continue the collaboration between the university and local realities in the area.

The *Off Campus*<sup>2</sup> program of Politecnico di Milano aims to strengthen the university’s presence within the city of Milan, promoting the idea of a university attentive to social challenges and close to territories and communities.

The initiative was launched in 2018 to open the first Off Campus space within the San Siro district. The project involves the creation of several living labs in different parts of the city of Milan. Born from the collaboration between the Politecnico and the Municipality of Milan, each Off Campus space puts design, research and planning at the service of social innovation, with the ultimate goal of regenerating and reactivating territories. Professors, researchers and students work in synergy with local communities and associations, developing innovative teaching with substantial effects on the environment. Off Campus Nolo is the second Off Campus space and is located at Mercato Crespi, the local Municipal Market in Viale Monza, and aims to continue the collaboration with the municipality and residents of the neighbourhood, acting as a catalyst for urban regeneration ideas and generating a positive impact on the community. Off Campus Nolo becomes a direct observatory on the problems of the area and encourages dialogue with citizens and institutions through codesign activities.

### **Situated sense-making: “Vocabolario di Quartiere”**

Within Off Campus Nolo, the *Vocabolario di Quartiere* project was born. Starting in November 2019, it began the creation of a vocabulary: a medium through which to investigate the meanings of certain words. Shared words have proved to be significant for the neighbourhood: hot topics around which to generate new conversations, which can identify divergences and convergences of meaning and action. The purpose of each word is constantly evolving; everyone’s intervention amplifies it, and, in this way, everyone can understand each other, even if they speak different languages and cultures. *Vocabolario di Quartiere* becomes a tool for understanding citizens’ perceptions, creating new dialogues, new social interactions to translate ideas and project ideas into concrete actions. “This results is a series of conversations bringing together the voices of citizens but also of experts, historians, designers, linguists, writers, artists, diverse voices from the world of culture to question the neighbourhood’s words from multiple perspectives” (Polimi DESIS Lab).<sup>3</sup>

The first draft of the *Vocabolario* is the result of a workshop held in collaboration with the editors of Radio Nolo. Ten terms were identified: public space, degradation, change, common good, sense of belonging, fun, memory, commitment, heritage and, of course, Nolo. The meanings of these ten terms were then put back into circulation during a second workshop held in February 2020 to expand their impact further. After a careful review, the research results were exhibited during the opening event of Off Campus Nolo in September 2020. Each of these words is intended to be researched by Off Campus Nolo. The various meanings will be explored and investigated in-depth with the neighbourhood’s inhabitants through participatory and codesign processes. Each word is equivalent to a period of study and research. In the end, a new episode of Radio Nolo’s podcast *In Poche Parole*<sup>4</sup> will be created and broadcast on the web-radio page and Spotify. The final objective is to use the shared meanings that words will bring out as starting points for development projects in the neighbourhood.



Figure 11.1 *Vocabolario di Quartiere*, selected words

### **“Public Space”: from conversations to practice by codesigning spatial solutions**

To validate the premises set in paragraph 1, the authors are here presenting the codesign activities<sup>5</sup> focused on the word “*Spazio Pubblico*”, understood as “*Public Space*” within the context of the *Vocabolario di Quartiere* – the Situated Vocabulary, developed between September 2020 and January 2021. The activities aimed to investigate the criticalities and potentials of public space from an internal perspective, closely related to the neighbourhood and its inhabitants. The research activities made it possible to discover new meanings and points of view on the territory and the word *Public Space* specifically related to the Nolo area.

The first research activities on the word were started in September 2020 within the Off Campus spaces. Due to the reintroduction in Italy of security measures for health emergencies, the whole process slowed down, and it was necessary to redesign and refine the activities for online usability. The first episode of the Radio Nolo podcast was launched in January 2021.

The first word we propose is “Space”. What does the word space mean for Nolo today? What is considered public space? Which private spaces become public and vice versa? Which new spaces have recently been created or should be made, in your opinion? How are they changing, or could they change the neighbourhood? These questions and many more start the conversation about what we consider to be the emerging idea of space in Nolo.

(Radio Nolo)<sup>6</sup>

Through the word *Spazio Pubblico*, it was attempted to understand the dynamics of the neighbourhood and its local specificities, assuming the point of view of the



daily experience of those who live there. The application of participatory methodologies, specifically facilitated by an experiment in the field of design fiction, allowed a dialogue to be established with some of the inhabitants of Nolo, creating relationships of trust and empathy. The research investigated the various meanings that the word Public Space takes on within this territory, identifying the practices of use that characterise the spaces, the interdependencies that develop within them, and the layers of friction and conflict that are inevitably established in such a complex reality. Intense, transformative energy emerged, which often translates into processes capable of triggering inclusiveness and social cohesion. The experimental and open approach adopted made it possible to define a shared meaning of the word and highlight the needs and potential of the public spaces in the neighbourhood, suggesting design actions that arise from people's desires and needs.

### **“Public Space”: offline and online interaction with local stakeholders**

#### *First codesign session*

The first activity took place in the physical space of the hub. A total of 21 people participated. The target group reached was relatively homogeneous and pre-selected by the space itself: customers of the Municipal Market, residents curious about the new reality of Off Campus Nolo and some architecture and urban planning students looking for information about the neighbourhood. Therefore, almost all the participants took part in the activity by chance, without having planned it and without knowing what to expect. Everyone was left to decide how much to contribute and how much time to devote to it. The activity process was straightforward: the person approached the space, an informal and informative conversation was started to explain the role of Off Campus Nolo and the *Vocabolario di Quartiere* project and, if interested, was invited to participate in the actual codesign session.

The activity was divided into two moments:

- Exploratory phase: a first approach to the activity. The participant is invited to recognise the spaces marked on a map with red flags. The person orients him/herself in the neighbourhood and guides the researcher: he/she reconstructs his/her places and usual routes, then recounts and remembers. The conversation then takes on a reflective character: the public space of the neighbourhood is questioned. The strengths and weaknesses of the area emerge, and an attempt is made to understand the reasons for certain behaviours and uses of space.
- Ideation phase: participants are asked to focus on the potential of the neighbourhood. White flags can be added to the map to indicate one or more places for possible intervention. The next step is to re-imagine the future of the chosen spaces. Some examples of projects already realised elsewhere and a set of cards of possible strategies and tools for action offer hints and stimuli to unlock creativity. At the end of this phase, the proposals can be written or drawn on some available cards, which will then be displayed, becoming inspiration and invitation for the following participants.

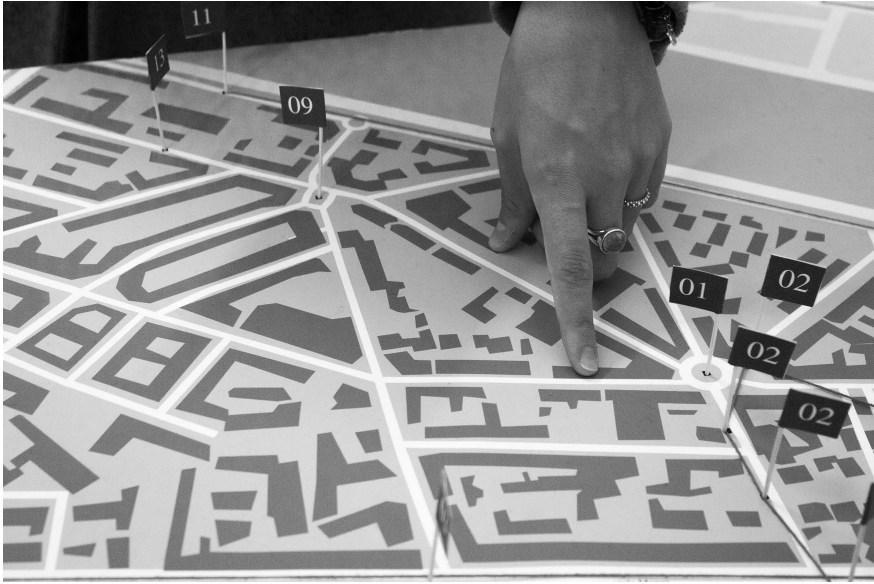


Figure 11.2 Codesign activity, exploration phase

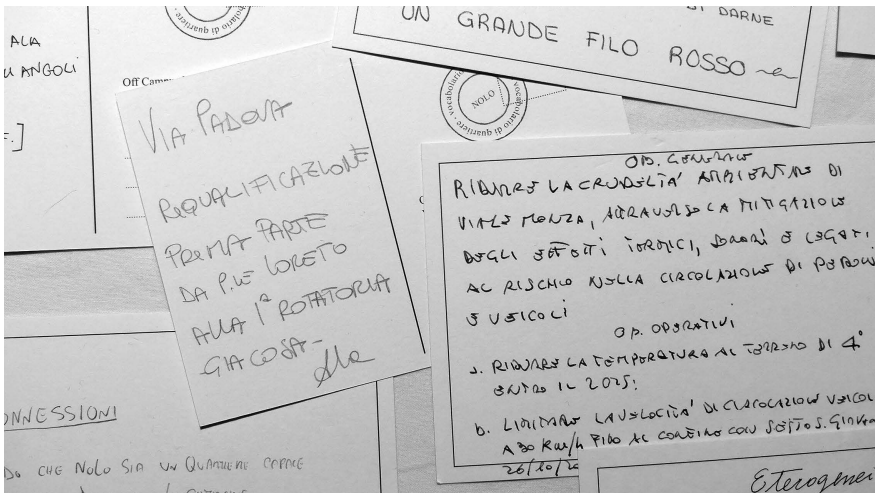


Figure 11.3 Codesign activity, ideation phase

At the end of this first week of the codesign session, Off Campus Nolo had to be closed to the public due to new COVID-19 restrictions. It was decided to continue the work and redesign the activity so that it would be usable online.

Table 11.1 First codesign activity – summary

Time of “Public Space” focus	3 weeks
Time of the single codesign activities	10–30 mins
People involved	21
Collected postcards with ideas	17
Target	Market customers, local people, students
Tools	Nolo map, images of significant spaces in Nolo, red and white flags, action suggestion cards, case studies, blank postcards

### *Second codesign session*

Analysing the results obtained from the first activity, setting up the second one in a more targeted way was decided. The foreign community of Nolo was excluded entirely from the first phase, as they do not usually attend the Municipal Market: including them to understand new points of view became the first objective of this second phase. It was also noticed that the participants had difficulties imagining and realising new solutions for the public space during the design phase. Therefore, it was decided to experiment with the design fiction approach to obtain a result more oriented towards the future possibilities of the neighbourhood.

- Entry point: a step that played a fundamental role in the process was the identification of key actors in the area, people who, thanks to their network, could help us find participants for codesign activities. Maria Grazia, Cristiana and Alessandro (coordinators of several local associations, including *Amici del Parco Trotter*, *La città del Sole*, the Italian language school for foreigners, who are very active in the area and the social regeneration practices of the neighbourhood) are privileged witnesses of neighbourhood life; thanks to them it was possible to get in touch with the students of the Italian language school of Parco Trotter. However, this was not their only contribution; all three were the focus of some interviews. The conversations took place in a relatively informal way. Through active listening and open-ended questions, it was possible to understand the neighbourhood’s complete picture better and understand specific dynamics. This phase was instrumental in identifying critical issues in the community and targeting the following codesign sessions in search of particular solutions.

Four people formed the first group for the online codesign activity, all of different ages and nationalities: Yara, a girl of Egyptian origin who grew up in Italy; Josselyn, from Perù; Andrey, from Ukraine; and Ahmed, from Morocco. In this case, two meetings were organised.

- Exploratory phase: the first meeting had an ice-breaking role. The objective was to introduce the *Vocabolario di Quartiere* to start a first discussion about the word *Public Space* and the general criticalities of the neighbourhood. This first phase proved very important to understand how to handle any language

Table 11.2 Second codesign activity, exploratory phase – summary

Time of “Public Space” focus	3 weeks
Time of the single codesign activities	60 mins
People involved	4
Number of sessions	1
Target	Students of Italian language class from other nationalities
Tools	Google Meet, Miro

difficulties and online usability. Again, specially designed support elements were used to guide and facilitate the conversation.

The results obtained in this preparatory phase were considered during the planning of the actual codesign activity, which involved experimenting with design fiction techniques. One of the principles of design fiction (Dunne & Raby, 2012) is based on projecting selected issues into the future to find solutions for the present reality. At the end of the activities, it was found that design fiction made it possible to deal with complex issues by creating a neutral ground for discussion, away from friction and internal conflict, where ideas can be objective and detached from reality (Scrignar, 2021). Fiction also has the power to make the activity playful and more engaging, adding a level of light-heartedness that allows creativity to be released lightly. The design of the training involved the creation of fiction scenarios for the Nolo of the future. The main critical issues that emerged during the previous activities became real challenges that the participants were invited to solve. Therefore, the aim was to identify a set of possible actions, creating an inventory of solutions for the scenario adaptable to the present reality. “Narratives have a transformative power: stories offer examples of how we can deal with and manage conflicts in everyday life and generate processes of change” (Tassinari et al., 2017). Three scenarios were carried out, and therefore it was decided to select

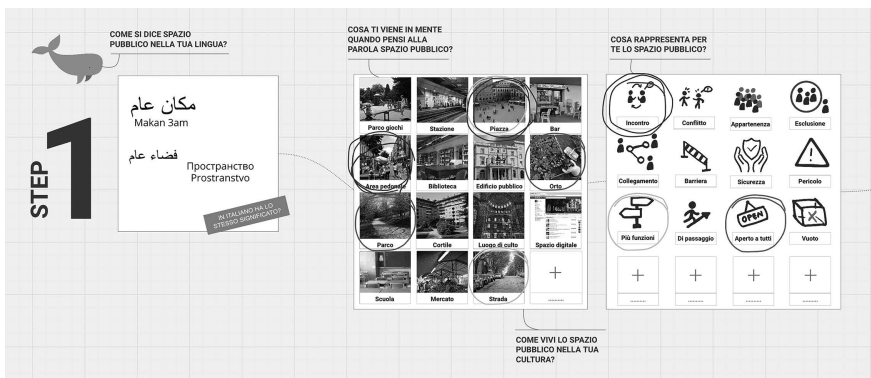


Figure 11.4 Online codesign activity, exploratory phase on Miro

three working groups. The first was composed of the same people involved in the previous preliminary activity; the other two groups were formed with people of different ages and socio-cultural backgrounds. Carlo and Lucia, from a local photography group, and Benedetta, Orsola, Cristina, Davide and Gabriella collaborated with Radio Nolo. In this second phase, they met through the *Nolo Social District* Facebook group<sup>77</sup> and participated in the activities. The meetings took place from 13 December 2020 to 3 January 2021.

- Ideation phase: each working group had the opportunity to choose a scenario to work on. Each scenario presented a different criticality (social division, over-sharing of space and digitalisation of human relations). The same primary challenge was addressed in all of them: increasing collaboration and social cohesion within Nolo. To create a fully immersive activity, it was necessary to structure the scenarios in their complexity and use storytelling elements to make the narrative credible. An introductory video presented the mission, and each participant could empathise with the protagonist discovering the future scenario. Two main characters raised the new world through future artefacts and visualisations. The second character, more critical than the first, presented the challenge. The participants then proposed solutions for the challenge in the scenario and, in a second discussion, were asked to actualise these solutions in today's Nolo.

Since part of the life of the neighbourhood takes place on the *Social Street* Facebook group, in parallel to the codesign activities described earlier, the platform was used to broaden the audience of the discussion. A post with a series of questions



Figure 11.5 Online codesign activity, ideation phase (design fiction session)

Table 11.3 Second codesign activity, design fiction online session – summary

Time of “Public Space” focus	3 weeks
Time of the single codesign activities	60 mins
People involved	12
Number of sessions	3
Target	Students of Italian language class from other nationalities, Radio Nolo volunteers, local people
Tools	Google Meet, Miro, introduction video, storyboard, characters, postcards from the future, scenario map

about the relationship between the word *Public Space* and the neighbourhood was published on the group, receiving a total of 38 comments.

### From codesign to results analysis

The information, concepts, ideas, needs and project ideas that emerged during the process were carefully collected and combined in words and images to outline a better future for the spaces in the neighbourhood. The shared definition of the term *Public Space* has been expanded. The ideas collected have been returned to the community in the first episode of Radio Nolo’s podcast *In Poche Parole* and through posts on the Off Campus Polimi Instagram page (@offcampuspolimi). These results are not simply the final synthesis of a process but represent the starting point for a new project phase.

*Vocabolario di Quartiere* transforms words, in this case, *Public Space*, into concrete actions for Nolo. During the months of work on the word, numerous opinions and ideas emerged: informal conversations, general considerations about the area or specific needs and actions. All the information were combined and then given back to the citizens. The ideas are still presented in an abstract form but turn out to be exciting draft insights that can be implemented in the neighbourhood and achieve concrete changes.

The research acquired a wide range of territorial skills and developed a new sensitivity. A thorough understanding of a neighbourhood or a proximity area means, above all, investigating the specificities and interdependencies of people and social actors who live there. The participatory approach has made it possible to identify with the inhabitants’ opportunities for new transformative actions: ingredients that can thus be combined in a project for regeneration and activation of public spaces.

The possibilities for improving public spaces in Nolo were numerous and offered fertile and responsive ground for possible future projects. The next step was to develop a design strategy for the area, hypothesising experimental interventions in the public spaces that emerged during the research and activity phases to establish a proximity neighbourhood model. The intent of this strategy was collaboration and social cohesion to trigger synergies and convergence that could become a concrete solution for the problems and needs of a specific local dimension, implementing practical local proximity.

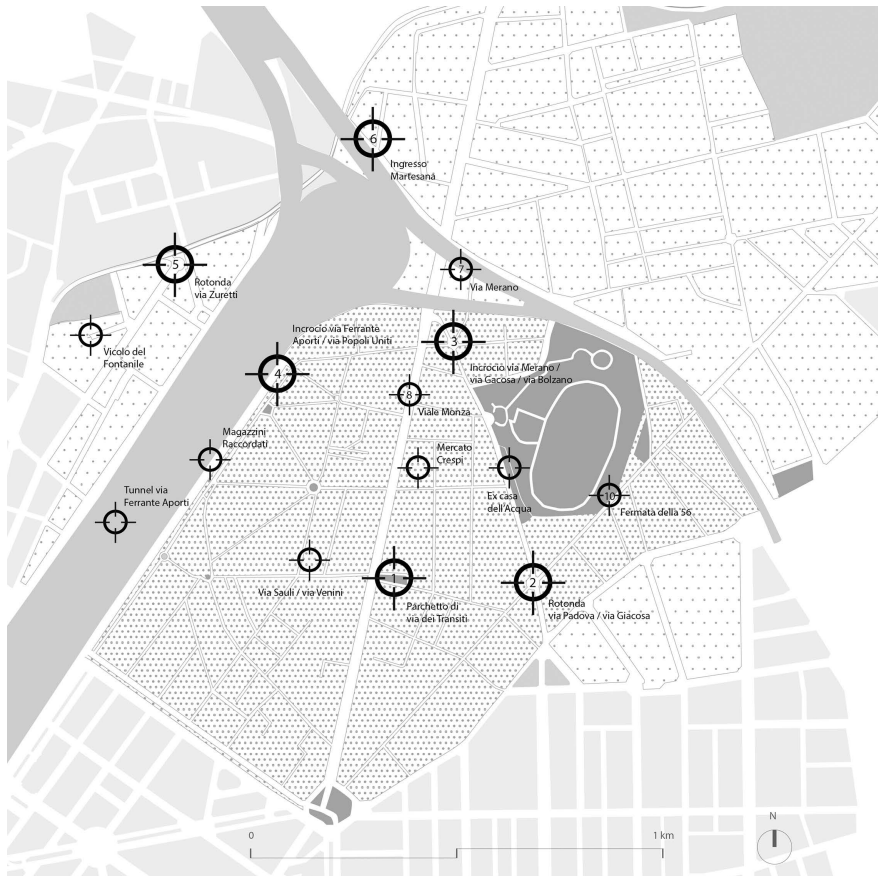


Figure 11.6 Map of potential actions to develop a new proximity model in Nolo neighbourhood

## Notes

- 1 Online Conference: 18 Nov. 2020, *Abitare la Prossimità. La città dei 15 minuti: cos'è, cosa significa abitarci, come si progetta e come si realizza. Un confronto di esperienze (prima e dopo il COVID-19)* held by Urbanpromo, FHS – Fondazione Housing Sociale, in collaboration with DESIS network <https://urbanpromo.it/2020/eventi/abitare-la-prossimita/>
- 2 <https://www.polimi.it/campus-e-servizi/spazi-e-aule-studio/spazi/off-campus>
- 3 *Vocabolario di Quartiere, Neighbourhood Vocabulary*, Infinite Creativity for an Infinite World: [www.infinitecreativityfiniteworld.com/en/works/vocabolario-di-quartiere/](http://www.infinitecreativityfiniteworld.com/en/works/vocabolario-di-quartiere/)
- 4 *In Poche Parole*, Radio Nolo: <https://radionolo.it/palinsesto/in-poche-parole/>
- 5 The project team consisted of postgraduate students, researchers and professors, including the authors: Virginia Tassinari, Ambra Borin, Francesco Vergani and Elisa Scrignar (Politecnico di Milano).
- 6 *In Poche Parole*, Radio Nolo: <https://radionolo.it/podcast/poche-parole-1-spazio-pubblico-1-febbraio-2021/>

- 7 The *Nolo Social District* is a very active Facebook group with more than 11,000 members (out of 24,000 inhabitants of the neighbourhood) in which people every day exchange advice or objects, and in which spontaneous community projects are often set up: [www.facebook.com/groups/NoLoDistrict/](http://www.facebook.com/groups/NoLoDistrict/)

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## 12 A case study of design-driven social entrepreneurship

### Service design startup to teach digital technology to older adults during the COVID-19 pandemic

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#### Introduction

Design has gained key significance during the COVID-19 pandemic, as digital interfaces have become the primary means of connecting people as they adhere to social distancing guidelines. However, populations such as older adults had difficulty adapting to these rapid changes. Because the pandemic required a sudden shift to a socially distanced and technology-dependent lifestyle, technological literacy became the critical factor determining many people's sense of "normalcy" versus loneliness. The frustration of many older adults unmasked a societal problem: our society lacks an educational system to support the older generation's technology adoption. The urgent need demonstrated by the pandemic raises questions about how younger generations can offer sustainable, accessible, and empowering technology education for their seniors. At the same time, the pandemic imposed extreme limitations on older adults regarding face-to-face educational options, as they were among the populations most vulnerable to COVID-19. How can we initiate and sustain remote education for older adults so that they can engage with a digitally connected world?

To address the challenges of proximity in reaching out to isolated older adults during the pandemic and highlight the opportunities for digital technology education, a team of new college graduates explored how design-driven entrepreneurship can fill the need for social enterprise. In the era of COVID-19 and a technology-oriented cultural shift caused by social distancing, many businesses had to make significant changes to remain profitable. Scholars argue that design is essential for connecting with the desired audience through a human-centred perspective (Forty & Cameron, 1986; Phillips, 2004) and can help initiate transformative problem solving that adds value to businesses (Phillips, 2004; Lockwood, 2010). In addition, we propose that entrepreneurship be considered a type of design. The recent emphasis on a holistic approach in design, exemplified by service design and customer experience, underlines designers' ability to make connections and develop end-to-end business solutions. This is especially evident in social entrepreneurship in times of

crisis, where attention to the people who use the service is critical to developing a flexible business model that can sustain the service.

How does design enable people to overcome distances such as physical remoteness, generational gaps, and differences in domain during dire times when community connections are essential? This chapter explores the challenges and opportunities of proximity by presenting the case study of a design-driven startup where human-centred design principles and methods support a unique need of older adults in learning digital technology that arose due to the COVID-19 pandemic.

### **Older adults and technology**

Since 1981, when the first IBM Personal Computer was released, the emergence of new technologies integrated into public use snowballed exponentially (Ryan, 2010). However, with the progression of time and the evolution of technology, entire generations are falling behind, lost in translation somewhere between the analogue lifestyle they grew up knowing and the dynamically evolving digital landscape (Plowman et al., 2010). Although overall technology adoption rates continue to increase, older adults still face unique barriers to sustained technology use. Research shows that 34% of older internet users do not have confidence in performing tasks using digital devices, and 48% of older adults state that they need help in setting up and learning to use a new electronic device (Anderson & Perrin, 2017). This technology divide has further been accelerated by the pandemic (Ramsetty & Adams, 2020).

Older adults often have difficulty keeping up to date with new technology due to a lack of an educational system (DiMaggio et al., 2001; Hanson, 2009, 2010). Barriers to technological literacy include unknown economic consequences, fear of fraud, and distrust of security (Hill et al., 2015). Along with improving usefulness and usability, these emotional and experiential issues need to be addressed for older adults to adopt the new technology in their lives (Mittelstadt et al., 2011). Studies show that human relationships, such as one-on-one help or personalized communication, enhance the trust that is essential for older adults to overcome these barriers and help initiate the trial-and-error process to explore how to position the technology in the context of their everyday needs (Fisk et al., 2020; Zeng et al., 2009). Anderson and Perrin's (2017) report shows that older adults make new technology a standard part of their daily routine once they get used to it. About 33% of older internet users go online at least daily, including 51% who use the internet frequently and 8% who do constantly. It is reported that 76% of older smartphone users visit the internet every day.

Nowadays, many technologies are created for older adults, but few are designed to reflect their autonomous use (Schulz et al., 2015). This perspective also reflects McCarthy and Wright's (2004) argument that technology is only part of the holistic experience of sense-making. Therefore, in addition to developing novel technologies in the areas most current gerontology and persuasive technology have been focusing on, there is a need to create services that naturally introduce commonly used technologies, such as social media and online meetings, to the ordinary everyday experience of older adults (Selwyn et al., 2003). Lee and Coughlin (2015)

further explain how differences in age and life experience contribute to the discrepancy between what designers and developers assume and what older adults need. Services and products tend to solve physical assistance and safety issues, whereas older adults value independence, privacy, and social interactions. They argue that there needs to be a broad study of human factors accounted for by everyday services to help older adults enhance technological literacy.

In other words, it is essential to understand these human aspects from the beginning of developing a service for a specialized population like older adults, which highlights the need for a design approach from the strategic phase of business development. Moreover, researching and considering human experience has become increasingly important as new technology continues to emerge and the digitally geared era of COVID-19 presents unprecedented needs. The pertinent question remains how entrepreneurship can be led by design approaches such as service design, user experience, and design research methods to make technology learning reflect these human factors. Klari is a service that takes on this challenge and offers personalized, affordable, one-on-one learning sessions for understanding older adults' everyday technology use by pairing its customers, or "learners," with members of their coaching staff who have all undergone training with an empathy-driven and collaborative approach.

## **Developing Klari**

### *Conceptualization*

Klari's original concept started as a web application used as the medium to connect two parties – older adults who needed technology support and those who wanted to provide that support. The user group can be further broken down into individuals with set-up assistance needs, individuals with technology learning needs, and caregivers. As applications or services specifically for technology learning are not on the market yet, the conceptualization process started by researching the existing market of applications with platforms that functioned similarly or had Klari's desired features, including peer-to-peer applications such as Rover, on-demand and remote assistance applications such as Be My Eyes, and services such as Medisafe that had tools for caregivers. However, these existing services lack support for a consistent help system or sustainable technology education for older adults beyond quick troubleshooting. Klari was designed to address this gap by providing in-person and remote on-demand assistance for resolving complex technical issues.

### *Research*

The next step was to conduct ethnographic research to understand existing problems and whether the service concept would be usable by the intended audience. The team started by conducting user interviews with a total of 16 participants. There were 12 female and four male participants aged between 55 and 87 years old, with a mean age of 78 years. Primarily based in towns in Vermont and New Hampshire, all

participants completed their bachelor’s degree, with some completing a master’s or higher. Fourteen out of the 16 participants were retired. Each participant answered 20 open-ended questions about their daily technology use and overall relationship with technology via a phone call or Zoom. Extensive notes were taken during each interview, and all interviews were recorded for reference. During this portion of the research, we wanted to develop a deeper understanding of our users and the problems we were trying to solve. Our research objectives included:

- Uncovering the pre-existing resources and defining what those resources do and don’t offer.
- Identifying main contributing factors to the technological literacy gap.
- Identifying features and tools necessary for a successful technology learning experience.

After initial user interviews, we categorized the information collected into behavioural patterns and emotional trends displayed by the participants. We began this process by reviewing the data and then creating initial codes from the summary of the key points. We then categorized the codes and mapped them into different themes (Figure 12.1). The patterns helped us identify goals and build a framework for individual learning sessions and the overall service.

During the user interviews, 88% of participants expressed difficulty remembering tasks after being taught and mentioned that they often have to review a solution once, twice, or three times after it was explained. “I have to go back [for help]. I don’t always understand the second time either and have to go back for a third,” explained one participant. Despite the hurdle of remembering, 100% of participants expressed a strong desire to learn how to do everyday tasks themselves and gain a sense of autonomy. There was a strong need to understand the solution to a question versus having their questions fixed by someone else: “I’d like to learn how to do it myself. I take many photos of my grandchildren and would like to know how to manage those on my own.”

A common theme from the analysis was the teacher’s communication skills for effective technology learning. The teacher’s communication ability was just as important as their knowledge for participants. “They have to assume, without being insulting, that the person knows nothing. They have to talk slowly and check for

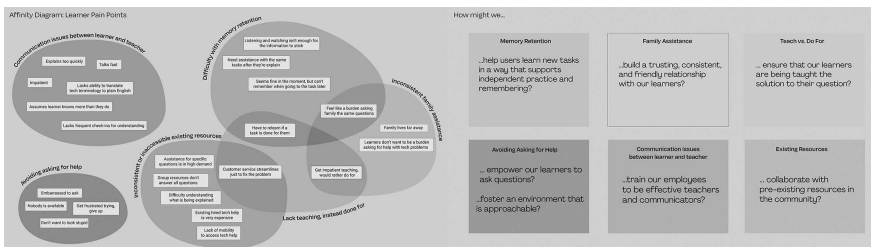


Figure 12.1 Research outcome: key themes and issues identified

understanding. Their job is to believe people can learn,” explained another participant, who had spent most of their career working in education.

Existing technology learning resources are offered by the surrounding community and used by participants. Still, many found that these resources were inconsistently available, succeeded to varying degrees, or aimed to solve the problem for them instead of teaching them. Alongside these day-to-day boundaries, many services offering technology learning help within communities have faced the new challenge of navigating social distancing regulations while supporting their learners during the pandemic. Some learners paid for premium services but expressed difficulty financially sustaining them with their fixed income. Expensive support for seemingly straightforward questions further added inaccessibility to consistent technology learning.

Participants described technology assistance from family as unreliable for ongoing help or that it led to becoming easily frustrated. Some participants spoke about not wanting to burden their busy family members with problems that seem unnecessary: “My son thinks that I should already know, or he has already told me how to do something, and I have forgotten.”

The themes from interviews also displayed overlap. For example, difficulty with memory retention and inconsistent family assistance overlap when learners would reach out to family members for technology learning support but could not recall what they learned and felt like a burden or ashamed.

### ***Development***

The interview findings drove Klari’s scope to expand from a web application to a full service. This evolution was caused by a displayed need for technology learning rather than assistance and the complexities involved in teaching someone rather than doing a task for them. The themes illuminated by interviews outlined a set of service goals. During the design of Klari’s service prototype, it was essential to consider more significant pain points, such as memory retention, inconsistent family technology learning support, or inaccessible outside technology-learning support, and construct solutions to fill these gaps.

Overall, the Klari model (Figure 12.2) was built to ensure accessible and reliable technology learning help by tracking clients’ progress and holding meetings over Zoom. For the much greater boundary of necessary social distancing, we designed Klari’s solutions to be entirely remote. Immediately after expressing interest, Klari contacts the potential client via telephone for a human-to-human discussion with a coach to collect necessary information and learn more about what kind of technology learning the learner is looking for. In the initial prototype, after each learning session, the coach would fill out a form explaining the topics discussed during the session, any additional questions, and anything that remained unsolved. Klari’s guide creators then received the form; a guide specific to the learner was created and sent back to the learner for independent practice.

To account for all critical takeaways from interviews, Klari approached closing the technological literacy gap through a service that can support learners at any

technology use level. Klari's service blueprint (Figure 12.3) included the creation of follow-up written and visual materials called “guides” for memory retention. Klari's services provided effective coaching through training on collaboration and empathy-driven teaching.

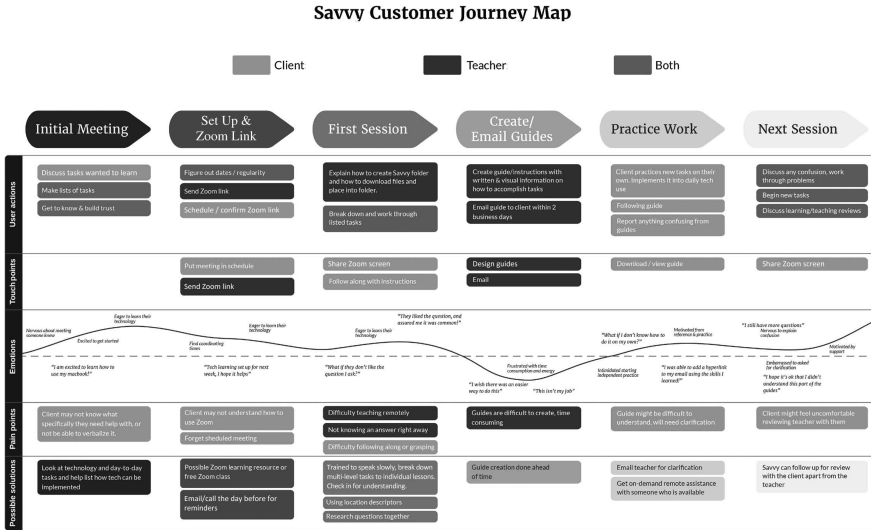


Figure 12.2 Customer journey map

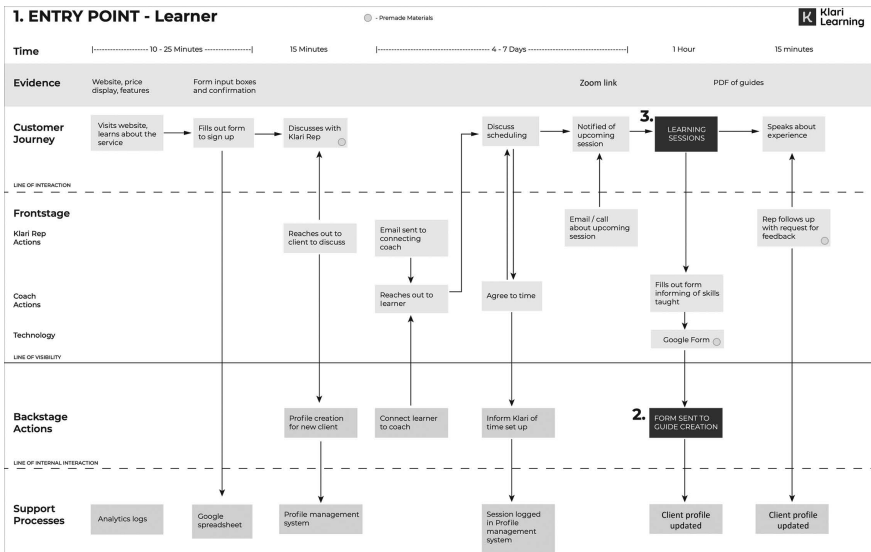


Figure 12.3 Service blueprint: new learner entry point

### Prototype testing

After the service prototype was blueprinted, it was tested to identify pain points. Prototype testing was held over a two-month timespan with six users trying the service three times. Each user was then asked another set of questions about the service for feedback. The feedback from testing amplified unforeseen issues in the design of Klari's service. After these problems were brought to light, an updated version of the service was created. Simultaneously, the redesigned brand voice and elements were finalized and implemented on Klari's website and follow-up guides (Figure 12.4).

Klari's service prototype testing lasted for two months, tested with six participants and three coaches. Testing included all facets of the business, including onboarding clients, training coaches, and learning sessions. Many of the findings from testing revolved around the guides sent for follow-up practice and memory retention. The initial system for creating the guides was inefficient and difficult to scale up. Because guides were being made for every task that a client learns, they took some time to create and send back to the client. We also found that learners preferred to independently practice their daily technology use, knowing that they had a guide as a backup. Usually, they could figure out the solution without a guide, especially with the more specific tasks. Moreover, some learners expressed feeling overwhelmed trying to think of a question to help them approach a topic as expansive as technology use.

Another unanticipated pain point and an aspect of the service that went unaccounted for during the user research was the client's privacy and safety. Because

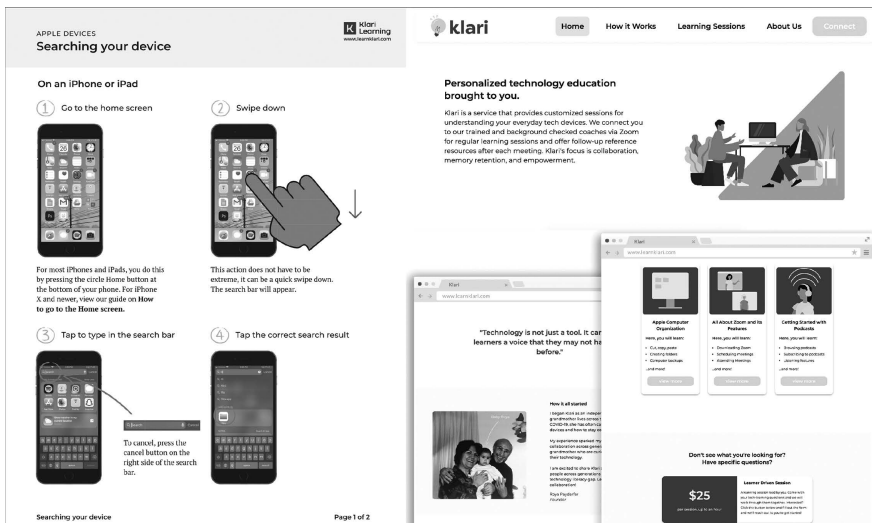


Figure 12.4 Klari guide and website

learning sessions are held over Zoom, users’ physical safety is not a cause for concern; however, their digital security vulnerability became apparent after initial testing. During learning sessions, it is custom for clients to share their computer screens so that coaches could better direct them, potentially exposing sensitive material like emails, desktop files, and usernames. Unfortunately, working on a computer and the internet will always expose users to cyber-attacks. We wanted to ensure no other vulnerabilities while our clients worked with Klari. The pain points exposed from testing were assessed to find solutions for the next version of the service blueprint (Figure 12.5).

**Community outreach**

After user testing and the design of Klari’s website and guides were complete, other aspects of the Klari business were rolled out for marketing, such as social media presence. Klari’s team also fostered a community outside of the technology learning service through other means of connection, such as newsletters and webinars. Klari’s webinar, called Klari TechTalks, is hosted for free and is intended to be an opportunity for Klari’s founders and coaches to build a relationship with the community by giving free presentations on different technology topics and opportunities for discussion afterward. In December 2020, we concluded a successful Klari webinar event with 50 attendees. With many people at home and in isolation, Klari’s team hoped to build a community by accessible sharing of valuable information.

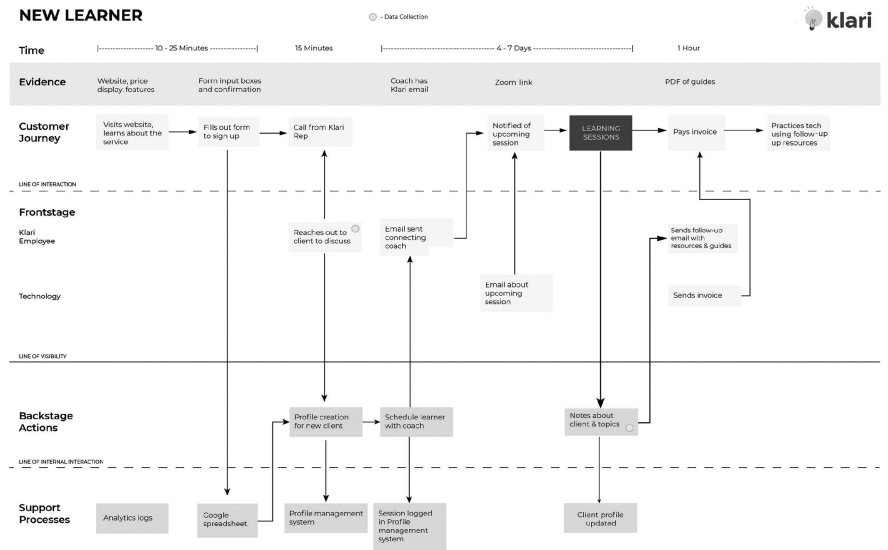


Figure 12.5 Updated service blueprint for new learners



## **Discussion**

### ***Proximity between domains: design-driven business success***

Within six months of its launch, Klari has grown into a small business utilized primarily by small communities in Vermont and New Hampshire. The benefits of a design-based approach to our startup included: ensuring the end users' needs are met, building a connection with the audience at the first point of interaction, and identifying and iterating friction points early on.

Much of Klari came to fruition in about six months, a timeline that would have been much longer without the systematic design process and user research. By initially assessing the pillars of need for our end users, we could bypass the prototype's trial and error phase and jump right into building a prototype based on a set of goals defined by users. The team also maintained a healthy level of collaboration with the user base throughout the design phases. It turned to the end-users at any point of concern or confusion. This collaboration further accelerated Klari's business success by creating a sense of community and trust.

Many customers expressed that they had resolved their technology learning questions and felt comfortable and accepted in their learning environment, which was essential to helping older adults overcome their initial fear of shame and resistance to new technologies. Klari's consistent design elements were compelling assets for this aspect of the business strategy. Because Klari's brand is the first point of interaction for establishing trust with its customers, it was critical to use visual and written language that was friendly, unassuming, unintimidating, and compassionate. Klari's design approach enabled us to apply this voice thoroughly from the beginning to the end of the learner experience.

### ***Proximity at a distance: synchronous and asynchronous components of the service***

Klari's approach of combining low-tech and high-tech methods and combining synchronous education via phone and Zoom with an asynchronous component helped overcome the limitations of social distancing by successfully lowering the barrier to entry for those unfamiliar with digital technology. Our service design approach, systematic design methods, and user research enabled us to identify the resources and needs of our learners. They also provided insights for key touchpoints and materials necessary to support the gradual transition from offline education via phone and paper-based media to infrastructure setup such as Zoom installation, and finally to more technologically advanced education, which was offered synchronously through Zoom and asynchronously through guides and lessons. In this process, providing personalized support and allowing older adults to cultivate relationships with the coaches helped nurture a sense of trust, which was essential for motivating older adults to continue their education, overcome feelings of shame, and face the challenges of new areas of digital technology.

Despite the success thus far, the lack of physical proximity did hinder some company-client relationship growth. The demographic that Klari serves is used

to face-to-face communication and support. Although Klari has found success with alternative solutions, the relationships established through remote learning are not as robust as those shown through in-person interaction. Moreover, it was particularly true for learners who face learning challenges that make distanced learning difficult, such as hearing loss. Our interviews also suggest that other learners who do not currently use Klari might be hesitant to accept support over the phone because of the frustrations caused by learning without a coach next to them, such as the challenge of explaining what they see on the screen. Post-social distancing, there is a need to adopt a hybrid approach to support learners who wish to maintain distance learning while also providing in-person support. This will be an area for further growth of Klari.

It was challenging to encourage learners to adopt the asynchronous components, such as guides and Klari-made lessons. After the first beta test, the Klari-made lessons were introduced to support clients who had questions about specific topics but did not know where to begin. We created baseline curricula that covered commonly used applications or devices. These lessons were built to support the clients with broader technology learning needs and come fully packaged as a curriculum with an accompanying booklet. During user research, written materials for memory retention were a common request; however, customers used guides merely to build confidence, not reinforce learning by practising independently. While this is not an inappropriate use, it raised efficiency questions. Klari needed to offer the support learners required without investing time and money in resources that are only moderately useful.

The most efficient uses of Klari's guides were by learners interested in common and generic tech-use learning, such as getting started with Zoom. Therefore, we adjusted the service design to offer the guides for specific technology learning questions instead of generic guides for situations like getting started with a particular device. After receiving the specific question, Klari sends a follow-up email summarizing the learning session with relevant websites and videos that go over the instructions. Emailing a follow-up with pre-existing resources offered the fall-back support that more technically knowledgeable clients needed without the initial expense for Klari. Although the revised version worked better, this experience reveals that senior learners more welcome synchronous education; Klari needs to recruit more coaches and provide flexibility for personalized education in its future expansions.

### ***Proximity across generational gaps: the value of local communities***

Although Klari's core mission is to offer accessible technology learning, much of Klari's focus was fostering a trusting community. Approaching Klari as a human-centred service design project allowed the young digital natives who founded and ran this organization to understand the needs of older users who are frustrated by their day-to-day experiences with technology. Moreover, many learners were interested in supporting the business because of its mission to enrich the local community. The pandemic illuminated the amount of support an average

consumer can provide to local small businesses and economies. Many customers expressed that they perceived additional value in paying for Klari's service because its founders are young members of the same local communities where our initial clients are based. Klari contributed to creating a relationship with the community by offering free Zoom events and webinars. In the future growth of Klari to a national scale, it will be crucial to maintain standardized quality while preserving this community value by creating local connections between the coaches and learners.

Like all ventures, Klari will continue to face challenges as it scales up. Through impact measurement methods such as surveys and interviews, the iterations of the Klari model will continue pushing through growth challenges while prioritizing the users' needs. Klari's immediate next steps are to fulfil marketing needs and expand the scope of the service. As the client base grows, further iterations will be developed to maintain service quality at an accessible price. One future goal for Klari is to continue to offer its services at a free or low cost. Another goal will be to explore how design methods can contribute to the systematic expansion of the service as it grows to the national level and begins to work with broader stakeholders.

## Conclusion

In this chapter, we introduced Klari, a social entrepreneurship startup created and led by designers. This project provides insights into how design serves as a way to overcome distances such as physical remoteness, generational gap, and distinct domains. This project contributes to the field of design by providing a case study of the design-lead startup development process, utilizing design research methods to overcome the challenges posed by the COVID-19 pandemic. This project also provides principles for designing educational services for senior populations through user research and multiple rounds of feedback from real clients. We hope this study can help underline the need for and the role of design in developing social services for isolated populations.

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# 13 Integrating care practice into product design education

## Insights into caring behaviour, design and circular economy

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### Introduction

In a consumer society, people tend to have little concern for the care, maintenance and end-of-use phase of the products they use, which has produced a “careless” society (Gwilt et al., 2015). As the circular economy (CE) is experiencing a period of growth and a transitional stage in its development, a new design approach is needed, one that involves practical working methods and design education tools to enable the implementation of care practice. However, to date there has been little research on the integration of care practice to design for sustainable behaviour in product design education.

Engster (2007, p. 28) defined care as a practice that includes “everything we do to help individuals to meet their vital biological needs, develop or maintain their basic capabilities, and avoid or alleviate unnecessary or unwanted pain and suffering, so that they can survive, develop, and function in society”. Tronto (Tronto & Fisher, 1990) interprets care as “a species activity that includes everything that we do to maintain, continue, and repair our ‘world’ so that we can live in it as well as possible. That world includes our bodies, ourselves, and our environment”. Accordingly, the practice of care in design aims to promote sustainable behaviour in users. The aim of incorporating care in design for sustainable behaviour is not just about “knowing how to help extend and preserve the life and use of particular objects and spaces” (Gwilt et al., 2015), but also about how the caring process influences the way the user views an object’s value at its end-of-use stage and aims to encourage users to preserve the product’s current condition in order to create other positive opportunities by adopting a closed-loop cycle approach (Choi, 2020). In this sense, care practice towards objects includes maintaining and repairing them, but also taking them at the end of use to somewhere that offers them a useful future – somewhere they can be shared – or returning them to be remanufactured, which resonates with the CE vision. Table 13.1 offers a classification of care practice in relation to the behaviour required for the transition to the CE.

The Carative Factors Inspirational Toolkit (CFIT) was developed to provide a better understanding of users’ relationship with objects, their effective use and thoughtful and responsible disposal, in order to create products, services and an environment that will influence users’ attitudes to object ownership and encourage

Table 13.1 Classification of care practices

<i>Care practices</i>	<i>CE behaviour</i>
Maintenance	Maintain/Prolong
Repair	Repair
Sending products to a better place	Share
	Return to service provider for reuse
	Return to product manufacturer for remanufacture
	Return to parts manufacturer for recycling

caring behaviour. The word “carative” originates from nursing practice and in caring science is defined as “love and charity” and the motive for all caring. Caring behaviour is as much about maintaining or mending subjects (that is, patients) as it is about ways to “let things go peacefully” (Watson, 1985, p. 7). The factors were identified through the process of translating carative factors from nursing practice to a design context using metaphor and set in a user-object context with phrases applicable to the process of design (Choi, 2020). This chapter aims to explore the insights relating to the adoption of care practice in product design through the use of a toolkit, the CFIT, and to lay the foundations for integrating sustainable behaviour and the CE into design education through selected design projects in which students used the CFIT to generate concepts and develop design outcomes.

## Methodology

A case study approach was adopted to explore the use of the CFIT in students’ self-generated design briefs to understand how they approached users’ problematic behaviour and used the Toolkit in responding to their own design briefs. The CFIT was introduced during the idea-generation phase to encourage students to adopt care-giving behaviour in their design thinking. The CFIT consists of four Motives of Caring themes: responsibility, commitment, benevolence (Blustein, 1991, pp. 121–130; Shaw et al., 2016) and Tronto’s (1993) caring factor, or empathy. Thirty-seven underlying motivational factors for four themes are categorised in an informational card format to inform the design process. Each identified factor contains a relevant quote, a question for inspiration, and examples of how the carative factors, as applied in design, that were identified during the research directly impact the creation of original carative factors for influencing caring behaviour. Figure 13.1 shows some of the examples of the carative factors within the theme of empathy. Three different user types are also included in the toolkit to help students visualise users with different behaviours and attitudes: “Attentive Users”, “Cautious Participants” and “Minimally Conscious Consumers”. The aim of the toolkit is to allow students to explore ideas through provocative and inspirational questions, to enable different ways to approach design challenges and to drive creative solutions. Students were asked to think about quick solutions to their own design challenge in response to one of the chosen user types by working through factors in the toolkit.

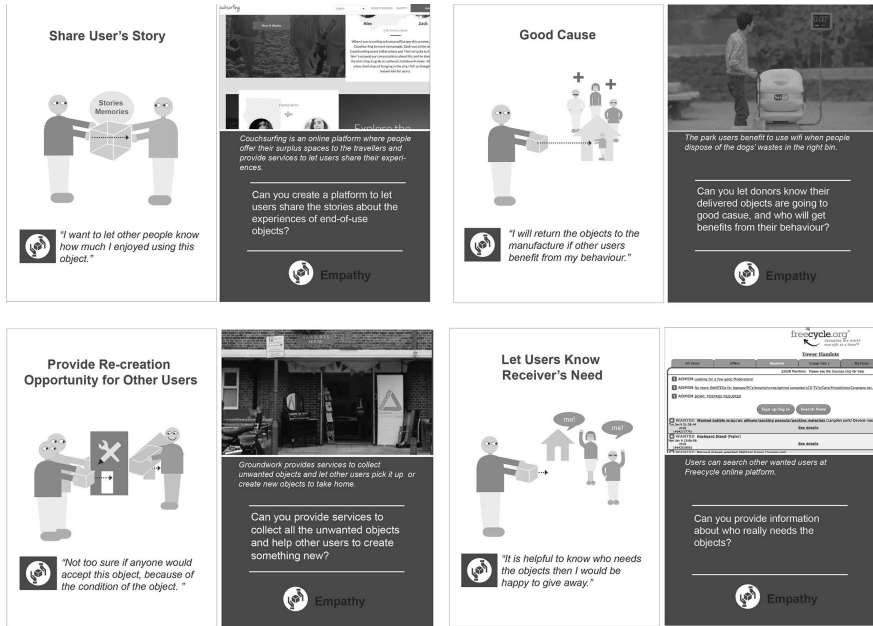


Figure 13.1 Examples of the carative factors and the front and back of each card

Semi-structured interviews were carried out to derive insights from the students' experience of adopting care practice in their projects and to inform the development of the curriculum in product design education. The students provided a wealth of insights, and each was discussed according to its relevance to each project. Thematic coding analysis was used for the collected data (Robson, 1993). Respondents' answers with similar meanings and connotations were grouped into clusters. Each cluster was coded according to a relevant theme. Using this process, the clusters were organised into categories to define the insights that related to care practice. Five insights relating to the integration of care practice were developed.

1. Design process
2. Feedback cycle
3. Systems thinking
4. Designer's role
5. Limitation

## Case studies

### Case study 1

The first student created a design brief to deal with the problem of unwanted clothing waste, addressing how design could help owners enable the shared use

of clothes that they no longer needed and improve the value of unwanted clothing. In this study, care practice has been associated with ways of increasing the value of objects by taking them somewhere that offers opportunities for reuse. By applying the toolkit during the idea-generation process, students explored ideas about products, services and an environment that would influence Attentive Users to share products at their end-of-use phase with multiple owners, by upcycling and returning the products for reuse in order to promote a circular system. The concepts explored include a touring workshop van that moves around an area and teaches upcycling techniques to people locally, or a travelling gallery van that offers people the chance to exhibit their upcycled clothing and sell it. Carative factors such as “Share personal story; Provide reward; Provide benefit to the community” influenced the idea-generation process by overlapping the four themes. Figure 13.2 demonstrates how Student 1 framed the caregiving behaviour as customising, swapping and selling within the CE with support from the toolkit. The final output of the design idea was a storytelling-based, peer-to-peer, online and offline platform where people could donate and purchase second-hand clothes, and in doing so receive points or credits (Figure 13.3). Both platforms offer design tutorials or workshops on upcycling skills and techniques to enable people to repair, adapt and customise their purchased clothes (Figure 13.4). Later the recreated clothing could be re-sold, with the designer’s story attached. The toolkit supported students in understanding that human behaviour could be viewed as a leverage point to change the current system and generate ideas around the transformation from consumer ownership to usership, enabling upcycling for reuse by a new user.

### Circular Fashion

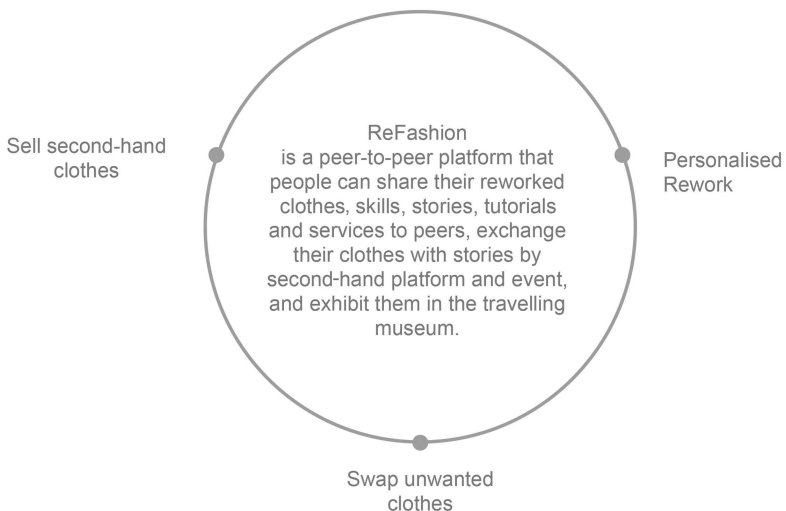


Figure 13.2 A systems-thinking process illustrated by Student 1



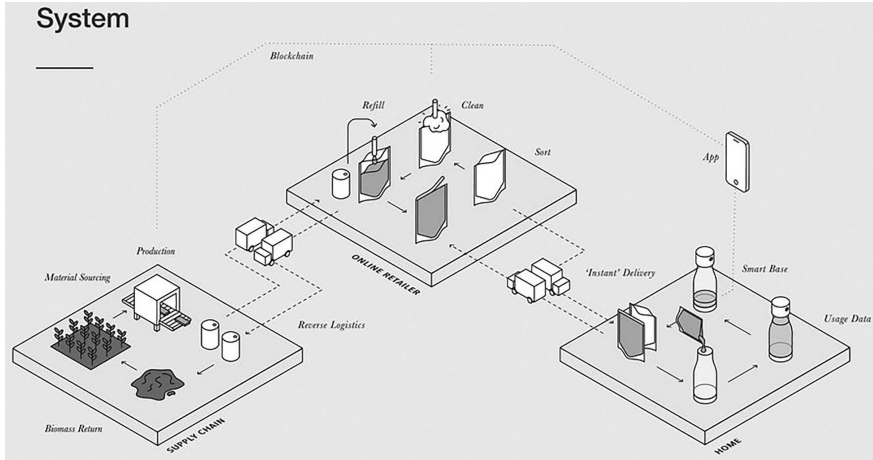
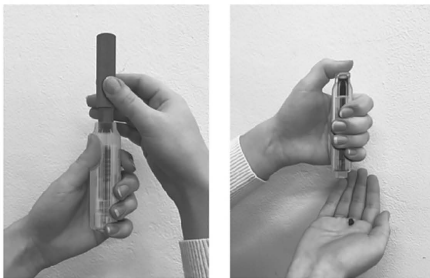


Figure 13.3 A systems diagram illustrated by Student 2

Project 1 Pillpal-Usage



To reduce packaging waste, pills are put in a paper cartridge and collected by users from the pharmacy. You insert a paper cartridge that contains the monthly dosage into Pillpal and you can then dispense each pill by pressing the top button. To remind the user to take medication on time, and every day, it also comes with an app. The app can auto-record when the pill is taken each time they dispense a pill. Or users can manually do it and manage other functions via the app. The final clear model is being producing at the moment. I hope the video on the right can illustrate my ideas.



Figure 13.4 Refillable contraceptive pill dispenser by Student 3

Case study 2

The second student explored the problems associated with people’s behaviour in relation to disposable packaging. In this study, care practice was seen as a process of increasing the value of objects to extend their lifetimes by the existing owner and

identified users' repair activity as a good example of a caring act. Factors such as "Notify about the amount of use time left; Make disassembly easier" influenced the idea-generation process. The concepts that were explored include a store refill system and a repairable pump structure. The final idea was an IoT-enabled sustainable material-based reusable container, service and system for Minimally Conscious Consumers: when it is empty, the container automatically orders refill pouches via a pay-per-use subscription service, which will then be delivered to the user. The product consists of a smart base, which can also be fitted to alternative containers via a small stainless-steel magnet. All parts are made of infinitely recyclable materials such as stainless steel and glass, and renewable materials such as cork: they are replaceable and easily repaired, taking the end-of-use phase into consideration. Care-focused thinking was encouraged during the entire design development process. Students explored the aesthetics and configuration of, and the necessary technical conditions for, the care-receivers (in this case objects and the environment), to allow the user to undertake repair and reuse.

Student 2 attempted to understand how current stakeholders are interconnected within a whole system and analysed the barriers to reuse in order to understand the leverage of what design might do differently. Figure 13.3 shows how carative factors such as "Make disassembly easier; Let users recognise that the object is reaching its end-of-use phase; Make objects with renewable materials" influenced Student 2's design thinking process towards sourcing sustainable materials and establishing an after-use system for behaviour change through approaching the project with systems-level thinking.

### *Case study 3*

The final student project explored the problem of a wasteful attitude towards pharmaceutical products and packaging. She explored ideas around how the design could be improved to encourage users towards reuse behaviour by using the toolkit. Carative factors such as "Make objects with renewable materials; Notify about the amount of use time left; Let users know objects are going to good causes; Inform users about the impact and result of their behaviour" encouraged Student 3 to consider the whole life cycle of packaging, to promote the responsible use of dispensers and enable material circularity. The concepts explored included biodegradable pill packaging and a colour-changing pill case to notify Attentive Users about the number of days left before expiry. The final idea is a refillable contraceptive pill dispenser. The dispenser is connected to a smartphone application that helps users to manage their contraceptive pill consumption, gives notice of expiry dates, provides information on how and when to take the pills and where to dispose of pharmaceutical waste and cartridges, aiming to encourage the responsible disposal of cartridges at the end-of-use phase (Figure 13.4). Figure 13.5 shows the users participating in creating a closed-loop cycle of pills, packaging and dispenser. A local pharmacy offers click-and-collect prescriptions, which are packed in recycled and recyclable paper cartridges; when the pills and the dispenser are no longer needed the user returns it to the pharmacy. The toolkit facilitated the generation of an idea

## Project 1 Pillpal-User Type &amp; Process of Collecting Drugs

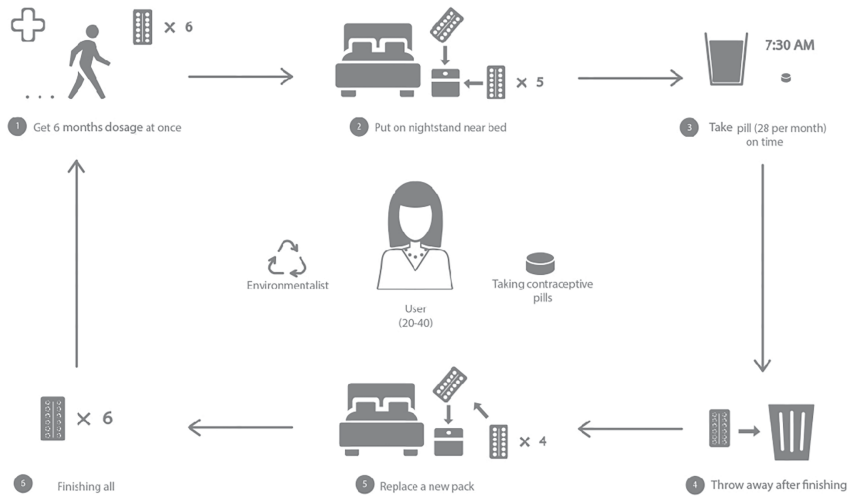


Figure 13.5 Student 3 approached the project with circular systems thinking

around the rental scheme to create effective materials flow to maximise the value of the resource when it is in use and then a reward system to encourage users to return unwanted pills to create a positive environmental impact.

## Discussion

### *The design process*

The toolkit was introduced in the idea-generation process, which encouraged students to identify potential problematic behaviour and to identify the target behaviour required, such as reuse, repair, sharing or returning the items to be remanufactured, which aligns with the objectives of the CE. Most of the ideas generated focused on how the service and the system could be improved, or a new structure and materials were found for products to promote caregiving behaviour to ensure the longevity of objects and their material circulation. According to the participating students,

the concept of carative factors was inspirational and informative applied to the idea-generation process. Integrating the carative factors at an early stage of the design process has an effect on understanding caring behaviour, and on considering the whole cycle of product use, including the after-use phase.

Based on the feedback gained from Student 1, the ideas generated contribute to the promotion of re-using end-of-life resources to prevent a loss of value and a negative effect within the materials chain. The pill dispenser rental scheme, and the

IoT-based reusable container and refill pouch delivery service, aim to increase the value of the object over time by promoting “usership”. The ideas generated demonstrate that carative factors enable consciousness in the user by promoting the qualities of empathy, responsibility, commitment and benevolence in users to promote sustainable behaviour and for the object to participate in creating a closed-loop cycle to “enable materials to maintain their status as resources” (Braungart et al., 2006). Therefore, applying the toolkit in the design process influences students’ design thinking towards a circular system.

It became apparent that responsibility and commitment were the themes that were applied most frequently during the research. Student 3 stated that the application of the factors within the themes of responsibility and commitment would enable users to consider the responsibilities that are required during product use and end of use and also enhance their commitment to environmental care. In many cases, responsibility and commitment were considered together, and this is because the forms of care are interconnected, and the commitment to a particular set of values entails a sense of responsibility (Shaw et al., 2016). The themes of empathy and benevolence involve encouraging empathic emotions in the user towards the object to deliver care action (Shaw et al., 2016). According to Student 2, the carative factors within those themes had less influence when exploring their ideas. It would have been beneficial if the toolkit had included more examples of how those factors could be applied in design.

### ***Feedback cycle***

Students who used the toolkit created designs to generate longer-lasting products which would be used responsibly and disposed of thoughtfully within the framework of the CE by caregivers receiving responses from either the care-receivers or the places where the objects are taken care of. The responses could be framed as financial returns, emotionally rewarding experiences or other forms of reward or penalty. Student 2 mentioned that providing meaningful responses between two parties would help to continue the caring relationship and encourage the caregiver’s continuous engagement with the caring process. As Mayeroff (1971) stated, the caring process embraces the caregiver’s “memory”, but also expresses their “expectation” of the one cared for: thus, providing meaningful responses between the two parties makes the caring relationship stronger and more enduring. Whether the appropriate reminders are given to users by the product itself, whether suggestions are offered to the user through design that responds to their behaviour, or whether the emotional responses are elicited from users through the use of the product, the relationship with the product creates meaning, value and experience, and the caring role in the design process becomes stronger, potentially promoting sustainable behaviour. When students work on behaviour change through the lens of care, they should aim to create a continuous feedback loop system between the caregiver and the care-receiver. Therefore, students should be given maximum freedom to choose care-receivers and caring practice techniques, as well as to define what is in need of care and what constitutes caregiving.

***Systems-level thinking***

Exploring ideas through the lens of care by using the toolkit at an early stage of the idea-generation phase provides an opportunity for students to understand the complexity of care relations and consider an approach to products which enables a shift from merely designing physical products to designing a system of products and services. Student 2 approached the project with systems-level thinking by attempting to understand how different stakeholders influence each other within a whole system, analysing the barriers that exist in order to understand the leverage point in terms of what design might do differently. Carative factors such as “Make disassembly easier; Let users recognise that objects are reaching their end-of-use phase” influenced the design thinking process towards sustainable material application, an efficient transportation system and establishment of an after-use system for behaviour change. According to Student 2, the toolkit essentially facilitated the development of a new business model by transforming the relationship between consumers and business. His business model, of an IoT-enabled sustainable material-based reusable container and refill pouches via a pay-per-use subscription service, attempted to retain the ownership of products, with consumers only paying for services, which facilitated a product-service system. Such an approach might be commercially beneficial to companies as a way of increasing the size of their loyal customer base and reducing materials costs by taking back used products. In addition to this, Student 2 stated that carative factors such as “Make object with renewable material” encouraged the exploration of ideas around using a renewable material-based container, that would enable a closed loop system for materials. Student 3 also commented that applying the carative factors facilitated the reconsideration of the entire life cycle of products, from sourcing material to the product’s end-of-use phase. The toolkit supported students in developing ideas to promote empathy, commitment and responsibility in users, which led the students to develop the idea of a rental scheme service for users to subscribe to a pill dispenser and return service. Considering the efficiency of resources that is required in systems thinking, there is a benefit in terms of a reduction in material cost when a company takes back used products, working in collaboration with a pharmacy. Student 1 commented that developing a new service platform for repair and sharing offered opportunities to address leverage points to influence users’ behaviour; providing an upcycling service within the system facilitates the shift from a linear system to a circular system. Carative factors such as “Make disassembly easier; Let users share stories” enabled systems thinking by understanding that human behaviour could be viewed as a leverage point (Meadows & Wright, 2008). The three case studies imply that carative factors have the potential to contribute to a systems-level thinking approach by providing an opportunity for students to consider sourcing sustainable materials for products, benefiting the supply chain environmentally and changing users’ behaviour during the use and end-of-use phase.

However, it is important that tutors emphasise that care is a reciprocal practice, occurring within the framework of a relationship between the caregiver and care-receiver (Gastmans, 2006). Good care practice is exhibited when the caregiver

is competent, has a knowledge and awareness of the care-receiver's needs and is responsive and respectful. Therefore, to analyse and provide a response to the perceived needs of care-receivers is of primary importance in establishing care practice. Then it is necessary to create a feedback cycle between the caregiver and the care-receiver by providing meaningful responses between the two parties in order to make the ongoing caring process and caring relationships unique (Mayeroff, 1971).

### *The designer's role*

Developing projects by applying the concept of care provided an opportunity for students to rethink the designer's role. Student 2 stated that designers should not merely focus on the appearance and functionality of products for commercial business purposes but should shift to influencing people's behaviour towards more sustainable lifestyles. Student 2 attempted not only to design an aesthetically pleasing container but also to consider sustainable materials, structures and behavioural elements more specifically, and to encode these into the design of a repairable product with a better understanding of its users. Student 3 commented that applying carative factors in the idea-generation process taught them that designers should recognise the environmental impacts of user behaviour in interacting with products and design a product that is able to support users in making conscious ethical decisions to do the right thing for the environment. The student stated that applying carative factors informed her to develop a pill dispenser that encourages users to make conscious ethical decisions by notifying the user about expiry dates and information on how and where to dispose of pharmaceutical waste, reminding them to behave more thoughtfully. In this sense, ultimately the designer's role is to develop a design intervention that has the potential to produce certain social norms and shared intentions among community members, encouraging both a motivation to act and behavioural habits that result in lasting behaviour change. Furthermore, Student 1 mentioned that the role of the product designer focuses on the design of the product, service and system that facilitates reuse, repair and upcycling though generating a new business model. Applying carative factors in the design process has provided an opportunity to consider the potential contribution of the designer in generating economic benefit and resource efficiency.

### *Limitations of the application of the toolkit*

The students tended to conduct research on sustainable materials at a later stage of the design process: therefore the outcome lacked an understanding of the application of sustainable materials. For example, the material was merely specified as "recycled plastic" in Student 3's project. The outcome would have been more innovative if she had conducted materials research at an early stage of the design process. Although materials consideration is one of the prompts in the toolkit, it requires improvement in terms of developing carative factors related to promoting the application of sustainable materials at an early stage of the design development.

Student 3 explored ideas around applying a financial penalty. However, Student 3 questioned whether taking this approach can be seen as ethical because it could mislead the user by implying that designers are all-powerful. In this sense, conducting a peer-to-peer discussion during the idea-generation session, in which students have opportunity to consider the ethical issues that might arise from user interaction with the product, could be useful. Through discussion, design solutions that were proposed by the students could be evaluated according to different ethical criteria. Nevertheless, design through carative factors enabled students to learn about the ethical role of design and encouraged them to develop a product design which helps users to make better decisions in relation to responsible behaviour.

## **Conclusion**

This chapter describes an assignment designed to integrate care practice into design for sustainable behaviour as part of a product design course. Three case studies demonstrate the use of the CFIT by BA and master's students in self-generated design briefs. Five insights into care practice were developed through semi-structured interviews and were discussed. This exercise helped students to better understand the nature of caring relationships between the user and objects during their use and end-of-use stages and informed students about the design process for caring behaviour within the CE. This, accordingly, influenced students' design thinking towards a circular system approach, creating a closed-loop cycle to enable materials to maintain their status as resources. This research helped students to understand how users can discover the depth and value of the object that comes with diverse forms of ethical approach involving care, empathy, responsibility and commitment and benevolence to achieve caring behaviour: through the insights obtained we understood the ethical dimensions of care more deeply. This research is valuable for both design practice and academia, as it provides concrete examples and insights from the integration of care practice into design processes and product design education; further work may extend it to understand the critical need of students for discussion space and to expand the carative factors in relation to the application of sustainable materials.

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# **14 Label and packaging design for sustainability checklist: a tailored tool for graphic design students and designers, co-designed by all stakeholders across the workflows**

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## **Introduction**

The starting point for this checklist was the perceived need that students of the degree in communication design at Politécnico de Portalegre need to broaden and make current the practice of design for sustainability. Strategies, tools and best practices for sustainability are discussed in different subjects throughout the course, especially in sustainable design, in the penultimate semester. However, once this stage is passed, students tend not to transport or deepen, in a natural and autonomous way, this knowledge and skills in the projects developed in last semester's subjects.

On the other hand, in education, the need to increase the number and quality of interdisciplinary work is always present. This practice helps to strengthen the idea that each design project must involve knowledge, skills and aptitudes that, despite being taught in different subjects, have to be understood globally and used together. This understanding is crucial to leverage design solutions that better understand the context of the problems raised and can provide them with more tailored answers. Strengthening this idea in students is central to design education and is also a premise of this work.

Another important dimension is the current European social, environmental, economic, cultural and political context. The European Union is stimulating structural reforms, defining the present decade as one of transition at different levels – environmental, energy, digital, and also cultural and creative – where the European Green Deal or the New European Bauhaus are outstanding examples.<sup>1</sup> Search for concrete and consequent actions in these areas, for European countries and for their citizens, is urgent. It is necessary to find balances in environmental and social matters, and designers, educators and other players in the education and production chains must also contribute.

Finally, it should be noted that the trigger for this list was our students' participation in an international label design competition, carried out by FINAT, an international label association. This seemed to us a good opportunity to develop a deeper work and greater involvement of students in best practices in graphic design, inter- and multidisciplinary and civic awareness. It was also an opportunity to intensify the relationship with some local and regional printing companies, fostering joint work in training new graphic design and production professionals.

This work is carried out within research teams and centres to which the authors belong. Among them, we highlight the Polytechnic of Portalegre's Laboratório Circular do Alentejo, which, also with the Forum of the Circular Economy of Alentejo, contributes to debate and to make new proposals towards sustainability in this region.

### **Objectives and premises**

It follows from the context in which this checklist has been developed that the objectives are varied. Firstly, it is intended that students can evolve more and better, contributing to sustainability when they enter the labour market. We also want this learning to take place in a more dynamic and collaborative environment, especially together with companies and institutions in the region specialized in some of the areas we work, such as communication design and graphic production. Many of these companies have ex-students, so this partnership between academia and the professional world becomes more obvious and potentially fruitful. In the end, as the checklist is gradually more used by students, designers and others, we will all be able to make a better contribution to the region's sustainable development. The use of the checklist intends to be a practical and easy-to-use tool to minimize negative impacts mainly on the design, production and use levels of products. Its application leads to a reflection about all life-cycle stages of artefacts, aiming to save resources along the production line and improve their use and end of life towards especially recyclability. Part of our goals would be accomplished if future young graphic designers and micro regional companies might use this tool regularly, benefiting also from a financial perspective.

### ***Why a checklist?***

The form of the checklist as an answer to all these needs arises from our conviction that this type of instrument can be easier to use, whether in an academic or professional environment. Unlike other tools too focused on strategies and new concepts, which tend to be more difficult to understand and implement in the day-to-day design practice, checklists lend a practical dimension and sometimes quite closer to the reality of current practical needs of students, designers and companies; but also because many of the small and micro companies need simpler tools to use, on the one hand, and on the other, tools that can visualize and propose more tangible results for their real needs.

### ***Radical vs incremental innovations***

For these reasons we also prefer smaller, incremental measures to radical measures. Smaller and gradual changes are much easier to implement, while radical measures usually create great resistance when applied, as they imply large financial investments and/or deep social changes, in production and/or consumption. Especially in the context of micro, small and medium-sized companies and, in particular, in peripheral regions of a country, such as Alentejo, in Portugal, incremental measures turn out to be much more realistic and bring more tangible results in the immediate term.

### ***A product-specific checklist***

This checklist proposes to focus on packaging, labels and their application, unlike the overwhelming majority of checklists we are familiar with. We believe that the wide scope of a list has positive aspects, but this generality makes its use difficult, as multiple adaptations to specific projects will be necessary. Issues such as materials to use, production processes or others related to particularities of a graphic artefact vary a lot from project to project, so the existence of a checklist directed to these specific problems helps users to better master the variables that they will have to deal with. On the other hand, the checklist items will be closely adapted to the specificity of each artefact to be designed.

### ***A checklist focused on labels and packages***

The labels and packaging area arose in the aforementioned design competition. But more important than that, it is an area of great importance in developed or developing countries, due to the large amount of production and consumption, use of materials, energy, waste and residues that this entails. This is also one of the areas of design and graphic production that has seen a continuous and significant increase, reflecting its growing social and economic importance in capitalist societies.

## **Methodologies**

Therefore, as a macro methodology, so to speak, to achieve our goals of contributing to greater environmental and social equity, we propose a label and packaging for sustainability checklist. The design of this list has started and has been applied and tested; but its refinement is underway as we intend to involve more stakeholders in production and consumption chains, in an ongoing work of dissemination and improvement. Methods described next were and are used to develop the checklist and to test its utilization. In fact, we understand this process as an ongoing work, needing continuous improvements and requiring adjustments to different kinds of users, according to their needs, objectives or level of expertise.

### ***Literature review***

The starting point was a literature review, gathering different ways of solving sustainability problems from content and form points of view. At this stage, we

analysed some checklists or tools with similar purposes to ours, such as the design guides by TUDelft (Boeijen et al., 2020), UNEP (2007), INETI (Frazão et al., 2006) or design collectives, such as Design Can Change (undated) or AIGA (2010). We studied other more complete works that could bring us other insights, such as works by Vezzoli and Manzini (2008, e.g.), among others on graphic design, such as Jedlička (2009, 2010), Benson and Perullo (2017), Sherin (2008) or Dougherty (2011). Some more specific works by Matos and Delfino (2015) or Delfino et al. (2015) were also considered. More recently, we have been looking for information focused on labels and packaging, such as the Suez.Circpack (2021) and the Portuguese Sociedade Ponto Verde (2021) guides.

### ***Interviews with lecturers and professional experts***

The revision of the following versions of the list will follow mainly in terms of production and recycling, reflecting technologies and materials evolution. On the other hand, we want to have a broad group of experts from different areas giving their contributions. This work has been done, based on structured and semi-structured interviews carried out in person or by email. In a first phase the interviewees are national and foreign higher education institutions lecturers, mainly from design, sustainability and packaging areas, but also from graphic technology or chemistry. Three other groups to be consulted are environment and recycling professionals; professionals from local and regional printers, with in-depth and practical knowledge in prepress, printing and finishing areas; and a fourth group made up of national designers with activity mainly in the field of labels and packaging. This extended list of experts leads to a real co-creation, strengthening the multi- and interdisciplinary character of the study, in an attempt to better face the variety and complexity of this area.

It should be noted that the external contacts that we have been carrying out, although not exclusive, are mainly centred on the Alentejo region. This is the area of influence of our educational institution, so it is essential that we understand this production context, seeking to contribute and collaborate with these partners, proposing solutions that can best fit these realities. Companies in the region, whether those seeking printing services (most of them in the food sector) or those providing them (printers), are mostly micro and small companies. However, in the graphic area, two groups are clearly distinguished: a majority of micro companies (fewer than 10 workers<sup>2</sup>), with relatively modest equipment, offset and digital printing and limited finishing possibilities; and a minority of small companies (fewer than 50 workers),<sup>2</sup> with state-of-the-art flexographic printing and other high production equipment, a good variety of finishing processes, and a relatively high turnover (most of them with important foreign capital). It is important to consider this huge difference in production forms and processes, as the working logic and possible application of different, and possibly innovative, processes varies between these groups; the degree of work specialization or diversification is big among these companies, so the needs and solutions must be equally different.

**Conferences, debates and field trips**

In addition to interviews with experts, some of them have been invited to present lectures addressed to students and teachers, focusing on specific themes. Lectures take place at school, in person or via the Internet, simultaneously with the application of the list by students in classes. By doing so we seek to encourage direct dialogue between all stakeholders, professionals and academics, taking the advantages of teachers and students to clarify doubts, which arise in the development of their school projects. Direct visualization of production processes and debate with professionals also take place through field trips to specialized companies in the region. These experiences not only improve the use of the checklist but also help to envision improvements to be introduced.

**Focus groups with students and consumers**

The assessment of the checklist, in its practical application, is carried out by our students, after having used it in academic exercises. For this we use two tools: focus groups and questionnaire surveys. Focus groups are carried out with small groups, from 4 to 6 students, with a semi-structured script, which allows us to collect more spontaneous and sincere opinions, and therefore more truthful, in a quicker way. Questionnaires, in turn, allow for more concrete suggestions, focused on certain specific items. Even with low response rates, opinions and suggestions are given

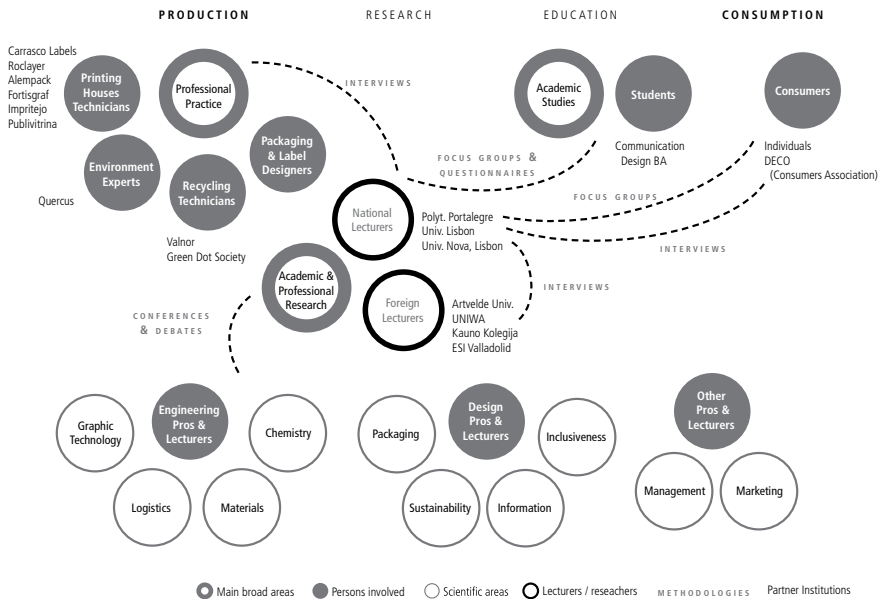


Figure 14.1 Diagram of partners, methodologies and forms of contact

by some of the most interested students, so they come to be objective and useful. At a later stage we will hear consumer representatives, also using focus groups.

## **Results**

Currently the list has a total of 77 topics. In general terms, the checklist necessarily includes several topics that we can find in other lists, even if they are shown in a different way, more simplified or broken down into more than one item. However, we chose to go deeper into other items, mostly related to graphic design, to its formal dimension, in its relationship with social and environmental aspects. The structure of the list itself reflects a different position compared to others, as a general rule of thumb, of a much more technical nature and related to engineering. We tried to meet our students' practical and immediate needs, but also direct the list to graphic designers' centre of activity and decisions, rather than leaning towards areas that are often dependent on the decisions of others professionals in the production chain.

Organization and contents of this list assume that aspects related to strategy, general and communicational concepts, or others related to design methodologies or design thinking, were discussed prior to its application. In academic exercises, this discussion takes place in the classroom, with lecturers, students and, eventually, other partners internal or external to our institution – in our case, with professionals or researchers from companies or institutions that participated in the conferences and debates. In a professional context, these questions of principle are defined between designers and clients, eventually involving several other professionals from technology and/or social sciences areas.

### *Checklist overview*

The checklist is structured into three major groups:

- Label and/or packaging form and layout, with 23 items
- Label and/or packaging form and materials, with 42 items
- Graphic production, with 12 items

The first group includes many aspects related to the shape of graphic elements, usually associated with saving space and resources. This includes questions related to the size of graphic elements; the use of colours and images; organization and display of mandatory and non-mandatory information; composition of the different text elements related to the product; as well as the importance of considering the inclusion of extra information related to recycling or reuse of labels and packages. We emphasize the importance given in this list to the dimension of information to consumers, but not only regarding the consumption of the marketed product, a dimension that has been treated for a long time in information design. This also includes the dimension of information and awareness regarding consumption and the importance of consumers and companies for concrete actions that contribute to

sustainability. Attention is also given in the list to issues of inclusiveness considering limitations such as vision problems or comprehension difficulties.

The group on materials is closer to other existing checklists. This includes issues related to the forms of labels and packaging and the attention that has to be given to problems such as oversizing, transport, disassembly or separation of different materials that constitute packages at the end of consumption or at the end of life. Regarding the packaging and label materials themselves – paper or plastics – several recommendations are included in the sense of valuing simpler, lighter, mono-material, non-fossil, recycled or compostable solutions. For these and especially for the other types of materials, attention is drawn to the importance of raw materials of certified origin and to the consideration of integrated end-of-life systems. As for inks and glues, following the same logic, it is recommended to select printers that have solutions with fewer chemicals, heavy metals favouring recycling, composting or reuse of packaging and labels.

The group on graphic production emphasizes the importance of valuing local or regional companies; with environmental or other certifications; or the involvement of printing companies in the decision-making process on materials and production methods selection. Finally, more concrete aspects about printing and finishing are included, highlighting the importance of opting for solutions that involve fewer colours, processes and chemical products.

### *Specialized and other regular checklist items*

In all three large groups on the list the importance of standards and certifications is highlighted. Here we can find references to the most important and recognized supranational certifications, of an environmental and social nature, such as EU Ecolabel and FSC. PEFC certification was also included, even though some environmental groups consider it less demanding and less impartial, either because of its connection to paper producers or because of lesser inclusion of social aspects. ISO standards in the areas of quality and environment, such as 9001 and 14001, increasingly used in Western countries, were necessarily included. Also other still lesser known ISO standards are here, helping to raise awareness among all professionals, such as 26000, in the social area, and 19603–4–6, for recycling, composting and reuse. Due to its importance, other internationally and nationally recognized labels were also included, such as Cradle to Cradle and SIGRE, the Portuguese national packaging waste management system.

Other common items on other checklists could not be missed. As mentioned before, all good practices related to recycling are valued here: reuse; simplification of materials and processes; reduction of materials, time and energy; or the use of mono-materials, at all stages, from design to production to consumption to the end of life of artefacts.

### *Graphic design-specific items*

Aspects related to graphic design play a key role in this checklist, even though it is not the group with the largest number of items. Not only do they occupy the top

positions on the list, but also they are among those who can contribute the most to a more rational occupation of space, considering environmental and social aspects. Text composition has several variables that must be properly taken care of: from the selection of space-saving fonts, to a way of formatting that strictly controls values such as leading, tracking and kerning, or hyphenation and justification, also contributing to savings.

The issue of images is necessarily addressed, whether their function can be mainly as an element of seduction and, therefore, their use and dimension should be used sparingly; either when they can replace parts of text, improving communication and functionality and, if possible, helping to save space. Along the same lines, there are still items that draw attention to the need for a good organization of information, contributing to communication and saving resources; and/or sometimes combining printed information with information available through digital media, to which consumers can access through QR codes, augmented reality or other types of hyperlinks.

### ***Inclusiveness and collaborative items***

Issues related to inclusiveness and collaborative design are increasingly investigated and considered in project development. However, in other sustainability design lists there is a bias to consider more issues related to the environmental dimension. In this list, however, some items that consider some of the most frequent limitations in our society were added, such as those of vision, including severe or extreme ones, or, the most frequent among men, colour blindness. Comprehension difficulties, such as dyslexia or others of a psychological nature, are also taken into account. The suggestion of replacing certain types of text with images also leads people with limited time for reading, or even limitations in understanding and interpreting written texts, in their mother tongue or in foreign languages, to better understand certain messages considered more relevant.

Along the list it is suggested that representatives of consumers and producers can include the design teams, namely in an initial design phase and in the production adaptation phase. Inputs from third parties in the different phases of design can be decisive in order to solve some issues that would otherwise end up creating barriers or problems in communication or in the printed matter production.

## **Discussion**

Among the aspects that we consider distinctive in this checklist, compared to the ones referenced here, is its focus on design practice, on graphic design, and less on production processes, energy, and other issues related to engineering or management. Materials and production processes are certainly critical to sustainability, but some of the items we find on certain checklists are often not within designers' decision-making range. Even in the strategy area, designers often do not have great decision-making power, either in situations where the client or the production context imposes most of the variables on them, such as in cases where the designer is a mere executor of pre-defined marketing strategies. The structure and organization



of our proposal precisely reflects this attention to graphic design; but also its content, that is, the large number of items that focus more on variables that designers control and less on those dependent on the companies they work with to produce what they design.

Another central aspect is the emphasis of the list on functionality. In contemporary graphic design practice, issues related to savings have often been overlooked in relation to expressiveness, visual impact, and seduction. Here, we seek to sensitize future designers to the need of balancing these premises of visual communication, of a commercial, aesthetic or symbolic nature, with practical, functional solutions that contribute to sustainability. The dimension of seduction and style may be a central aspect of visual communication in Western, capitalist societies, but a judicious use of space is also increasingly necessary. In this sense, the shape and size given to graphic elements must be in balance with economic and consumption needs, but also with environmental and social needs at a more humanistic level.

For these reasons this checklist contains more items related to graphic design and space, which are the first and main tools that graphic designers have in hand to be able to contribute to improvements aimed at sustainability – typography and text composition, visualization or organization of information in order to save space. The space occupied by text, for example, is extremely important, especially on packages with a large amount of mandatory information, such as food products, especially processed ones. This has to be an aspect that appears among the most important ones that designers have to deal with, rather than being overlooked, sometimes forgotten on the back of packages.

Directly related to this aspect of information are all issues concerning citizenship, rights and respect for consumers. This checklist also that pays more attention to the power of information and consumer empowerment, including their responsibilities: information about the product, about its production; but also about how to consume; or how to deal with the end of life of the product or packaging. And going further, it also seeks to be an inclusive checklist in the usual, more objective sense: one that doesn't let minorities be forgotten.

In this line of thought, this also intends to be an inclusive and collaborative checklist, both in its application and in its own construction: involving in graphic design, but also in the construction of the list itself, the largest number of members of the education community, production and consumption, bringing different perspectives, involving different stakeholders from different areas of knowledge, enriching the final result both of the list and the design that it intends to help build.

## **Conclusions**

Our labelling and packaging design for sustainability checklist is in the early stages of application and assessment. It was applied in the classroom, during a school year, with results that we consider promising. In the students' assessment of the list, in focus group sessions and in the questionnaire, some of the main criticisms and improvement suggestions are related to the need for complementary information, useful during its application. The importance of greater synthesis and

ease of application was also mentioned. Complementary information requested by students can be part of the list or take the form of external links (or hyperlinks, in a digital version) mainly for extra information on more technical data. Some of these topics are addressed during the classes of the involved subjects, but often they cannot be properly studied. Discussions with experts and field trips to companies seek to complement these issues. Student feedback is being introduced in a subsequent version of the list.

At the moment, contributions are being received from lecturers and specialist professionals from different scientific areas related to labels and packaging. This process of assessment and improving the list is, for the time being, considered continuous. In this sense, all interested parties are invited to contribute to this construction and improvement of future versions of this list. The list will be made available by these authors to those who request it and wish to apply it in classrooms.

In the future, we would like to create three versions of this list, aimed at undergraduate students, master's students, printers and designers. Each of these lists will have increasing degrees of complexity: from a simplified version, always focused on design, with special emphasis on inclusiveness and other social issues, and with a strong support of technical issues, for first-cycle students; for students in the second cycle, a more complex version with more technical data related to materials and production; and a version aimed at professionals, less didactic and more in-depth, which may be available online or made available by service providers to their clients or designers.

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## Notes

- 1 According to the UE. [https://ec.europa.eu/reform-support/what-we-do\\_en](https://ec.europa.eu/reform-support/what-we-do_en), for example, consulted on 26/10/2021.
- 2 According to Portuguese law in *Decreto-Lei n.º 372/2007*, published on 06/11/2007.

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# 15 Making makers citizenships

## Network tools for Lazio digital manufacturers' awareness

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### Introduction

The Maker community social response to the deficient mass production and distribution of PPEs, during the COVID-19 sanitary emergency; characterized by global diffused bottom-up initiatives of volunteers' DIY production of sanitary supplies, has finally proved the role of Making as a resilient practice theorized since the 2009 economic crisis (Anderson, 2014). If on the one hand the economic crisis gives the impulse to a community identification, that later on brought to the definition of a proper Maker network, on the other hand the people's participation necessary to determine a resilient reaction has been reached just during the lockdown period, proving its direct proportion with emergency states (Folke et al., 2010). Making has been already widely recognized as a social and technological boost, potentially able to define more resilient development models, and as a social response aimed to extend the awareness to the public administration (PA) (Capdevila, 2014).

As described in previous studies (Monaco et al., 2021), the EU understanding of Maker movement has been strongly characterized by PA interest and involvement, that shifted within two years since 2016 the European perspective over the Maker movement from the civic role of social technological empowerment and educational commitment to a local economic booster role (Gershenfeld et al., 2017). This institutionalization process has been followed by a global contraction of the global network visible in the decreasing number of Maker entities registered in the most representative platform (fablab.io and wiki.hackerspaces.org), early registered in Europe by JRC since 2016.

This global context led therefore the research to question the evolution of Maker realities: to whom, this contribution reports a territorial case study, focused on the Lazio region, where the role developed by community of Makers in rebuilding proximities during the sanitary emergency has brought back into evidence the intrinsic and inescapable social vocation of the practice of making beyond the PA orientation. The aim of the research is to investigate the regional community network and its potential in redefining new models of citizenship based on renewed proximities.

**Regional case study**

Design acts as a strategic tool in triggering, supporting, and enhancing social innovation, while putting designers as infrastructures to support initiatives for autonomous and self-established communities (Morelli & Sbordone, 2018) and opening to a much broader disciplinary field that goes beyond productivity, technology, and the market (Meroni, 2007; Villari, 2012); a relatively new combination of methods, introducing a range of tools across many areas of design. A co-design focused on communities for the design of relationships, strategies, products, and services, based on the enhancement of both human and territorial capital. These dynamics place the citizen at the centre, and the citizen autonomously finds solutions through bottom-up interventions, starting an innovation process that no longer passes through institutions or authorities (top-down). In a broader perspective, therefore, design supports communities by proposing solutions to problems that, according to Manzini (2014), neither the market nor the state have solved. In a highly self-organized context, design becomes a useful tool for understanding and developing social innovation by mediating public and private needs.

The impact that those empowered citizens had on public affairs has attracted the attention of public administrations (PA), pushing towards the establishment of new governance models and new generations of urban entrepreneurs, which are active “for” and “with” the local community to collaboratively achieve common goals useful to the society itself (Smith et al., 2016). Indeed, the European policies, that hoped for a growth of local realities in more inclusive and sustainable contexts for 2020, conceived those factors of well-being as a union of social, environmental, and economic capital (Stiglitz et al., 2009), opening up to collective scenarios such as those implemented by commons policies (Rifkin, 2015), where Makerspaces play a crucial role as a social-driven tool in supporting thematic exploration, access to technology, and citizen empowerment (Taylor et al., 2016). This civic role becomes a determining element for those municipalities that compete to create environments and attract innovation (Hoyler et al., 2018).

However, there is a critical need for stable policies and practical solutions to the challenges posed by the organization of work, which seems to still have marginal consideration on a mediatic and political level (Rosa et al., 2018). This process seeks inclusive methodologies that would allow the society to envision a participatory future, where studies, experiments and dialogues can promote the co-creation of the necessary knowledge addressing more important social problems.

***Regional scale and virtuous examples***

The evolution of Hackerspaces, from places of diffusion of an active technological culture to Makerspaces as potential places of widespread production in the territory (Menichinelli, 2016) has brought the traditionally informal spaces of DIY (in all their forms such as repair cafes and Fablabs to name a few formats) at the centre of a new debate on the resilient city. From the first European Fab Lab founded by Vincente Guallart in 2011 inner production moved to a “data-in, data-out” model based on digital manufacturing, as a response to the youth unemployment crisis of the

time, rethinking the traditional idea of the city as a place of consumption based on a “products-in, thrash-out” model. This model, allowed by the technological accessibility and the knowledge that comes along with it, led to a rethinking also to the way production, distribution, and consumption models could have been improved.

Albeit the concept of self-sufficiency alludes to a certain level of productive independence (capacity of non-dependent production) at the same time, this independency arises from cross-fertilization of exchange of supplies and knowledge. It is therefore necessary to point out that the self-sufficiency concept requires an interconnected environment, interrelated and open to exchange. At first glance, it seems a contradiction between autonomy and interaction (between independence and interdependence), but the empowerment (social, ecological, and economic) along with the awareness are two of the most promising frameworks for understanding the dynamics and contexts of youth civic development (Christens et al., 2016). These factors draw attention to the capacity of institutions and communities to critically analyse social issues, identify solution and carry on best practices for design, production, distribution, consumption, and management (Guallart, 2014). Among the various international experiences, also in Italy new forms of making have been identified (Maffei et al., 2015) which have gradually opened up to new policies in favour of hybridization or the shift between professional and productive activity, looking at the dual nature of independent innovators and manufacturers (Maffei & Bianchini, 2014).

Another broader example comes from the Distributed Design Market Platform project, a European collaboration aimed to position manufacturers in well-defined market areas thanks to a design-driven approach, resumes intentions similar to the examples cited earlier. In this sense, the network and ICT tools become a tool that a project that aims at inclusiveness and the mutual contamination of experiences cannot give up, but which at the same time must be able to give the right space, without totally delegating any organizational responsibility.

In the Italian panorama there are extremely different realities, from Milan where Makerspaces are complementary to a rich cultural fabric and widespread design culture, to much less urbanized regions where the spontaneous birth of Makerspaces is more difficult, and innovation is a cultural challenge. Local, provincial, and regional PAs therefore take on a driving role in this economy of experiences by intervening with policies and programmes aimed at strengthening existing communities, as in the case of the MakER network of Emilia Romagna and the FabLab network of the Lazio region. MakER was a network of private laboratories and self-organized Makerspaces which created a widespread factory in which the technical equipment of each laboratory was complementary to the others in favour of a more responsive production chain (Cattabriga, 2019). The Lazio region’s “Spazi Attivi” is instead an example of a network of 10 spaces that in 2015, thanks to the joint intervention of citizens, PAs, and companies, has expanded its technological system to redistribute itself in different urban areas as a single widespread Fablab, whose hybrid functions between business incubator, living lab, and educational space, have been declined in individual structures according to local conditions. These two examples are the mirror of two overlapping approaches to the

independent culture of fabricating citizens: the Makerspace as a widespread factory and a space of co-creation as cultural forge.

### **Mapping and understanding Lazio digital manufacturers**

The reflection on the methods and approaches that design can trigger a virtuous circle of social planning and policymaking, in a set of various experiences that produce a radical change in the system in which they operate (Transit, 2017). Consequently, designers are transformed into politicized agents of change (Fry, 2010) to overturn many deeply rooted political, economic, ideological, and technological foundations. Self-generated movements provide practices and models that, with a view to preserving their social identity, must be able to be protected and cultivated by generating public services or even public policy (Selloni, 2018). Design and research are called upon to build a co-design path intended to produce different outputs depending on the reference context, in a form of social activism that develops a counter-narrative for social innovation (Fuad-Luke, 2009). Lazio urban centres such as the Roman one, with its satellite centres dotted with “self-productions” (Cellamare, 2014), constitute interesting research contexts to develop reflections on redevelopment processes and forms of self-organization seen as a structural fact of contemporary cities.

Technology has assumed a social role through time in supporting the births of hybrid communities in physical spaces, that therefore requires a deeper thought on re-placing those technologies “that re-create or reinforce the connections between people and physical places thanks to digital spaces” versus displacing ones “that move people and their relationships out of physical places towards only digital spaces” (Manzini & Menichinelli, 2021). Approaching then the case study of the Lazio region, the research includes in its investigations several different productive realities, questioning their proximity with the PA and local community to address the role played by the enabling technologies as social mediator in which it is possible to recognize new ways of networking, transfer knowledge, developing competences even within a global crisis.

The study has been developed by mapping digital manufacturing entities to obtain a framed picture of the network and common practices in the Lazio region by numbers, localizations, openness, and specialization, to understand the digital manufacturing community in order to verify and evaluate the actual status of each Maker community, in relation to their territory, a ground investigation (Figure 15.1).

Despite the prominent role covered by technologies as subject of investigation and distancing due to the pandemic, the investigation prioritized, whenever was possible, personal contact and direct witness to not fall in tautological medium response.

#### ***Regional overview of digital manufacturing realities***

More than 50 entities have been catalogued and defined depending on technologies and machine sharing, referring to their audience, such as Open or Referred. Starting with the analysis of the information available online, direct interviews have been conducted with each entity registered, by mail and telephone call (prioritizing

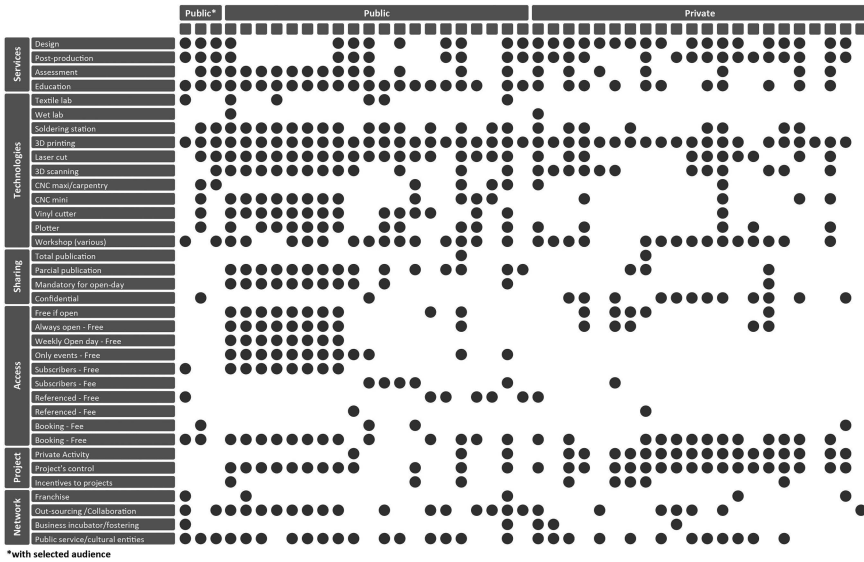


Figure 15.1 First investigation layer matrix on Lazio region Makers realities

interviews instead of proposing surveys). This first screening brought to the definition of 3 categories: public spaces, public spaces with selected audience, and private spaces. Since the distances of those distributed spots along the region (Figure 15.2), another “zoom” has been made at urban scale on the city of Rome, where competences and characteristics of single places revealed a more dynamic pattern (Figure 15.3). Then, the research investigates specific aspects such as the service’s offer, the technological implant, the level of openness of inner projects, internal assets relative to customer care, and involvement in projects developed within the structure, inclusion, or relationship with a specific business network (including outsourcing).

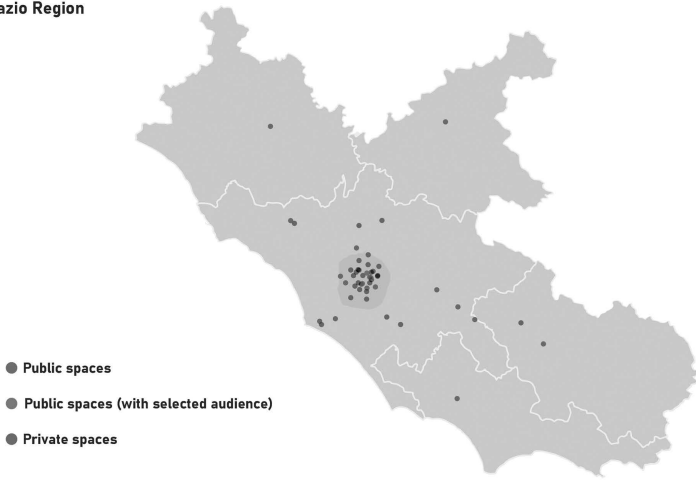
Fablabs in Lazio works as a unique diffuse workshop, complementary in the tool’s supply and similar for services offered. Remapping this set of data as one entity, it is possible to identify a substantial un-discrimination between public and private entities not event in the access policies, suggesting a possible migration of managing from public to private models. Focusing on services offered, education is transversally offered in public and private structure, while the private ones are more interested in offering design consultancy. The missing physical sharing does not look to be offset by digital sharing, underlining open innovation as a critical question confirmed by network data that shows several isolated realities overlapped with missing projects’ policies.

**Digital manufacturing community**

In order to understand the Lazio Maker community and evaluate its social value, skills, and proximity impact, an interview campaign has been conducted with



**Makerlabs distribution  
Lazio Region**



*Figure 15.2* Regional geolocation of Maker different realities in Lazio



*Figure 15.3* Urban geolocation of Maker realities identified for percentage of positive answers in the Matrix (Figure 15.1)

relevant figures, considering their community and local activities, covering private and public sectors: a national foundation, a regional network of creative spaces, a local Fablab, a startup related to digital fabrication, a 3D printing filament producer, and a 3D printing service. Interviews, that averagely last 2 hours each, have been carried on according to anthropological investigation methods and ground theory, characterized by low structured questions – giving the opportunity to reach a topic throughout conversations – and holistic evaluation (including non-explicit commented context). Identifying their activities between education and collaborative learning, interviews reported a progressive “closure” of the public spaces toward more referred access models, based on projects relevance or economic development potential. Moreover, all the entities but the startups were born with educational vocation but due to pandemic restrictions had to shift to services offerings to find economic sustainability. Public laboratories, instead, have shifted to educational and research support instead of direct digital alphabetization, confirming the role of training courses in the economic model of all Maker laboratories.

The role of open innovation and open-source sharing activities has revealed a diffuse misuse of the characteristic sharing platform in favour of professional relationships networks, based on person-to-person meetings and the events of most famous global networks, or door-to-door relationships for SMEs. The PA role in supporting regional and local challenges, which reported a common recognition of its fundamental role for the development of a sustainable management model, also showing the need for a better communication system related to calls and funding opportunities.

These interviews highlighted 4 main interesting areas:

- **Open design:** a widespread misalignment has been noticed between digital and physical identities where project development is not corresponding with open-source design and sharing practices. Public laboratories affirmed that they do not open their design, sometimes justifying the practice with the necessity of protection of possible patents. On the other hand, private activities recognize open innovation as a necessity to allow SME development, but don't frequently share design anyway for third-party interests.
- **Mission shift:** Laboratories founded by public institutions are shifting their cultural objective in favour of economy booster and project incubator, with an increased focus on intellectual property. Meanwhile, private institutions founded with educational objectives are obligated to service practice for economic sustainability.
- **Economic models:** Despite different opinions on the role, they could cover as “digital manufacturers”, they commonly seem to still be economically indecipherable: we could therefore point out that up to now digital manufacturing has not yet found a stable and consolidated economic model within these spaces.
- **Proximity-based relations:** it is not possible to define a proximity client's environment, even if the commercial network is mostly based on door-to-door relationships. Regardless of physical territory, there is a robust community

characterized by strong, interdependent personal and professional relationships that do not correspond to a synergic vision of a new production/distribution short-chain model, reporting in fact that, among the interviewed laboratories, digital manufacturing is still not considered as a relevant alternative for mass production.

From an overall understanding of the interviews and the considerations emerged, it has been acknowledged that to sustain spaces in which the sharing and co-design practices of the consolidated digital community come physically, new governance models should be then considered as undoubtedly necessary.

### **Networking by doing**

The interviews highlight the need for these laboratories to recognize a network they could trust and feel related to, not only for their own production capacity or for the social role associated to the citizens' responsiveness to stimulate the connections between these realities different digital tools have been considered to localize individual laboratories. Nonetheless, within this specific regional context, it seems that few efforts have been conducted towards those updated models that could efficiently help the infrastructure of productive nodes to connect and produce, aiming to a proximity-based planned action close to the "15 minute city" model (Manzini & Pais, 2021). Promoting and determining these interactions dictated by proximity and by a type of SLOC activity opens the possibility of supporting the constitution of hybrid communities of producers, which will therefore be able to develop new activities and relationships. The communities themselves, in their practices and models of action, cultivate and protect their identity within public services and in public policy (Selloni, 2018) where it is possible to glimpse the role of design in addressing social issues and in building a resilient culture, distinguishing between experts (design professionals) and a diffused design (people, social groups).

From the interviews, the evolution of open projects among the Lazio population become clearer despite the barriers imposed by NDAs or business secrets in place within these spaces that can instead become a stimulating key to the establishment of projects. Therefore, a hypothetical emerging map of projects should not look specifically at the products developed and the consultancy offered (which therefore characterize the laboratories by competence and qualify them by specialization). Instead, it has been pointed out in different occasions the will of those spaces to be identified by topics of interest that can open to conversations defined by disciplinary areas characterized most than from the technological and owned skills.

A hypothetical tool would then act as a multi-sided platform for comparison and visualization of collected data, a map with individual nodes representing georeferenced laboratories within the area, linking to each of these one of the values investigated and reported at the end of the map. Starting from the investigations conducted for the establishment of a multi-sided platform that can facilitate the interconnection of these production centres. By adopting different research criterion, this tool

would not only give back a clear picture of the technological and disciplinary system of the activity of urban production places but could possibly stimulate the establishment of thematic bridges guided by the identification of specific practices initiated in the individual creative spaces. A “search by projects” approach that hopefully will be able to open the possibility of setting up community-supported projects that would possibly act as a bottom-up response by which the community can express specific needs and ask other spaces to participate in the development of specific projects, while allowing the PA, having a clear picture of the potential and the “project trends”, to plan specific top-down initiatives for projects specifically designed on community needs.

### **Networking by challenges and future interactions**

The research is currently being built upon two levels of analysis: the first one is defined by the users’ identification and the accessibility to the service infrastructures, while the second is defined by proposition, support, and development involvement in the processes of engagement and commitment of those places. For the first layer, 4 user profiles have been defined: Maker, Expert, Citizen, and PA. While access has been intended as a combination of the level of interaction allowed and the role of involvement, many variables in defining each user profile offered a mutable work base by which image future adaptation could have been possible. Corresponding to a different degree of involvement for each user’s profile, on the second layer, the investigation took under consideration those degrees of open sourcing and sharing obligation within the Maker network. With this regard, the research is challenging those definitions of possible interactions of a variety of stakeholders’ interests while negotiating to reinforce the identification of proximity-based process.

Assuming a long-term scenario in which the local networks of digital manufacturing SMEs, Makerspaces, and Fablabs, the current project can act as an infrastructure rooted in the territory, investigates the current condition of these laboratories within the Lazio region as an effective network of production in order to provide useful data for the establishment of guidelines that can be implemented for the coordination of an intrinsic creative potential as a resilient social response capable of stimulating social innovation actions, shared economies, and good daily practices.

To explain how those experts’ principles and practices definitions could act locally, and therefore affect the platform participation, it is necessary to set on the specificity of the Lazio regional scenario: on the one hand experts’ involvement defines specific constraints, such as the openness and the participatory factor of the projects; on the other hand, if pursuing an open design experience getting the project to a globally diffused community, the new scenario should then refer to local communities to find similar cohesion beyond their common necessity, such as in person-to-person relationships and a priori cohesion within specific local identity.

This project is currently under development, and it mainly aims to quantify, test, and qualify the overall intention to network within regional spaces, by creating a roundtable where all those actors can play their role and contribute directly and

even indirectly to the development and sustainability of the network itself. Different realities currently collaborate, design, co-design and produce within the region, but their different visions, knowledge, skill, work attitude and conception keep the individual realities from opening to each other unless previously dictated, most often by personal experience, has not been put in place. Therefore, the goal is not to assume that it would be possible to create new networks and facilitate the way for connections to be created, but instead, that it is only necessary to structure a playground for a possible network, that would more likely establish by itself, since the main characteristic of these transformations is that they are unpredictable and spontaneous.

### Acknowledgement

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# 16 Design-led entrepreneurship workshop

## A dialogic approach

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### Introduction

The planning, management and control of activities within an organization require expertise that management sciences master skillfully. They are also not as comfortable in dealing with “fuzzy” iterative design processes (Dorst, 2019; Jones, 2014) that unfold within the design and development phases, user experience inquiry and qualitative approaches (Cooper et al., 2009; Dorst, 2015; Martin, 2009b; Wiltchnig et al., 2013). The same applies to designers who may struggle with management concepts, linear approaches (Kagioglou et al., 2000), prescriptive tools and methods (Ahlemann et al., 2013; Kärnä & Junnonen, 2017) but are comfortable with wicked problems (Bailey et al., 2019; Buchanan, 1992; Dorst, 2006; Kolko, 2012), the definition of problem space, identifying design opportunities as well as “devising satisfying solutions” (Dorst, 2011, 2015; Dorst & Cross, 2001; Garbuio et al., 2018).

Thus, knowing that management and design science and disciplines originate from different paradigms but cohabit within projects (Garbuio et al., 2018), it is worth exploring their apparent convergence and the operationalization of their respective approaches, prescriptive for one (Koskela & Howell, 2008; Ahlemann et al., 2013) and self-organizing for the other (de Blois, 2012). So, can these approaches and methods be combined and adapted to a complex and dynamic environment within which projects arise and unfold?

This question arises from a dual synergy (Figure 16.1) illustrating domains and processes that interact within the entrepreneurial undertakings. These will be described in our exploration of their eco-systemic behavior and additional dimensions: the organizational and actor’s role dimensions.

In project contexts, innovation and entrepreneurship initiatives contribute significantly to the success of businesses (Maritz & Donovan, 2015) and are associated with creativity and design (Brown, 2009; Drucker, 2007; Kelley, 2007; Yilmaz & Seifert, 2011). Nonetheless, few studies have emerged on the convergence of these disciplines under the angle of entrepreneurship-innovation/designer-creator (Baran, 2018; Brem, 2008, 2011; Verganti, 2009; Wright & Wrigley, 2019).

The following question guides this research: how can design processes, through innovation based on a design mindset, inform entrepreneurial processes, and vice

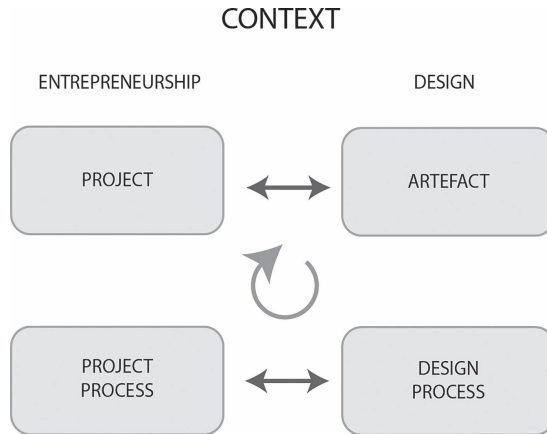


Figure 16.1 Dual synergies between disciplines and processes

versa? Design mindsets may include human-centeredness, empathy, mindfulness of process, prototyping culture, bias toward action and radical collaboration (Brenner et al., 2016; Brown, 2009; Carroll et al., 2010). Based on previous research results from case studies of design and construction projects, it is proposed that a synergy between these two domains generates a series of processes that allow projects to self-organize according to the project's own specific characteristics, occurring at the processual and structural levels (de Blois, 2012). We aim to validate this finding within the entrepreneurial project process.

Design activities and processes constitute key elements of innovation (Borja de Mozota, 2003; Gardien & Gilsing, 2013). Designers create and innovate beyond the traditional spheres of the object/service, at every organizational level: logistic, operational, strategic (Bruce & Bessant, 2002; Kimbell, 2011; Martin, 2009a; Owen, 2005; Shamiyeh & Dom, 2010). Nonetheless, although designers are creators/innovators, they have not, until recently, been highly involved in entrepreneurial endeavors (Desrosiers, 2010; Garcia et al., 2017). This situation is evolving and entrepreneurship amongst designers is accelerating (Colombo et al., 2017; Gardien & Gilsing, 2013; Nussbaum, 2013). Design contribution to entrepreneurship has gained momentum (Baran, 2018; Dimov, 2016; García et al., 2017; Katz & Corbett, 2016; Klenner et al., 2015). Another objective is to address a need manifested by designers to acquire entrepreneurial skills and knowledge, and for entrepreneurs to facilitate synergies and shared vision.

### Theoretical foundations

Popular literature pays tribute to this new breed of innovators/creators (Hoover & Heltzel, 2013). Academics do the same through the “design thinking” literature (Dorst, 2011, 2015, 2019; Kimbell, 2011, 2012; Shamiyeh & Dom, 2010; Keeley



et al., 2013). We noticed a significant adoption of design methodologies by management disciplines (Brown, 2009; Martin, 2009a; Osterwalder et al., 2015), but the integrity of fundamental systemic design principles is not fully integrated. These appropriations are partial, rendering design approaches dubious in terms of efficiency (Collopy, 2009; Nussbaum, 2013).

There is a profusion of research and publications on entrepreneurship and innovation (Brem, 2011; Cuervo et al., 2007; Landström, 2015; Urban, 2010). But Busenitz et al. (2003), Davidsson and Wiklund (2007) and Wiklund et al. (2011) highlight that fundamental research in the field remains limited, suggesting the inclusion of complementary knowledge fields. Gregoire et al. (2006) retrace conceptual convergences of entrepreneurial research and other related domains. The research conversations evolve around: (1) the identification and development of opportunities; (2) the recognition of the value of social capital and networks; and (3) the study of emerging phenomena. This research focuses on these issues, adding a design-innovation perspective since there are overlaps between entrepreneurship and innovation (Landström et al., 2015; Maritz & Donovan, 2015). In fact, design, through its focus on innovation, contributes considerably to entrepreneurial activity while addressing complex issues (Brem, 2011; Bruce & Bessant, 2002; Jones, 2014; Jones & Kijima, 2018; Verganti, 2009; Zhao, 2005).

Design is mainly concerned by: (1) the search and valuation of new opportunities (Shamiyeh & Dom, 2010); (2) the enhancement of quality of life and well-being of communities (Brown, 2009); (3) establishing various types of networks (social, logistic and business) (Juriado & Gustafsson, 2007) and (4) the implementation of creative processes characterized by iterativity (Boutinet, 2010; Dorst & Cross, 2001), which in turn initiate the emergence of self-organizing processes and structures (Le Moigne, 1999; Morin, 1977; Weick, 2001).

In contrast, an important body of research (management, organization) (Ahlemann et al., 2013; Packendorff, 1995; Williams, 2005; Winter et al., 2006) states that prescriptive approaches are at the root of numerous “systemic” problems (Koskela & Howell, 2008) within businesses operating on a project mode. This leads us to consider the development of alternative methodologies, based on systemic principles and concepts, for the study of design/entrepreneurship. In doing so, this research dives into the synergy of disciplines driving the triad “innovation – design – entrepreneurship”.

## **Methods**

Back in 2014, design and entrepreneurship were not natural siblings and were taught in silos. A need was identified to bring them closer, as designers were engaging in entrepreneurial activities. Entrepreneurs needed a more experiential learning, shifting from traditional business plans and management practices towards more flexible approaches.

We identified curriculums blending these disciplines that could guide us in crafting our own. We conducted an inventory of programs within our institution, as well as abroad. We identified key common characteristics and variables of project

modes and processes for entrepreneurship initiatives. We found a few fragmented programs. Entrepreneurship formats were mainly focused on business performance and management parameters while the focus of design resides mainly on the product/service process and outcome.

The curriculum was designed from the elements we had in hand, experimenting a design-led approach to entrepreneurship. Guidelines were established, combining design and entrepreneurship principles, processes and contents (Daniel, 2016; Jones, 2014). The design and redesign of the program spanned a period of 6 years, with multiple iterations, prototyping, testing and analysis. We achieved this by analyzing data from the workshops, as well as integrating the following principles.

Jones and Kijima (2018), Jones and Van Patter (2009), and Nelson and Stolterman (2012) propose a set of 10 systemic design principles shared between design and systems disciplines (Jones, 2014, p. 107) (Table 16.1) on a 5-stage design process, divided into 3 metaphases. The development of the workshop format was based on these, as well as Löbler’s (2006) and Daniel’s (2016) 10 principles for entrepreneurship education, which added the design thinking dimension (Table 16.2). They describe the approach “as a framework for designing an entrepreneurial learning environment in which students can, to a large extent, govern their own learning process, thus enabling the development of a social constructivist approach to entrepreneurship education” (pp. 217–218).

***Workshop – methodological approach***

The workshop format is based on: (1) the business creation process, centered on sequential and prescriptive models/toolboxes, and (2) the design mindset methodology, combining theories, methods and toolboxes. The two threads were subdivided into a 5 fields approach: entrepreneurship (Aulet, 2013; Blank & Dorf, 2012), organization (Osterwald & Pigneur, 2010), design (Kumar, 2012; Dorst, 2015; Osterwald et al., 2015), innovation (Van Wulfen, 2013; Keeley et al., 2013) and design thinking (Liedtka et al., 2013; Sanders & Stappers, 2012, 2014; Jones, 2014; Durand, 2004).

*Table 16.1* Systemic design principles: adapted from Jones (2014)

<i>Metaphases</i>	<i>Design model</i>	<i>Systemic design principles</i>
Exploratory	Strategy	Idealization Appreciating wickedness
	Discovery	Discovering purposes Requisite variety
Formative	Design	Boundary framing Ordering
	Develop	Feedback coordination Generative emergence
Evaluative	Deploy	Continuous adaptation Self-organizing and placement
		Feedback coordination

Table 16.2 10 principles for a design-led workshop (adapted from Löbler, 2006; Daniel, 2016)

<i>Principle</i>	<i>Löbler – Entrepreneurship</i>	<i>Daniel – Design thinking</i>	<i>Workshop design-led entrepreneurship</i>
1	Experimentation	Exploration of possible solutions	Scenarios – VP – systemic principles
2	Learning goals set by students	Empathy – user perspective	Projects embedded in personal experience
3	Contents on demand to fulfill goals	Proactive search	5 themes
4	Testing	Competition – external evaluation	Pitches – in workshop and VC
5	Interaction and socio-cognitive conflict	Multidisciplinary collaborative work	Project teams and stakeholder participation
6	Open information flow	Shared perspective	Cocreation
7	World of opportunities	Synthesis – insights	Systems of solutions
8	Addressing the problem from a different perspective	Equal input from participants	Reframe innovation
9	Fostering autonomy	Emotional, integral and experimental intelligence	Personal insight, teambuilding, learning by doing
10	Fun environment for motivation	Informal and cooperative environment	Design studio, nature retreat, networking, challenges

These themes and sources provide an accessible framework for participants providing a sound perspective on actual academic orientation as well as practice from design and business domains (Brem, 2011). This format evolved to include additional theoretical perspectives such as Cross (2006), Dorst (2015), Kolko (2010, 2011), Krippendorff (2006), Muratovski (2015) or Visser (2006), to name a few. We tested over 70 tools and methods from handbooks and online sources (Dorst et al., 2016; Kimbell, 2014; Strategizer, Lean Canvas, D. School, etc.). The 5 fields approach defined the protocols and methodology of workshops and case study formats (Perren & Monder, 2004; Yin, 2004), which involved the development of product/service and business models, aimed at designing concurrently the processes and structure that support entrepreneurial initiatives.

The workshop protocol monitors and analyzes: (1) the types of design opportunities (innovations) and projects/solutions developed with a design thinking approach, based on problem solving as opposed to idea development; (2) the business model devised around the project/value proposition instead of a traditional model based on the industry segment; (3) the nature of processes (linear or iterative) and synergy between business model generation and product/service development (Osterwalder & Pigneur, 2010); and (4) the processes and synergy between three methods: (i) the startup step-by-step approach (Aulet, 2013; Blank & Dorf, 2012), (ii) the business model generation and (iii) the Ten Types of Innovation (Keeley et al., 2013).

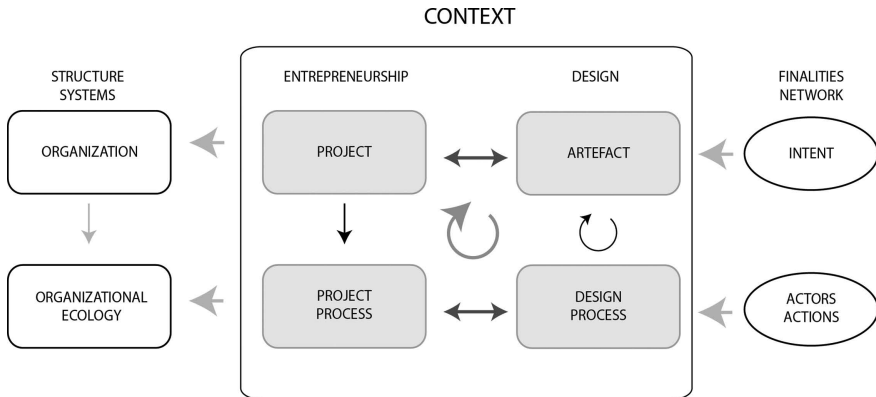


Figure 16.2 Expanded context

With this framework in mind, the initial question posed by the dual synergy between domains and processes expands, adding two elements: (1) the role of the initiator of the project and the intent that motivates him into launching an entrepreneurial process and (2) the multiple organizational dimensions enabling the project to take root. Thus, the entrepreneurial project and artifact do not evolve by themselves, but through processes are activated by an actor's intent and actions within a broader context of organizations.

### **Workshop format**

The Design Entrepreneurship Seminar is offered at Université Laval. It runs 8–10 hours/day, 5 days+/week, for 4 weeks, with events and networking, offered jointly by 2 departments. To create a realistic environment, we added the participation of businesses, crowdfunding organizations, incubators and speakers from the startup community. Between 25 and 40 participants are recruited across Mexico, England, France, the United States and Canada through our institution affiliation network. Selection is based on (1) interest in design and/or entrepreneurship, (2) having completed one academic year and (3) being engaged full time in the program and activities. Between 8 and 14 projects/teams are formed each year. Each team develops a project around a problem space, generating systems of problems that in turn open up systems of design opportunities. The program, divided into 9 segments/stages and 30 modules, expands on the 5 field approach themes: entrepreneurship, organization, design, innovation and design thinking, thus allowing the synergy between processes throughout project timelines.

### **Data collection and analysis**

Mixed qualitative methods were deployed to experiment and test the theoretical and practical material, observing the outcome of the process triad: design – entrepreneurial – innovation. The first 2 years were exploratory. We then

transitioned to a participatory experiment, retro-feeding the results and amending the format. From the third and fourth year we implemented co-creation processes with partners, speakers and students.

Perspectives were documented from the emitting end (students) and the receiving end (stakeholders), including observations, video and photo captures, interviews, testimonies, document analysis, cocreation workshops, presentations, course evaluations and pitch contests. Over 6 years, 185 projects were documented. Primary sources were collected from the workshops, the project's documentation and students research reports. Secondary sources are from speaker and project stakeholders.

### ***Preliminary results***

We established our key propositions from workshops and projects outcomes. We outlined a theoretical frame linking design to entrepreneurship into a design-driven entrepreneurship process. Our analysis reveals that the links between theories of entrepreneurship and innovation are well established despite that these research fields have evolved separately (Landström et al., 2015). In terms of scientific research output, these links remain limited. The trend suggests a need in pursuing further inquiry into the synergy of design – innovation – entrepreneurship as a promising field of research. The discussion section proposes a framework permitting to nourish these inquiries.

### ***Dialogic between entrepreneurship and design***

We tested design approaches and embedded them into entrepreneurial practice. The data reveals differences and overlaps between design and entrepreneurial processes. One process is mainly linear, starts with a single idea, proposes a single product/service, is based on an established or prescribed business model, is focused on market segment, revenue streams, etc. The other is iterative, starts with a problem, generates multiple design opportunities, proposes integrated products/services/experiences, conceives (self-organizes) the business model (structure and processes) around the project, is focused on the user and experience, addresses sustainable development, unfolds into the social innovation sphere, and is by nature based on a systemic process encompassing a wider ecosystem.

The main challenge for participants consists in making choices for the sequence of steps. The design process and the entrepreneurial step-by-step approach differ greatly, both in terminology and in sequence. Parallels can be made between these approaches, but their mindsets are different.

In the end, the design process-oriented approach strongly alters the traditional entrepreneurial process by: (1) strongly embedding the project within its context, (2) allowing to understand the conditions leading to a project pivot around an amended value proposition in consideration of its economic model and (3) allowing a shift of the project rationale from a customer-centric one toward a more inclusive ecosystemic one, integrating an array of stakeholders (multi-tiered business model).

*Shifting mindsets to allow synergies*

We observed the changing role of designers in the entrepreneurial landscape as well as the changing mindset of entrepreneurs using design-driven approaches (Table 16.3). Two elements stand out: (1) strong disciplinary stance and (2) difficulty in switching process modes.

Disciplinary stance (1) is two-sided. First, on the business profile side, professionals have more difficulty adopting a design attitude, that is, putting the focus on defining the problem space. Most are instinctively inclined at generating a flow of ideas and then trying to validate the most profitable one. Few will take the risk of devising/designing a novel business model around their proposition and will adopt a traditional structured approach, more in line with a linear positivist and sequential approach, more organized and structured in their objectives and output. They refrain from engaging in confronting scenarios and iterations within and between processes.

Second, designers do not readily understand the intricacies and strategic importance of business model development, as it conditions the product image, experience

Table 16.3 Shifting mindset

<i>Entrepreneurial mindset</i>	<i>Design mindset</i>	<i>Design-led entrepreneurship mindset</i>	<i>Levers of action/ activators/anchor point</i>
Deductive/inductive	Inductive/abductive type1	Abductive type 2/ effectuation	Method-process
Short timeframe, < 3 years (BP)	Long timeframe	Average “realistic” project timeframe	Project timeframe
Local	Global	Situated-context embedded	Project scope/scale
Individual/organizational project	Collective/social project	Stakeholder valorization	Shareholders/ stakeholders
Private source	Open source	Co-ownership	Intellectual property/ capital/market opportunity
Project-centered	User-centered	Holistic-complex	Systemic thinking
Project/idea focused	Problem focused	Array of possibilities/ opportunities	Project orientation/ multiple pathways
Symptom driven	Root cause driven	Systems driven	Ecosystem/network
Competition	Cocreation	Cooperation	Nature of interrelationships
Control/ profit-centered	User/human-centered	Value proposition	Socially anchored
Economic/financial vision	Social/societal vision	Triple vision (Elkington, 2008)	Project impact
One best way/ one sided	Multi-sided/ multi-solutions	Ad-hoc structure	Adaptability: flexible-evolving-dynamic structure
Mechanical mono-culture harvesting	Sowing –growing – cultivating	Eco-systemic	Circular proposition

and delivery to their user. They tend to let decision-making slip away until it is well advanced and more difficult to turn around. In both instances, designer and business profiles go through a steep learning curve in terms of the tools needed to communicate with each other. Rhetoric, modes of thought and proper understanding of disciplinary terms are at first hindering the cooperation between disciplines, creating unnecessary frustrations.

Switching and balancing between processes (2) proves difficult. They lean on one disciplinary stance and stick with this posture, nevertheless creating balanced and challenging teams. The best leaders have more ease in dealing with uncertainty and test more scenarios, this being unrelated to discipline. Knowledge and experience in respective disciplines appear to be a determinant factor in this dual synergy. The more entrenched and experienced a practitioner is, the more likely the disciplinary boundary will be a negative factor for fluid cooperation. But at the end of the process, participants are much more aware and knowledgeable of the importance and role of respective disciplines and processes than at the beginning of the workshops, indicating that a well-crafted protocol encourages the synergy between disciplines.

### ***Design as a driving force to leverage entrepreneurial endeavors***

Data finally suggest that entrepreneurship can very well and successfully be driven by design. The approach reinforces the responsibility of entrepreneurs, social embeddedness and impact of projects. It encourages the involvement of stakeholders. Projects are no longer developed in silos, but in a collaborative spirit.

The format strongly challenges the means used to achieve the end result by crafting/designing alternative tools and processes. The proper use of resources is reevaluated. Projects gain ethical and responsible dimensions. A well-developed value proposition does not lead to one product or service. The design brief does not prescribe a fixed solution but suggests a set of performance criteria leading to a “universe of possibilities”. Entrepreneurs anchor and deliver business models (8 BMC components) around the value proposition.

Observations highlight the role of design in redirecting outcome beyond the product/service. These indicate that a sound design intent approach, based on systemic concepts and problem space analysis generates a pool of rich design propositions, leveraging entrepreneurial endeavors into scalable business models, sitting on a system of interrelated design opportunities. Close to 80% of projects result in a wider system of propositions. Design-driven projects embed a strong value system and social innovation dimensions, have a well-articulated mission and a clear vision, connect bottom-up and top-down strategies and have a noticeable impact on VP reception.

For each pivot, systemic design approaches allowed the identification of additional stakeholders and interrelated issues. By encouraging stakeholders to initiate their own project, we saw the impacts grow from a single idea/problem space toward systems of VPs. Taking into consideration this interconnectedness, smaller interventions generate an unexpected positive domino and compounding effect.

**Discussion: a dialogic approach**

The data analysis and theoretical foundations produced the following framework. It has 2 dimensions: (1) the 4 knowledge domains (vertical axis) and (2) the underlying system of relationships that interconnects and articulates the domains (Figure 16.3).

The first dimension includes 4 knowledge domains of the project disciplines represented by an ontological frame (de Blois, 2012), including (vertical axis): (i) organizational dynamics and structures (Bengtsson et al., 2007; Demers, 2007; Mintzberg, 1979; Short et al., 2008;), (ii) project and entrepreneurial development processes (Boutinet, 2005, 2010; Brem, 2011; Van de Ven, 1986), (iii) theories of design and innovation (Cross, 2006; Dorst, 2011, 2015; Findeli & Bousbaci, 2005; Zhao, 2005) and (iv) network actors' dynamic (Crozier & Friedberg, 1977; Giddens, 1979; Latour, 2005).

The second dimension activates relationships between domains and ontologies, confronting the two dominant paradigms: analytic (linear positivist project process) and systemic (constructivist iterative design process). The systems concepts, the systemic approach and systems modeling principles (Durand, 2004; Le Moigne, 1999) within the paradigmatic frame of complexity (Morin, 1977; Morin & Le

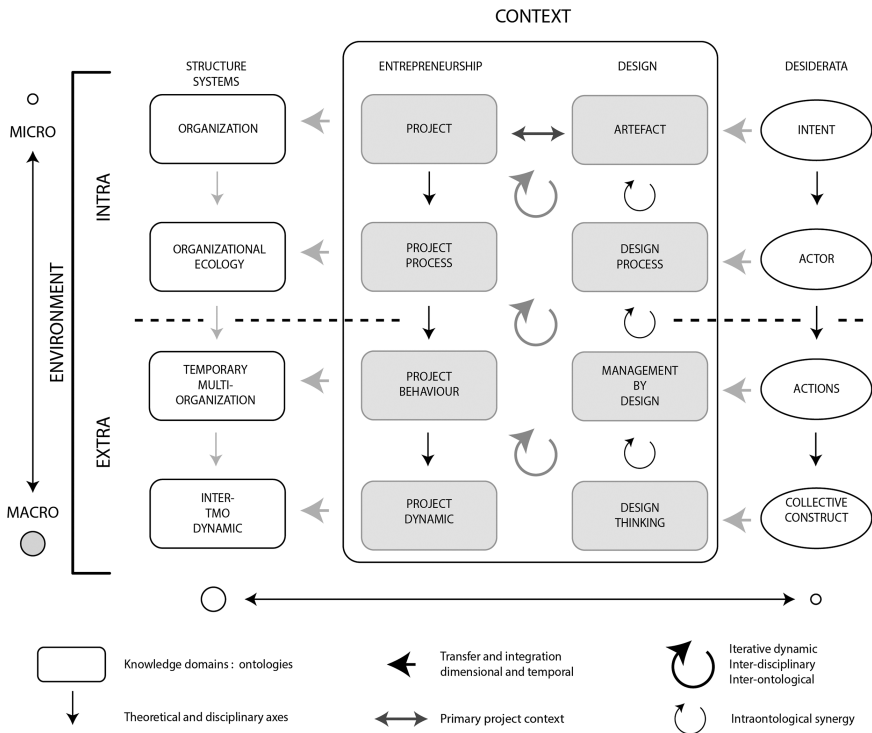


Figure 16.3 Theoretical framework



Moigne, 1999) articulate the interrelations between knowledge domains. It permits to model and better understand the synergy of interrelated processes that involve entrepreneurial innovation and product and service development. The framework matrix is organized as follows: (1) domain categories (vertical axis); (2) knowledge domains – ontologies (individual boxes); (3) environment classification – intra/extra, micro/macro; and (4) individual to organizational.

Activating the framework goes as follows. First, we identify the project contexts (Figure 16.1), animated by two domains: (1) the project and its conception, embodied by design, constitutes the bridge between the actor's formulation of intentions and its formalization in the object-project, and (2) the project and its execution, represented by management, establishes the operational context through multilevel processes.

Second, at the core of this synergy, a third domain comes into play (Figure 16.2): (3) the action project, derived from Boutinet's (2010) project theory, establishing a theoretical reflection on the nature of actions motivated by our intentions. Project domains (1) and (2) cohabit within projects but stand on very different paradigms. Project management rests on a positivist view and is deployed in a linear and structured fashion (Pollack, 2007; Cicmil et al., 2006); design is characterized by a constructivist approach, iterative and self-organizing (Le Moigne, 1999; Le Moigne & Morin, 2007; Nelson & Stolterman, 2012; Visser, 2006; de Blois et al., 2016).

From an epistemological and praxeological point of view, these two disciplines are confronted and conditioned by constraint as well as united by necessity, revealing the complexity of interactions between two project modes (1, 2), which are activated by a third and central mode, the prospective actions of actors (de Blois, 2012; de Blois & De Coninck, 2009). The third mode (3) is the least understood, especially when actors are positioned at the intersections of disciplines. We finally consider three distinctive and complementary modes of projects (design/innovation – intention/action – management/entrepreneurship) in order to position the dynamic design – innovation – entrepreneurship triad. The links between these knowledge domains are nevertheless fragmented. The underlying systems approach (Durand, 2004; Le Moigne, 1999) supports and activates the framework, highlighting the functional and structural mechanisms of these dynamics.

### **Conclusion, limits and future research**

Research domains addressing design-driven entrepreneurship have gained momentum and are expanding. We presented an overview of a continuing research and academic experience. We explored and documented synergies between design/innovation and management/entrepreneurship processes, in a workshop program/experiment, observing processes that allow projects to organize and self-organize according to the project's own specific and unique characteristics, at the processual and structural levels.

Our main results indicate: (1) that the design process approach strongly alters the traditional entrepreneurial process; (2) the changing roles of designers in the entrepreneurial landscape as well as the changing mindset of entrepreneurs using design-driven approaches; and (3) that entrepreneurship can be successfully driven

by design, redirecting outcomes beyond the product or service. The results also permitted to develop the multidimensional theoretical framework.

One of the main limits is methodological and consists in the amount and diversity of data sources and how they are synthesized and analyzed. The case study method allows us to document in detail but must be mixed, and triangulation more robust. The authors being participants, additional protocols should be deployed to avoid potential biases. Future research is being conducted. We expanded the program and created, in 2017 a one-year post-graduate program in entrepreneurship by design. It will then be possible to account for the longer-term impact of the format.

Other research directions include the importance and impact of entrepreneurial support within a continuum, before and after the program; the critical input of design in permitting faster and more anchored pivots toward more responsible and ethical propositions; and the legitimacy of experienced mentors, complementary to academic teachers. Finally, the format generates diverse output profiles, not only for entrepreneurs but more so for innovation enablers. Adapting these dynamic experiential formats allows multiple modular profiles and seems to respond to a new need expressed by students seeking alternative programs.

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**Part IV**

**Design research**





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# 17 Towards the histories and the pedagogies of social design in Brazil — a research outline

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## Introduction

In the post-1968 period, the questioning of ‘industrial design’ and the approximation between the area of design and the human and social sciences implied the insurgency of a popular movement of alternative design and, to a certain extent, the reorientation of the formalist design practice towards critical intervention with a renewed social agenda. In this regard, design historian and anthropologist Alison J. Clarke (2019, 2021a, 2021b), director of the Papanek Foundation at the University of Applied Arts Vienna, has contested the genealogy of social design, previously attributed to political activism within the US counterculture.

Therefore, the scholar has relocated the beginning of this project approach in the amalgamation between design and the human and social sciences – especially anthropology – vis-à-vis the émigré cultures and the theoretical-critical contribution of the Austro-American designer, professor, activist and immigrant Victor Papanek. The director considers that the profession’s engagement with social issues occurred at different times in the history of design, such as the Arts & Crafts movement and the modernist socio-technological utopia. Nonetheless, the design culture of the 1970s was marked by the understanding of ‘social’ applied to practice according to the paradigms of the humanities and social sciences (Clarke, 2010, 2016a, 2016b, 2018).

In Brazil, the historic landmark of higher education in design is the installation of the Superior School of Industrial Design – ESDI, in Rio de Janeiro-RJ, in 1963, whose ‘ulmian’ orientation model influenced the courses that followed. The basic polemic of the institutionalisation of design education in Brazil resides in the experience of the Ulm School as a reference, in contrast to the country’s reality. However, according to Cardoso (2008), the context of relative decline of the military

dictatorship and the recognition of the limitations of modernism made room for a conception of social design, from the early 1980s onwards.

Yet, Montuori (2017) states that a humanist and socially oriented pedagogy dates back to the establishment of undergraduate courses in Industrial Design and Visual Communication at the Pontifical Catholic University of Rio de Janeiro – PUC-Rio, in 1972. On the occasion of Papanek’s incursions into South America and the holding of lectures and workshops at PUC-Rio in May 1980, design education would strengthen towards a reinvigorated direction, with the restlessness of professors and researchers Ana Maria Branco and José Luiz Mendes Ripper – who were looking for a new way of teaching design and were inspired by Papanek’s ideas. Following, the triad ‘process of making – native themes – practical results for students’ was elaborated in order to conceptualise the idea of social design in a pedagogical context, by philosopher, anthropologist, historian and activist Lélia Gonzalez, among other teachers in the Department of Arts in collaboration with Professor Ripper, as he took on the role of head of the department in 1982 (Araújo, 2017; Couto, 1991, 2017; Montuori, 2017; Pacheco, 1996). At the time of the endorsement of an institutional policy stressing the ‘social’ aspect as the foundation to all courses at PUC-Rio, social design was established as a design pedagogy that consisted of

a project methodology that proposes that students leave the classroom and go to a real environment, where an activity is carried out by a professional so that they can, based on their observation in the daily life of the group involved, develop their project. This approach was given in the beginning of the course projects and the students had the possibility to resume it in their final project. It was called Social Design.

(Araújo, 2017, p. 22)

The approach has also been called ‘participatory design’ by some teachers and, eventually, has been named ‘Partnership Design’ at PUC-Rio. In this sense, Couto (2017) explains that the curricula implemented since the 1980s expanded the contours of this practice and contributed to the university’s bachelor’s degree in design, leaving an indelible mark on social design, recognised nationally and with repercussions in various undergraduate courses to the present day. Furthermore, it is worth mentioning that the first master’s dissertation in design approved in Brazil, in the pioneering graduate program at PUC-Rio, was the investigation by Pacheco (1996) on social design in the realm of design education.

Hence, the objective of this chapter is to lay a theoretical and conceptual frame for a doctoral research project (now concluded). Considering that academic work on social design is constituted mainly by reports of actions and, in addition, alternative approaches have remained on the sidelines of the object of study of the official historiography of design, this research proposal resides in placing social design in the scope of design history and design education.

Firstly, in order to set the theoretical frame of a doctoral thesis, a brief introduction is presented regarding the historiographical strands of social history, microhistory and history of education. Then, the discussions on design history studies are

summarised through a literature review, as well as the problematisation around the emerging category of history of social design, in general terms.

### **In the direction of social history, microhistory and history of education**

When reflecting on the various specialties among which the field of history unfolds, Barros (2004, 2005) points out that social history is subject to oscillations of meaning, since it is a fertile modality in terms of object of study, as well as in terms of interdisciplinary possibilities with multiple areas of knowledge. Initially, the scholar emphasises that specialties in the field of history can be delimited according to focus, methods and themes, which has three broad classification criteria: a) a 'dimension', which implies a focus or in a 'view mode'; b) an 'approach', based on a 'way of making history' and the material with which the researcher works; and c) a 'domain' corresponding to themes, subjects and objects of investigation. Indeed, social history fits as an historiographical 'dimension', whose dynamic character considers research around 'processes' and objects of subsets of society, such as the processes of industrialisation, modernisation, colonisation and social movements, while the objects can be professional categories, outcasts, groups or social classes.

The modality of social history was established with the Annales School, in France, in the first half of the 20th century, according to Barros (2004, 2005), oriented towards the history of the masses and social groups as a starting point, in contrast to the biographies of great men and the history of the institutions that were the tonic of the historiography of the previous century. Corroborating this issue, Burke (1992) cites the emergence of the expression 'new history' in the Annales movement: written history as a deliberate reaction to conventional paradigms. In this line of thinking, the scholar mentions that the incipience of social history was associated with a contempt for political history, that is, contrary to the prejudices of traditional political historians. On the other hand, the specialties of microhistory and the history of everyday life emerged as reactions to the study of major social trends which, as Burke (1992) stresses, would be the examination of society without a human face.

Taking this into account, Barros (2004, 2005) considers that there are no isolated political, economic, cultural or social facts and, therefore, specialties in the field of history are not defined by the type of fact under analysis, but by the emphasis given by the historian. In the case of social history, the researcher is concerned with how these conjunctural variations affect different social groups and the relationships between groups. From the 1960s onwards, social history came to be understood by its vocation for a 'synthesis of facts', both to study society as a whole and a specific community. Overall, the argument that 'all history is social' is correctable:

Any historicised information can be socially treated, it is correct to say. But it is also true that not all history is necessarily social. If it is possible to elaborate a Social History of Ideas or a Social History of Art, it is also possible to elaborate a History of Ideas or a History of Art that restrict themselves to

discussing works of thought or artistic creation without restructuring them within their wider social environment.

(Barros, 2005, p. 16)

Thus, history is ‘social’ if the historian has social concerns when examining the past. In turn, Hobsbawm (2013) emphasises that social history considers: a) the history of the poor or popular classes with a focus on the history of work, ideas and socialist organisations; b) the history of human activities that are hard to classify; and c) the study of the combination of social history and economic history. Furthermore, social history can be elaborated both from the perspective of macro-history – which examines factors of social movements or the social stratification of a given human reality from a distanced point of view – and from microhistory – which aims to analyse daily life, individual trajectories and practices perceived from the examination of documents (Barros, 2005, 2007).

In this aspect, Levi (1992) informs that the historiographical aspect of microhistory includes the daily life of specific communities – in geographic and sociological terms, as well as biographies linked to the reconstitution of micro contexts, that is, anonymous figures that would go unnoticed in the crowd. This procedure takes the particular as the starting point and proceeds to identify its meaning in light of its own specific context:

The microhistory perspective is, once again, different, because fundamental importance is given to the activities, forms of behaviour and institutions that provide the framework where languages can be adequately understood, and that allow for meaningful discussion of those concepts and convictions that would otherwise remain hermetically closed in on themselves, without an adequate reference to society.

(Levi, 1992, p. 156)

Moreover, Levi (1992) underlines that microhistory does not sacrifice the knowledge of individual elements for a broader generalisation, while it also does not reject forms of abstraction, as insignificant facts and individual cases can serve to reveal a more general phenomenon. Regarding the domain of history of education, Bastos (2006, 2016) points out that it refers to cultural memory, issues of school culture and educational practices that are engendered in the daily life of each society, by the State, by institutions, interest groups, teachers and students. Hence, research in the history of education expands our universe as historical subjects, teachers and future teachers, as it encompasses the set of curricular experiences and integral training through a threefold path: language culture, scientific culture and historical culture. Still in line with the scholar, writing the history of education allows us to advance within educational activity, by taking into account issues of the present, as well as memory of the sociocultural places of production.

From this perspective, Stephanou and Bastos (2005) indicate that the construction of historiographical knowledge in the field of education deals with the analysis of the complexity of educational phenomena, which need to be understood beyond the mere description of institutions, educational policies and agents. In this sense, the experts

mention questions about curriculum, educational processes, school devices, literacy, educational institutions, among others, which substantially enrich historical research that takes educational phenomena, materialities and processes as their object of study.

Consequently, research in the domain of history of education is multifaceted and multidisciplinary, as it covers a variety of themes such as history of teaching, history of books and reading, history of textbooks, history of children, history of women's education, history of adolescence or young people, history of education and teaching printed matter, history of educational institutions, history of pedagogical ideas, history of school systems, history of school subjects, history of the university, history of non-school educational practices, history of the curriculum, etc. (Stephanou & Bastos, 2005; Bastos, 2006, 2016). Next, a brief overview of the discipline of design history is drawn and, subsequently, some links are established with the emerging category of history of social design.

### **Along the paths of design history**

Until the mid-20th century, the dominant paradigm of design history consisted of an emphasis on the aesthetic-formal factors of artefacts, biographies and designers' portfolios – as in Pevsner's (1936/2002) precursor work. When mapping the theme and pondering the problems and possibilities for research, the seminal texts by Dilnot (1984a, 1984b) expressed a significant advance in relation to the 'Pevsnerian' method, as the theorist placed the discipline of design history in broad social nexuses, as well as within the scope of design studies and projectual practice, in addition to inter-relationships with adjacent disciplines, such as art history and history of technology. At the time, Dilnot (1984a, 1984b) considered that the collapse of the modernist proposal occurred in a vacuum in terms of philosophical and methodological bases in the field of design and, therefore, discussions such as 'the social function of design' and 'the role of aesthetics in project' would be inadequately understood by practice without historical study.

From this perspective, Garvey and Drazin (2016) state that, starting in the 1980s, a series of seminal publications focused on designed objects beyond the results in terms of professional skills, which implied the reallocation of design in accordance with aspirations and actions of a socio-economic, political and cultural nature. Among these references, the academics cite the book *An Introduction to Design and Culture* (1986/2020), in which Penny Sparke validated the possibility of investigating the field of design under a sociopolitical lens; Adrian Forty, and the analysis of production and consumption contexts in *Objects of Desire* (1986); Judy Attfield and Pat Kirkham, and the emphasis on ethnographic methods in *A View from the Interior* (1989); as well as *Wild Things* (2000/2020), by Attfield, which explored the 'vernacular eye' of material culture in design history.

In this context, material culture studies emerged as an interdisciplinary field, especially in the fields of anthropology, archeology and museology, following the example of the Indian anthropologist Arjun Appadurai, and the book *The Social Life of Things: Commodities in Cultural Perspective* (1988). In synthesis, the process of revitalisation of design history studies was marked by the dialogue with the social sciences and, at the end of that decade, by the launch of the *Journal of*

*Design History of the Design Research Society* – which culminated in the affirmation of design history as an autonomous discipline (Garvey & Drazin, 2016).

Subsequently, the matter of design history in relation to design studies was examined by Margolin (1992/2014), for whom design historians are able to “identify design practices and activities that need to be repeated. They can also sustain patterns based on experience and, from previous activities, they can extrapolate possibilities for the future” (1992/2014, p. 284). The scholar argues that these professionals prevent the technicist turn in design research and contribute to the articulation of ideals, principles and research agendas of the design community. In line with the allocation of the triad ‘history, theory and criticism’ at the heart of design studies, Buchanan (1995, 2005) postulates that historical narratives have helped to consolidate design practices and collaborated in the exploration of design theory.

In turn, Meggs (1994) reflected on the methodological and philosophical factors of design history by analysing the history of graphic design and problematising: a) the distinctions in relation to the history of art; b) collecting and the commercial opportunity in exclusive galleries; c) the historiography that is too comprehensive for the different aspects of the field; d) the limits of emphasis on styles; e) the controversy around collective or individual approaches and the synchronic and diachronic points of view; f) pedagogical imperatives; g) the emergence of feminism and the tensions between eurocentrism and multiculturalism; as well as h) design as an ideology, whether in the corporate environment or in the field of political activism.

In the elaboration of future perspectives, Dilnot (2009) asserts that “the subject matter of design history is the capacity of design as we see it historically from the point of view of our endangered present” (p. 393). Currently, the interdisciplinarity between design and history aims, in short: a) to expand the understanding of design; b) to treat history as a problem that requires consideration; and c) to propose ways to establish a dynamic and critical relationship between the two areas (Fry et al., 2015).

In turn, the art and design historian Cardoso (2000/2008) favoured the major social and cultural trends that conditioned the development of project activity, that is, design within the scope of social history. According to the Brazilian scholar,

design history should have as a priority not the transmission of dogmas that restrict the designer’s performance, but the opening of new possibilities that broaden his/her horizons, suggesting, from the wealth of examples from the past, creative and conscious forms of proceeding in the present.

(p. 15)

When approaching the research agenda from a contemporary perspective, Lees-Maffei (2010) adds: “an early concern for ‘good design’ has become less compelling during a period in which design history seeks to challenge ideas about discrimination and pursue an inclusive definition of design within social context” (p. 264). Also in an update of the panorama of the discipline, Whitehouse (2017) corroborates:

design can no longer be defined simply in terms of the designer, the object, technology and manufacturing. Rather it comprises a complex and changing

dynamic that on the grand scale pertains to economic, social and cultural production and consumption, and on the micro level to the collaborative practices of designers and ordinary people in the construction of everyday meaning.

(Whitehouse, 2017, p. 63)

Concerning design history research in the Latin American context, it is important to mention the inflows of the decolonial turn, as Lara-Betancourt and Rezende (2019) highlight in a special edition of the *Journal of Design History*. In the analysis of conferences and publications conceived as ‘design exchanges’, the scholars articulate the agency of Latin American and Caribbean studies within design research, in contrast to the influence of the modernist canon on the historiography of the field:

the scholarship emphasis on histories of design education and the professionalisation of practice, interpreted from nation-specific perspectives and celebrating the biographies of successful (usually white, usually male) designers (framed as ‘pioneers’) results from an initial lack of academic research in the field of design.

(p. 9)

The researchers point out the opening of new paths based on the recognition of historical and geographical disjunctions, such as violence against native Indigenous populations and the diaspora forged in the slavery of African peoples and the various migratory currents, as preponderant factors in the production of material and visual culture of Latin America. Hence, the issues that have remained outside the object of study of the official historiography of design are brought to the fore, within the following topics: popular culture; artisanal production of the Andean peoples; democracy, citizenship, exile and censorship in regimes of civil-military dictatorship in the 20th century; and communist and socialist experiences on the continent.

In a historiographical genealogy about the process of constitution of design history as topic of inquiry in Brazil, Braga (2020) points out that the consolidation of the discipline occurred from the establishment of graduate studies, scientific journals and academic congresses in design in the 1990s. In this phase, historical research attempted to expand its scope beyond institutionalisation and industrialisation, and after an impulse to publish specialised works in the early 2000s, it encompassed the history of packaging and the emerging studies of graphic memory. During the following decades, the emphasis of design history research in Brazil has been regionalism, with events and publications that discuss the field in states other than the Rio–São Paulo axis, along with studies from the perspective of gender and female protagonism.

Regarding theoretical-methodological aspects of historical scholarship in the field, Braga (2020) highlights the need to contextualise the conception of design under analysis, which, in turn, sets the parameters for investigation around the period prior to institutionalisation, as well as in the realm of vernacular culture. Furthermore, the design historian mentions the preponderance of research that privileges professional practice of designers and respective languages and formal



elements that represent a certain material and visual culture: “there are few studies focusing on the relationship between design and the socioeconomic conditions of production or studies that try to understand how design results from the economic and social demands of the society in which it is inserted” (p. 331). In line with Margolin (1992/2014), Braga (2020) endorses that it is necessary to connect design history with the history of business, history of work, history of technology or history of material culture, which would arouse interest on the part of researchers from other areas and would place design in a history of society.

### **History of social design as social history of design**

The year of 1968 was marked by student protests and general strikes that challenged conservative values. The protagonism of revolutionary youth and working class in a political, social and cultural movement made that period known as ‘the year that shook the world’ and ‘transformed the history of the 20th century’. The so-called *zeitgeist* had repercussions in various areas of knowledge, and several disciplines underwent conceptual and methodological revision – including design. In this sense, Papanek (1971, p. 14), who became known as a leader of the social design movement, criticised industrial design as a professional activity that “put murder into mass production”. Moreover, the following statement became emblematic: “there are professions more harmful than industrial design, but only a few of them” (p. 14). In view of numerous projects in design for the superfluous in the face of pressing social problems, Papanek (1971) argued that designers should always dedicate themselves to issues of social impact or at least allocate 10% of their professional time to social causes.

In response to Papanek’s call, other professionals have developed design programmes for social needs, especially for the elderly, low-income population and people with disabilities. However, Margolin and Margolin (2002) consider that little progress has been made in terms of a new model of theory and social practice in design, in contrast to the model of design for the market. The scholars emphasise that this is not a binary concept, but two poles of a same constant, whose difference would be defined by priorities of the demand, and propose a research agenda in social design based on participatory observation and interdisciplinary work with professionals of fields such as health, education and the humanities – which, along with the study of social needs, would be a fundamental factor in the realm of design education.

A decade after the publication of the seminal article on the ‘social model’ in co-authorship with his wife, social worker and teacher Sylvia Margolin, whose repercussions in the dawning of the millennium renewed the conceptions and actions around social design, Victor Margolin (2015) broadened perspectives beyond intervention. The concept of ‘Design for the Good Society’ was developed by academics such as Margolin, Alastair Fuad-Luke and Alison Clarke, among others, who participated in five biennial meetings held in Utrecht, Netherlands, between 2005 and 2015, in which social design was the core of the debates. In contrast to conventional design oriented towards economic value of products and

services governed by market laws, the ten theses elaborated at the end of the series of events constituted the 'Utrecht Manifesto'. By recovering the utopian thinking of William Morris, Walter Gropius and Buckminster Fuller, as well as by suggesting a local, national and international network of schools and design organisations for the joint planning of actions in favour of a 'Good Society', Margolin (2015) called for the proposition of radically new ways of life through the practices – established and emerging – of design.

With regard to the 'social' in design, Armstrong (2015) highlights that, usually, history is not part of the researchers' agenda. When reporting her participation in the 'Papanek Symposium 2015 – Émigré Design Culture: histories of the social in design', the academic mentions that the meeting pointed to a necessary critical perspective on 'the culture of the social' in the field. The event is organised every two years by the Papanek Foundation, and that edition discussed tensions between normative and progressive design culture, as well as actions socially oriented by appropriation rather than innovation, and presented articles included topics such as collaboration and interdisciplinarity policies. Also, according to the scholar, these mantras continue to be recurrent in academic work on social design, while the rich and complex stories that sustain them are only beginning to arouse interest.

During the biennium prior to the symposium, the specialist had been part of a team responsible for preparing the report entitled 'Social Design Futures'. The study, with emphasis on conditions of academic research in social design at higher education institutions (HEI) in the United Kingdom, was conducted by designers and researchers from the University of Brighton and the Victoria & Albert Museum and commissioned by the Arts and Humanities Research Council (AHRC), between 2013 and 2014. By making it clear that we are witnessing a 'social design moment' – not only in that country, but globally, in the face of multiple complex challenges that this design approach has the potential to encompass – the introduction expresses the emerging character of social design as a topic of inquiry. This reason justified the report, with the aim of critically understanding the main opportunities and questions for research in a wide range of activities related to the term 'social design' (Armstrong et al., 2014).

The document outlines the opportunities that open up in this field, among which it is worth noting: a) the position of research in social design in relation to design studies and the social sciences and b) the historical formation of social design, current policies and other contexts and future possibilities. Other challenges in this scope are: funding mechanisms and availability of research support; the relationship of academic research at HEIs with other organisations directly or indirectly engaged in this area of activity through investigation and/or practice; the types of research already carried out; comparative international models; and the current landscape in terms of HEI strengths in social design, in research initiatives, in the academic community and in postgraduate activity (Armstrong et al., 2014). Despite the relevance of the topic as an established practice in the British scenario, the authors point out investigation gaps referring to criticality and social vision, and that "there is also an incomplete historical understanding of the development, reach and impact of social design. The academic research agenda is influenced

(sometimes negatively) by non-academic work in the field” (pp. 7–8). Nevertheless, Armstrong et al. (2014) point out that the history of social design permeates various circumstances, approaches and political positions.

In addition, Clarke (2019, 2021a, 2021b) argues that alternative approaches have remained outside the object of study of the official historiography of design and are rarely integrated to document collections and museum programmes. By extensively researching Victor Papanek’s biography and the social design movement in historical perspective, the scholar asserts:

In challenging design’s assumed role as the originator of frivolous fripperies in an age of overabundance, his [Papanek’s] ideas pivoted on the overarching theory that design was the key agent of social change, not merely a technocratic tool for stylization or aestheticization, or a driver of increased consumer consumption. As an integral part of the social design agenda, he advocated non-Western tropes of design – from material cultures of the Inuit to the Suku Bali, as holistic models of design whereby things are understood as inseparable from social relations, customs, rituals, and histories in which they are embedded. The politics of design, in other words, relied on understanding the practice as a cultural rather than rational, problem-solving phenomenon.

(Clarke, 2021a, p. 13)

Thus, once social design, humanitarian design, design anthropology, transition design and design decolonisation movements emerge in contemporary science, the work of iconic figures like Papanek – still regularly referred to as having challenged Western, corporate and patriarchal design paradigms – demands greater critical scrutiny (Clarke, 2021a). In support of this topic, Del Gaudio (2017a) observes the growing interest in debating the designer’s competences for acting in the social sphere, as the project expands to domains outside of the traditional ones and the designer is understood as a constructor of meanings and critical actor in society. By presenting limits and challenges that have not been deeply discussed, the researcher addresses that “after 40–50 years, since the issue of social design has been introduced, it is necessary to reflect on how much the practice has evolved” (p. 17). Considering the multiple variables and views of design with a social vocation, Couto (2017) postulates that the composition of a transdisciplinary body of knowledge that provides theoretical support and foundation is essential. Therefore, it is worth revisiting the ‘Social Design Futures’ report and underlining the renewed interest in the topic verified from the global economic crisis of 2008 onwards:

Social design has deep historical roots. What is known about this history has tended to be folded into accounts of design history in which its pioneers are understood within mainstream accounts. However, social design invariably involves non-expert practitioners, close alliances with non-design fields, entanglement with policy bureaucracies or, conversely, below-the-radar,

grassroots action. There remains much to be researched and analysed in its historical background.

(Armstrong et al., 2014, p. 18)

Hence, the report indicates that social design has aroused new interest in contexts of economic crisis, marked by the implementation of austerity policies of the neo-liberal agenda. When it comes to theoretical aspects, social design has usually been specified in terms of design oriented to common good, with the understanding of ‘common good’ varying according to historical and geographical perspectives. Based on this premise, Kaszynska (2021) applied genealogical and archaeological analysis to three texts considered canonical in social design, elaborated in contrast to their respective sociocultural contexts: a) the social reformist vision and the idea of social design of the philanthropists of the Victorian era in *News from Nowhere*, by William Morris (1890); b) the counter-movement to corporate, industrial and mass production design, as well as to modernist design seen as separate from the “real world”, in Papanek’s *Design for the Real World* (1971); and c) the social design iterations in recent manifestations of participatory design in Ezio Manzini’s *Design, When Everybody Designs* (2015/2017).

Fundamentally, Kaszynska (2021) references the theoretical contribution of Michel Foucault and Friedrich Nietzsche, as thinkers agree that genealogy is not the search for origins, nor does it designate linear development. On the contrary, the historical perspective it offers is inherently pluralistic and designed to undermine the unitary and non-historical understanding of concepts exposed to the products of specific interests operating in specific historical circumstances. In conjunction with the philosopher Ludwig Wittgenstein’s conception of ‘family resemblance’ – namely, an open set of shared characteristics, whose overlap by recurrence in use indicates a pattern in which a phenomenon is identified with certain categories and meanings – Kaszynska (2021) stresses that the idea of social design plausibly alludes to this concept. When taking into account distinct perceptions of common good in the history of social design, the scholar highlights the impossibility of adopting watertight definitions, since the comprehension of social design is contingent on socio-cultural contexts that have different notions of common good: “there is enough overlap in use to show that the concept of social design is useful to differentiate a certain family of practices from others – not *all* design is social” (p. 306). Therefore, this factor paves the way for choices that are more attentive to notions of common good to be updated by the practice of social design.

### **Preliminary conclusions**

As a striking feature of the history of social design, it is necessary to point out the recurrent mention of a supposed semantic and epistemological problem by designers who consider that ‘all design is social’. In addition to pleonasm, social design has occasionally been labelled as ‘neocolonialism’ since the movement led by Papanek in the 1970s. Furthermore, the specialised critic has noted the absence of a feminist perspective in the ideology of the initiative. However, the social design

movement would once again be credited within the scope of the theory and history of design for contributing to a conception of professional activity aligned with social needs, to the detriment of demands from the capitalist system.

In addition to possible criticisms, it is customary to write ‘social design’ in quotation marks and, sometimes, professionals in the area express deception and doubt in orality [*social design?*] – which denotes the unofficial character and dissent around an alternative design approach, still in the process of structuring. Although without the intention of resolving the controversy between some designers on this subject, it is worth citing that historical scholarship contributes to inform the debate. In this regard, in light of the works by Clarke (2019, 2021a, 2021b), Kaszynska (2021) and Margolin (2015), the basic controversy surrounding the accusation of pleonasm falls apart. Thus, in the broader context, the genealogies of social design go back to the utopian socialist vision of the reformists of the Arts & Crafts movement, permeate the insurgency of a specific popular movement in the post-1968 period, and even reach the manifestations that privilege participation and community sphere in contemporary design. In the context of Brazil, Araújo (2017) and Couto (2017) explain that social design has a historical background of four decades of intertwining with design education. Whether, in the Brazilian scenario, social design has constituted a ‘movement’, the question remains open, as well as the tensions of the approach with decoloniality studies, as stated by Lara-Betancourt and Rezende (2019).

In conducting design history research, according to Braga (2020), the methods and particularities of the field of history are of interest to designers, such as social history, oral history, microhistory and history of material culture, as well as domains such as the history of ideas, regional history, history of private life, etc. Thus, in the contemporary condition that privileges historiography of design in broad social, cultural and political nexuses, it is worth noting – without playing on words – that this doctoral investigation on the history of social design constitutes an effort in the realm of social history of design.

In this sense, this doctoral thesis envisages historical research as a means rather than an end, to then study the topic in the domain of teaching. Expressed in other terms, by placing social design in the design history, the idea is also to discuss the insertion of the theme in design education. Considering the broad character of this design approach, multiplicity of approaches and insertion in everyday life – which, according to Barros (2005) and Burke (1992) demands the synthesis of facts around several histories with social nexus, which do not end in an investigation – the idea converges with the meaning of social history.

Furthermore, the triangulation of social design – design history – design education privileges microhistory, as mentioned by Levi (1992), since by emphasising the embryonic case of PUC-Rio and social design as thematic delimitation, it seeks to situate the process of insertion of this approach in teaching, research and university extension in Brazil. These entanglements demand a deeper understanding on the domain of history of education, as elucidated by Bastos (2006, 2016) and Stephanou and Bastos (2005). Nonetheless, in genealogical orientation, this investigation frame corresponds to the parameters set by Whitehouse (2017) and

Lees-Maffei (2010), on contemporary design history in terms of collaborative practices of the everyday, along with searching for an inclusive definition of design within social context.

In summary, by joining efforts on deepening theoretical aspects regarding the examination of social design in retrospect, as pointed out by Armstrong et al. (2014), Armstrong (2015), Clarke (2019, 2021a, 2021b), Del Gaudio (2017a, 2017b), Couto (2017) and Kaszynska (2021), as well as in the realm of design education, it is worth noting that this initiative is a two-way street. As history sheds light on discussions of the subject, the idea is to also offer an addition to the historiography of the field, since alternative approaches are only beginning to arouse interest as an object of investigation and to appear in design history books. This bet is based on the pedagogical role of history, which, as a method of study, helps in the contextualisation of a given topic – towards social design without quotation marks.

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# 18 A map for knowledge transfer and exchange in doctoral research in design

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## Introduction

This chapter addresses the problem of knowledge transferability from design research (as developed in PhD design courses) to society and academia. A PhD programme is always a research-training programme, and the PhD journey must culminate in a thesis that makes an original contribution to the knowledge of the discipline. This is a well-established principle in any academic discipline; the goals, methods, contexts of study and even the underlying epistemologies may differ across academia, but the purpose of PhD research remains stable: to expand the knowledge of a field (Petre & Rugg, 2010). Eggink and Mulder-Nijkamp (2016), reflecting on the role of research in design education, argue “[a] university can be defined as a place where the search for new knowledge (research) and the dissemination of that knowledge through the raising of new professional talent (education) meet” (p. 216).

Design is a relatively new academic discipline, which means many PhD programmes are a couple of decades old. Such a short period is insufficient to establish a robust research tradition. In other words, whereas well-established disciplines can fall back on a body of knowledge built on decades (in some cases centuries) of research studies, design is only now reaching a point when it can look back to examine the first efforts in building its academic body of knowledge.

The study we present here is the result of a research project that aims precisely to develop the disciplinary self-reflection other academic disciplines already have. To do this, we gathered and analysed all the PhD theses in design from the PhD programme at the University of Lisbon, with early results published and presented in 2019 (Almendra & Ferreira, 2020).

These preliminary results offered a much-needed overview of the ongoing work of the last 15 years. Furthermore, the initial effort allowed us to gather feedback on our study’s methodology, which led to the conclusion that PhD research results are problematic to objectively analyse (a problem we will elaborate on in this chapter).

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This was a limitation that had to be addressed; as such, we built on the work done previously in order to develop a knowledge transfer and exchange (KTE) qualitative analysis for every thesis. In the following section, we present the process of developing the new analysis criteria that we added to the framework.

### **Mapping KTE in PhD research in design**

Our analysis began by establishing provisional codes to categorise doctoral theses according to how immediate their results could be applied by society. We defined five levels, ranging from non-applicable on level 1, to immediately applicable on level 5, and set three intermediate levels (Table 18.1).

We then used the doctoral theses in design completed at the Lisbon School of Architecture as our data sample for a first round of deductive coding. Soon an evident issue emerged with our categorisation: the outcomes of some theses were not immediately applicable in society, even though the research process involved society directly; such were the cases of theses where participatory design was used as a research method. Therefore, it became clear that we had to distinguish two branches of analysis: a) the knowledge transfer level of research outcomes, noting how socially applicable the results were, and b) the level of knowledge exchange in the research process, noting how socially engaging the research activities had been. In both cases, we kept the five-level categorisation scheme.

In our second round of coding, the growing data clusters contributed to shape the limits of each level in our codebook – where each code receives a description, inclusion and exclusion criteria and examples – but soon we noticed the unsuitability of numbering levels, as it created an unintentional hierarchy that did not reflect the aim of this project: level definition was mostly qualitative, as it seemed unreasonable to attempt a quantitative measurement. Moreover, it became clear that our first definitions implicitly considered two different variables. On the one hand, we had the reach of the contribution: for example, theses on level 5 related to knowledge applicable in society more broadly, while on level 3, the applicability was restricted to academia; as such, we concluded that there are different scopes of use for the knowledge contributions of doctoral research: therefore, analysis should not be about the level of applicability (how much or immediately applicable), but its scope (where it is applicable).

On the other hand, we noticed yet another influence on our analysis, which was the type of input on knowledge: for instance, theses on level 2 were more related

*Table 18.1* Preliminary categorisation for KTE of PhD research in design

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*Preliminary categorisation for KTE of PhD research in design*

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Level 1	non-applicable
Level 2	principles, potentially applicable
Level 3	transferable to academia, for long-term applicability
Level 4	applicable after further development or fine-tuning
Level 5	immediately applicable – ready-to-use by society

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to principles which, being new, may not be readily applicable, noting that the type of contribution also influences its transferability. Therefore, we had to explicitly acknowledge these variables instead of stratifying our data into levels and understand how the contributions to knowledge relate to different scopes of applicability.

In our third iteration we reached a set of axes where the doctoral theses were categorised and mapped according to three dimensions:

1. type of contribution to knowledge,
2. scope of knowledge transfer from the project's outcomes and
3. scope of knowledge exchange during the research process.

### Mapping guidelines

In this section we present the mapping axes in detail, illustrate it with examples and discuss our current tridimensional mapping of knowledge contributions of doctoral research in design.

#### *Types of contributions to knowledge*

According to our mapping, doctoral research in design can result in three primary inputs to knowledge: context, vision and means (Table 18.2).

Theses that result in **context** contributions set the scenario of our world. They contribute to mapping our past and current conditions, paving the way for informed change. In *context*, we divided knowledge generation between *retrospection* (history) and *analysis* (diagnosis), which provide a past or current state of the art. Knowledge related to context is needed as a basis or map through which *vision* can be discerned and sustained. In particular, research contributing to *context/analysis* frequently results in relevant recommendations for future research.

**Vision** contributions are the output of theses where knowledge offers a new way to see the world. These were divided between the category of *understanding* – which

Table 18.2 PhD in design contributions to knowledge

<i>Contributions of design doctoral research to knowledge</i>		
<i>Inputs to knowledge</i>	<i>Categories</i>	<i>Category definitions</i>
<b>Context</b> (Contributes to map our environment)	<i>Retrospection</i>	maps past conditions (e.g., history)
	<i>Analysis</i>	maps current conditions (e.g., diagnosis)
<b>Vision</b> (Contributes to new ways to see the world)	<i>Understanding</i>	shows/explains how something works or happens (e.g., theory, models)
	<i>Direction</i>	provides guidance for future action (e.g., principles, strategies)
<b>Means</b> (Contributes to improve human activity)	<i>Methods</i>	presents new ways to do something (e.g., processes, techniques)
	<i>Tools</i>	provides physical or digital aids to do something

includes concepts, theory and models (representations) which not only describe but also explain and help us understand how something works or happens – and the ones concerning *direction*, which includes principles and strategies (plans of action) that propose guidance for the future. *Vision* is not readily applicable, but it is crucial to challenge the current state of affairs and stimulate progress.

Theses that result in *means* provide knowledge that can be used immediately, including *methods* (processes) as concrete ways to do something and *tools* (physical and digital implements, offline and online platforms) as aids to do something (Herriot & Akoglu, 2020). We should note that the term tools, in this analysis, refers to physical or digital aids to carry out specific actions other than *understanding*: this is important to distinguish from models, which we consider as representations contributing to *vision* through *understanding*.

### ***Knowledge transfer of research outcomes: applicability scope***

The criteria defined for this analysis concerned *where* the knowledge generated is relevant and applicable, that is, to where it is transferable. So, while in the beginning of the analysis our question was “To what extent is the doctoral knowledge transferable?”, soon it changed to “Where is the doctoral knowledge transferable to?”, as we recognised that the immediacy of doctoral knowledge application is related to the context of transferability. To this end, we distinguished whether knowledge was applicable:

1. within academia, where knowledge is transferred to other researchers as building blocks to their projects, or to educators and then taught in the classroom;
2. beyond academia but within the field, where it is applied directly in design practice; or
3. applicable in the broader society, beyond the scope of design practice.

With this mapping, we recognise how doctoral knowledge in design can contribute to our world at different paces: when applicable in society, that contribution is more immediate, whereas when it applies to academia only, it is bound to be a long-term contribution, as it adds to the body of research which other researchers can use to advance knowledge, or applied by educators in their lessons, which may contribute to more knowledgeable design graduates and future practitioners.

### ***Knowledge exchange in the research process***

Knowledge exchange implies that the researcher may gather knowledge from different people but also allows for knowledge exchange, that is, knowledge the researcher shares with other people at a generative level of the research process. This kind of knowledge exchange is different from the dissemination that is expected from the researcher throughout the doctoral journey.

Examples of this exchange can be found in projects related to social innovation, which make a valuable contribution to communities through close collaboration during the research process. However, the outcome of the thesis is less palpable

or short-lived outside the scope of the discipline. Involving other people in the research process is particularly important: designers do not and cannot know everything, so, to successfully understand whatever issue needs to be addressed, one must gather insights from others who may know more; either because they are specialists on the subject or because they are immersed in it in their daily lives. This does not mean that the insights from others should be restricted to a diagnosis or evaluation phase. Involving others throughout the project also means that the researcher's analysis will become richer with the growing understanding of different issues and possible approaches.

Thus, we defined five categories to distinguish the different kinds of participation of other people in the research process (Table 18.3), ranging from research conducted in isolation to that made with a community in the process of co-design.

Knowledge produced in isolation was identified in theses which were essentially developed in isolation. While we acknowledge the influence of the supervising team, this level of categorisation means that the knowledge was produced usually by analysing or reflecting on specific existing data or artefacts, without having other people directly involved in the research, thus without knowledge transfer or exchange during the process.

Knowledge produced with inputs was identified in theses which included other people in the research process, generally outside the generative phase.<sup>1</sup> In these cases, knowledge was usually derived from specific feedback (diagnosis) and was subjected to a specific review (evaluation), meaning there is some knowledge transfer but no exchange. Typical examples include diagnosis made through questionnaires or interviews at exploratory stages, where knowledge travels in one direction only (from participant to researcher); expert reviews or usability tests conducted on the final stages of the project, whose feedback is mentioned in the discussion section but do not feed the research process nor influence research outcomes.

Knowledge exchange with academia was identified in theses where members of academia were engaged in the research process. In these cases, knowledge produced involved work with students or educators at a generative level, meaning knowledge transfer further informed the research process. Moreover, because knowledge was produced in cooperation with these students or educators, there

*Table 18.3* Categories for knowledge exchange in doctoral research in design

<i>Knowledge origin</i>	<i>Examples</i>
Knowledge Produced in Isolation	e.g., artefact analysis (no exchange)
Knowledge Produced with Inputs	e.g., seeking people to provide inputs for an initial diagnosis or a final evaluation (no exchange)
Knowledge Exchange with Academia	e.g., educators or students involved in projects, brainstorming sessions or workshops
Knowledge Exchange with Community Representatives	e.g., collaboration at different phases of the research with a sample of people of similar conditions, such as a disability
Knowledge Exchange with Community	e.g., collaboration at different phases of the research with neighbourhoods or corporations/institutions

was also knowledge exchange (e.g., when students do an exercise in which they are also learning). Eggink and Mulder-Nijkamp (2016) recognise the importance of combining research and education in a meaningful way that can contribute to the best educational experience in design. Thus, it is critical to note that making a questionnaire directed to students or educators is not enough to fit this category. That would mean knowledge transfer (from students to researcher) but no exchange. In these cases, co-production within academia should involve projects, exercises, brainstorming sessions or workshops.

Knowledge exchange with community representatives was identified in theses which involved members of society (outside academia) at a generative level of the research process. In these cases, the knowledge was produced in cooperation with specific people who, while not representing a community, have relevant traits that render them suitable to inform the research process. An atypical example still fitting into this category is the case of knowledge deriving (diagnosis) from and being subject to review (evaluation, user testing) by the same people.

Knowledge exchange with community was identified when theses were produced involving the community in collaboration or co-design with social or corporate communities. It means that both researcher and community contributed and learned with the project. These are excluded from this category when, despite involving other people in the research process, it does not involve a broader community in co-design.

### **Testing the map**

This section presents and discusses preliminary findings from applying these new criteria on our database of 110 PhD theses in design concluded at the Lisbon School of Architecture between 2010 and 2021.

Most theses can be positioned according to their scope of applicability and contributions to knowledge. For example, roughly one-third of our sample contributed to context, applicable within academia, which could point us to a clear, quantitative framing of our analysis and result in a quick overview of what is coming out of this doctoral programme. Therefore, this kind of mapping and analysis could be helpful when assessing the strengths and weaknesses of doctoral programmes in design.

However, we choose to focus this chapter on presenting the nuances and questions that emerged during mapping. One example is the relation between knowledge transfer and exchange. In our sample, theses with higher involvement of other people in their research process tend to result in outcomes with a short-term application (as means to the field and society). Could this mean that the more significant the potential of short-term applicability, the more the researcher should involve other people during the research process?

### ***Blurring limits***

We found several doctoral projects falling in between categories. In these cases, theses either contributed with a specific scope of applicability while seeking to make it transferable to a broader scope (e.g., contributions applicable in academia

attempting to contribute directly to the field) or made one kind of contribution to knowledge but began to explore a potentially different one (e.g., outcomes contributing to *vision* while feeling the ground for a potential contribution to *means*).

Within the **scope of applicability**, we find two scenarios:

1. Doctoral outcomes transferable within academia but attempting to apply to the field. One illustrative example is a doctoral project that resulted in a tool tested in a classroom setting and by professional designers. In both settings, the purpose and potential of the tool were praised. However, usability was not. For students, the tool was too complex to be used independently; therefore, they always needed the educator to guide them and fill in the knowledge gaps that hindered their understanding and ability to use the tool. For designers, the tool was too complex and detailed, and therefore time-consuming, to navigate in the fast-paced environment of the design studio. Therefore, the final potential of the research outcome was a tool for educators to guide their students through the complexity of what needs to be acknowledged during the design process rather than a tool for design practice. This suggests that keeping in mind the scope of transferability aimed for the project is essential, as different scopes have different needs.
2. Doctoral outcomes transferable to the field but attempting to apply to society. This frequently happened in research projects focused on social innovation and inclusion, which involved communities in participatory design processes. These projects are highly valued during the research process; however, their application is often temporary and the effects short-lasting. Despite their potential for social innovation, these projects frequently lack human and financial resources to thrive without the researcher or beyond the research project's timeline. This suggests that society may be losing short and long-term benefits of doctoral research in design, and particular efforts should be made to address this issue.

Within the **categorisation of inputs to knowledge**, it frequently happens that doctoral projects contribute to *vision* but also attempt to contribute to *means* (e.g., theories followed by methods). When the contribution is to be transferred to society, what sometimes happens is that the development of means necessarily needs several rounds of iteration, testing and fine-tuning before being ready to implement. The researcher cannot, in their timeframe, conduct these iterations. An example of this is a doctoral project that developed strategies for companies and drafted a process that could not be tried and tested for further trouble-shooting and fine-tuning to become an effective contribution to *means*.

Within academia and the field, contributions to *vision* that aim for *means* tend to happen due to the perceived need to develop more tangible or immediate solutions as doctoral outcomes or to answer a “now what?” question after developing a theory. In these cases, a potential contribution to *means* is trialled to validate the developed theory and not as an objective contribution of the research. Findeli notes how design researchers tend to go beyond “what is going on in the world (descriptive stance)” to “look for what is going wrong in the world (diagnostic stance) in

order, hopefully, to improve the situation” (2010, p. 293), which may explain this need to envision or design potential ways for improvement.

We could argue that a more solid contribution to *means* could be pursued in post-doctoral research as an extent to the contribution to *vision*. However, a more interesting approach may lie in the articulation between doctoral research and master’s programmes – given their frequently practice-based approach, master’s students could be encouraged to explore *means* as a way to test and question the doctoral contributions to *vision*; and a more solid connection between the PhD and master’s programmes could enrich both levels of research.

### ***The misfits***

During our analysis, we were also intrigued by a few theses which could not be placed within our map. The common issue among what we termed “the misfits” was in identifying their kind of contribution to knowledge. What triggered this doubt? A recurring phenomenon across some of these theses was the focus of the research in the development of a specific artefact – a design answer to a design problem – instead of building knowledge. As Veiga et al. (2020) previously noted:

The focus of a design project developed for a PhD should not be located in an artefact that validates a hypothesis, but rather in a practice of designing that is conducted with the deliberate purpose of developing new knowledge that is useful for the whole community.

(p. 177)

In the context of doctoral research, a “design-problem – design-answer” process may be adopted to support the “research problem – research answer” journey but should not be an end in itself. As Findeli (2010) advises, research projects should not be confused with design projects. In the misfits facing this pitfall, final validation (often through usability tests or expert panels) was applied to the design answer to validate the entire research, resulting in theses that do not address the design-answers’ fundamental issues, i.e., the research problem.

One illustrative example is a doctoral project which aimed to address two research questions: how the cultural heritage of a porcelain brand could be transposed to contemporary culture; and how to avoid compulsive replacement of objects, extending their lifespan. The project outcome was a porcelain collection – a design answer to the first question – and the thesis seems to have left the most fundamental question (on prolonging the use of objects) unanswered. In such cases, perhaps the “design-problem – design-answer” process was not framed in the manuscript within the research methodology, or the researcher may have lost the focus of their research problem while wrapping up the thesis. However, we may also associate this issue with a struggle in defining the research problem and research questions within doctoral research in design (further on this issue, see, for example, Findeli, 2010).



The second issue raised by the misfits can be linked to purpose, which is even trickier to tackle. First, note that we are not questioning the usefulness of research – after all, much progress can come from what may at first seem “useless knowledge” (Flexner, 1939/2017). We question, however, the reason why something is done or created. An illustrative example is a research project looking into how design could democratise cultural consumption through the museum store, resulting in a set of strategies to increase consumer spending in museum shops, regardless of what is being consumed. Finally, an illustrative example of how the issues mentioned earlier can intertwine into an atypical doctoral project is one in which a gap in the market was identified to justify the design project of a luggage organiser to improve the comfort of the general air traveller.

Both issues that emerged from our misfit cases add up to further questioning on what kind of contribution to knowledge is expected from a PhD in design. In this tool, we propose a categorisation of types of contributions to knowledge, but it is important to stress that we went from a deductive categorisation to an inductive one – as our preliminary categories radically evolved from the analysis of our sample – which means that applying this mapping to a larger sample may question our current categorisation and result in different categories. Moreover, the current categorisation excludes fundamental questions that must be addressed upstream, namely the purpose of the research project and its distinction from a design project.<sup>2</sup>

### ***Discussion and conclusions***

In this chapter, we presented a set of dimensions to map knowledge transfer and exchange in doctoral research in design; the goal was to better understand the perceived low knowledge transfer from design research to society. We elaborated on the process of defining the parameters of the mapping and how, through the analysis of our sample, we found a new way to look at the problem: the seemingly low knowledge transfer is related to the type of contribution to knowledge and its scope of applicability.

For example, theses contributing to *context* for *academia* seem to have less immediate applicability than theses contributing to *means* for *society*. However, theses contributing to *means* for *society* face more significant risks of being reduced to design projects instead of robust research projects, which raises the need to clarify what contribution to knowledge is expected from doctoral research in design. It is important, of course, to recover the idea argued by Flexner (1939/2017) that the contribution of a thesis does not have to be immediately applicable to be considered useful; in fact, one may argue that a thesis makes a contribution to the extent it generates an answer that is an original contribution to the knowledge of the field.

But what constitutes an advance in knowledge for a discipline like design? For instance, a researcher may get a PhD by studying a designer’s work and describing what he did. In this case, they can clarify and detail what was new about his creative process, what was relevant, or if any new principles or techniques had been introduced that could be built upon by others. On the other hand, the actual design work and artefacts created by the designer do not constitute grounds for the

awarding of a PhD. This point helps clarify the distinction between design practice and design research. Like Langrish (2000) argued

[t]wo different things – battleships and forks – are not made the same just because they are made of steel and two different kinds of research – that done by an artist and that done by a PhD student are not made the same just because they are called research.

(p. 299)

The clarification on what kind(s) of knowledge contribution(s) can be expected from the design research conducted during a PhD is crucial to understand design's role within academia and society at large.

Finally, as a research tool, this mapping can help identify transferability issues (in scope and input, as presented in the section *Blurring Limits*), contributing to a clearer vision of our initial research problem. Therefore, this mapping can contribute to further research on the subject. Furthermore, it may be a valuable tool for students and reviewers to establish the potential contribution to knowledge of a research proposal with greater detail.

### **Supplementary material**

The authors encourage readers to contact the research group for feedback or access to figures, diagrams or other data: [redes@fa.ulisboa.pt](mailto:redes@fa.ulisboa.pt).

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### **Notes**

- 1 We are applying the exploratory – generative – evaluative phases proposed by Martin and Hanington (2012).
- 2 In short, the purpose of a research project should be to generate new knowledge for the discipline of design, whereas the purpose of a design project is to create a new artefact (Friedman, 2000).

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# 19 A study on research methods in design and territory

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## Introduction

In an article entitled “Investigating Design: A Review of Forty Years of Design Research”, Nigan Bayazit (2004, p. 16), following Bruce Archer’s concept,<sup>1</sup> argues that design research is based on a systematic search for knowledge, the way of thinking and acting of the design process, and the way designers idealize and perform their activity.

This way of thinking and acting the design process led to a new approach to the relationship between design and territory in the late 1990s, when it emerged in response to a greater need for intervention and proactivity in the creation of new practices and ways of appreciating territory, either through action research or educational experiences.

This chapter first presents an analysis and understanding of the concept of territory, followed by the different approaches that design has used to analyse territory. It then examines the most used methods in design and territory research and their application.

## Research in design and territory

Territory is a cognitive system used by local society as a framework for consolidating shared languages, experiences, and identities to facilitate the exchange of knowledge between all those involved in the construction of a territory and its meaning (Saquet, 2007). By the end of the 1980s, geography as a science was no longer characterizing territory as a closed entity defined only by endogenous factors, but always in relation, in a logic of proximity and contact. The territory itself changed according to its inhabitants and its boundaries. The house, the village, the city, the local community are elements linked to paths (Zanini, 1997).

Over time, the territory acquires new characteristics as a resource capable of creating values, ready to understand aesthetic, historical, and economic issues.

These three elements influence the constant change of identity and authenticity of a territory, since the identity of a territory is never fixed. It is an evolutionary, dynamic, and constantly evolving process, and each territory is simultaneously local and global (Parente et al., 2017, p. 5).

The valuing of the territory through design allows the use of methods resulting from design experiences that focus on the local community, thus playing an active role in the processes of solving and implementing new products. To analyse the way design has approached the subject of the territory and the understanding of concepts that take hold in time, such as “design in/of/for the territory” (Parente & Sedini, 2017), becomes fundamental.

- Design in the Territory. It considers the territory as a design context in which the design (essentially the product design) acts with its own logic, using innovative materials and interpreting local know-how in original ways.
- Design of Territory. It highlights the role of design in the conception of products as enhancers of the values of a place, reinforcing its identity and visibility.
- Design for Territory. A broader, more inclusive and strategic vision of how to look at a territory. A more active role that generates new practices and new ways of experiencing places, as a leverage for sustainable development, both from an environmental and social point of view and from an economic one.

These three research procedures extend scientific knowledge about territory as the context of the project, territory as the object of intervention, and territory as a system of relationships. Nigel Cross has a similar approach (2006). According to the researcher, the knowledge base consists of three different “sources”: (i) people – idealization is a natural capacity of humans, particularly designers; (ii) processes – through the methods and development of techniques of each designer; and (iii) products – in the forms, materials, and finishes that characterize design. Separated into three categories:

- Design Epistemology. The study of factual knowledge – “knowing how” – i.e., knowledge is essentially grounded in people and their skills.
- Design Praxiology. The study of design practices and processes, considering that knowledge is contained in these very processes and in the way they materialize themselves.
- Design Phenomenology. The study of the form and configuration of artefacts, an implicit knowledge that can be explained through research.

### ***Research methods applied to design and territory***

Research in design should aim to guide practise and contribute to the development of theories and methods (Silva, 2010, p. 84). However, design practise is not research, but can involve inquiry and, in this sense, the creation of new knowledge that goes beyond gathering information and organizing existing knowledge

(Frascara & Winkler, 2008). When applied to the territory, research should be processed in three main moments (Parente, 2016, p. 24):

- See. Interpreting and experiencing the territory through documentary and field research.
- Let see. Showing local communities and stakeholders the possibilities and potentials, both in the research phase (to create collaborative networks and connectivity) and in the final phase (when the results are communicated);
- Fore-see. Create a global design model to identify the specific actions that need to be taken (be it a service, a communication campaign, a new product or merchandising system, etc.).

Once you understand the specific procedures for integrating, analysing, or evaluating the phenomenon of a design object, their application leads to new design ideas based on the designer's prior knowledge. In empirical research, the research design is of utmost importance. The formulation of objectives, questions and hypotheses, experimental design, methods of observation and documentation, analysis and interpretation of data and results are the basis for success.

### *Interdisciplinary literature review*

One of the most commonly used – if not the most used – methods in scientific research is interdisciplinary literature review. It involves not only publications in books or articles, but also a list of references from websites, scientific journals and newspapers, periodicals, videos, lectures, theses and dissertations, historical records, and government reports, in short, any reliable source that can contribute to contact with the object of study under investigation.

O'Grady and O'Grady (2009) define literature review as “a comprehensive examination of all documents, publications, articles, and books dealing with a particular area of study”, while for Tay (2020), “Literature reviews are important resources for scholars. They provide the historical context of a field while offering opinions about its future development”. For Galvão and Ricarte (2020), the method prevents research from being duplicated or, if interesting, allows its reuse for application in other contexts or scales. It also enables the discovery of gaps in studies already conducted, identifies knowledge gaps that need to be filled by new research, improves the selection of keywords, and helps in the formulation of themes, problems, hypotheses, and innovative research methods, in addition to other contributions to the scientific field. In summary, the interdisciplinary literature review has the following objectives:

1. distil information from published sources and summarize the essence of previous research or projects. The review does not need to summarize everything from every source, but summarize the information in a way that makes connections between the various references selected;

2. avoid duplicating research or highlighting gaps in knowledge;
3. to introduce the researcher to a new area of knowledge;
4. contribute to the understanding and explanation of findings from other research methods; and
5. enable the reuse of research findings for application in different contexts or scales.

However, it is important to be aware of its limitations. Some words may mean different concepts in different fields of knowledge. Therefore, special attention should be paid to understanding some specific concepts and using terminologies appropriately. A good review should avoid jargon and explain the basic concepts to someone who is new to the field. The most useful reviews for researchers from other fields are those written in understandable language. It will always be subjective, but the reader needs to be able to tell if it is a “convenient” or a “systematic” review, concepts we explain next. The cost of accessing publications may also be an issue. It is recommended that the facilities of the institution that conducted the research be used.

Considering Grant and Booth (apud Galvão & Ricarte, 2020), 14 categories of literature reviews were identified, with variations ranging from a simple general presentation of a topic to systematic reviews and meta-analyses. However, Prof. Paulo de Carvalho Mattos’ Library (2015) considers three basic types of reviews: narrative, systematic, and integrative.

Narrative review, also called “convenience” review, is a type of review in which the researcher discusses selected scientific works without explicitly stating criteria that led to the formation of the body of knowledge. For this reason, it can be considered as having little scientific basis. Systematic inquiry, on the other hand, is itself a form of scientific inquiry. It uses systematic and explicit methods to collect, select, and evaluate the results of relevant studies. It seeks to understand and put into logical form a large body of documents, especially to examine what is or is not effective in a particular research context. It explicitly presents its bibliographic databases and focuses on reproducibility by other researchers. Finally, the integrative approach proposes to conduct rigorous reviews, combining studies with different methods and areas of knowledge, with the same methodological rigour as systematic reviews. It allows for the combination of data from empirical and theoretical literature. Combining research with different methods in integrative review expands the possibilities of literature review.

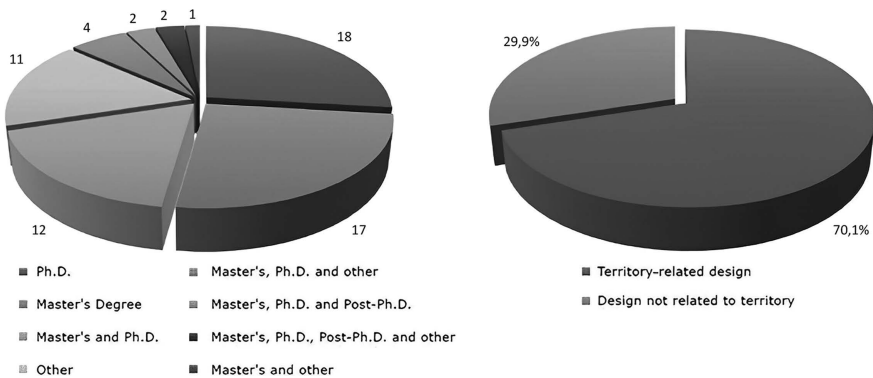
The theoretical framework of a scientific investigation may even encompass a single discipline, but such singularity is rare in design investigations. Design as a practical activity encompasses several aspects that must be considered in the development of a project. This fact leads the designer and the design researcher to deal with information that is not part of their basic academic training, but which, in order to ensure the success of a project or investigation, cannot be ignored or disregarded. For Bonsiepe (2011, p. 231), in developing a project “the designer who relies only on his sensibility and supposed creativity will not get far and may fail”. He illustrates this statement with the example of a designer who is asked to design a sustainable packaging for milk. Such a project requires the search for knowledge about energy profiles and ecological materials, while being unable to approach the challenge only intuitively and find only formal solutions.

Also, according to Redig (1977), the designer must relate areas of knowledge that must – or at least should – always be part of the scope of any project. There would be nine essential areas: anthropology, ecology, economics, ergonomics, philosophy, geometry, marketing, psychology, and technology.

So, we can see that design, as a practical or research activity, is familiar with interdisciplinarity, whether it is related to a specific territory or not. Especially in scientific research in design, interdisciplinarity is evident to varying degrees. To test this statement, we conducted a small original investigation. A short online questionnaire with only three objective questions was shared between May 13 and 17, 2021, exclusively among designers from Portugal and Brazil, through the social networks Facebook and WhatsApp. At the questionnaire’s introduction, it was mentioned that it was a short research project on the topic of “literature review in design research”, in the framework of the research and education in design discipline of the doctoral programme in design at the Faculty of Architecture of the University of Lisbon. It was also made clear that the privacy of the respondents was guaranteed, as participation was anonymous.

During the five days that the questionnaire was available on the Google Forms platform, 67 designers participated in the survey. First, they indicated the level (or levels) at which they had already conducted research in design, ticking the options doctoral, master’s, post-doctoral, and “other”. It was found that a large proportion of the research was conducted during doctoral studies and 70.1% of these researchers had to establish a link between design and a territory (a country, region, city, or district) in at least one study (Figure 19.1).

However, the greatest diversity was evident in the variety of knowledge areas with which these researchers associated their design research. The very content of the questionnaire and the list of response options encouraged this diversity, as in addition to the 14 knowledge areas available for selection, there was also the descriptive option “other”. As the result of this short survey, “Anthropology/Sociology” was the most frequently mentioned knowledge area, followed by “Art in general”, “History”, “Psychology”, “Marketing”, and others. Looking at some of the individual



*Figure 19.1* On the left, the different research levels of the respondents and on the right, the strong presence of territorial themes in design research



responses, we notice examples that indicate the level of complexity that research in design can evoke. One of the researchers, whose topic was related to the territory in at least one study, has conducted a literature review including knowledge in history, medicine, physiology, psychology, education, and literature/linguistics. Another respondent had to synthesize data from anthropology/sociology, history, economics, public management, business management/administration, engineering (production, materials, etc.), and arts in general into a single investigation.

To accommodate this diversity, it is recommended the literature review be systematized in the following steps:

1. narrow the question to be addressed in the review;
2. select databases;
3. develop strategies for advanced searching (by keywords, title, abstract, author, date of publication, or other criteria);
4. use tools to manage references, notes, and comments, such as EndNote, Mendeley, and Zotero;
5. select texts and systematize the information found. Example: If you have found 50 publications on a particular keyword of interest to your research, select a percentage according to a specific criterion that meets the requirements of your research question. As suggested by Jones (1992, p. 204), focus on finding the knowledge that your research does not already have, in the most sophisticated way possible. For example, in design research that aims to clarify how to determine the body measurements of potential users of a product, the researcher should not search for “any information about anthropometry”. Such a search would likely result in a lot of irrelevant information about weight and body measurements. The most efficient text search and selection should take into account “how to do body measurements”; and
6. finally, the use of diagrams to define the areas of knowledge and main authors that a literature review should cover can be a strong ally for the objectivity required for a concise and relevant study.

### *Case study*

The use of case studies in the research of design and territories is gaining increasing recognition, largely due to its flexibility as a method. The researcher has the opportunity to mix or combine quantitative and qualitative techniques, approaches, concepts, and methods in a single study with the aim of analysing multiple aspects of a phenomenon, problem, or real-world situation with intensity and depth (Eisenhardt, 1989, p. 534; Johnson & Onwuegbuzie, 2004, p. 19; Yin, 2009, p. 62).

The questionnaire, individual or group interview, diary, and documentary sources are the most commonly used data collection instruments in a case study. According to Hamel (1997), this variety of ways of collecting information depends only on the nature of the case study and its objective, so several angles of study or analysis can be combined.

In design and territories research, the case study is often used to narrow a field of inquiry that is too broad or when the phenomenon is too new and there is no

established evidence. By answering “how” and “why” questions, the case study provides additional insights: how the intervention is implemented in the field or why a particular strategy is preferred to another.

Case study as a research method begins with the identification of a specific case. This can be defined more concretely as an individual, small group, organization, or partnership and more abstractly as a community, implementation process, or organizational change (Yin, 1993; Stake, 1999; Rodríguez et al., 1999).

The report must be clear, concise, and objective, the design must include the purpose of the study, the methods used, and the techniques chosen for data analysis (Ludwig, 2015). It is usually carried out using a specific case and then a comparative analysis is carried out with other cases (Cajueiro, 2015). It implies the use of several data collection techniques, such as interviews (structured, semi-structured, or unstructured), documents (scientific articles, diaries, newspapers, protocols, etc.), questionnaires (open, closed, or mixed questions), and observations (spontaneous, systematic, or participatory). Their scope is based on:

1. interpreting a complex issue through a detailed contextual analysis of a limited number of events and their relationships;
2. applying different methods and using multiple sources to investigate a research problem;
3. expanding or strengthening knowledge of what is already known through previous research;
4. examining current reality and supporting the application of concepts and theories or the extension of methods; and
5. providing more accurate information from specific and rare cases (Yin, 2009).

However, being a less systematized and comprehensive method, the analyses of different case studies differ relatively in their approach and methodological design, which may lead to some weaknesses, such as the use of a single or a small number of cases may be insufficient to establish reliability or generalize results from a larger population; the absence of important information hampers the interpretation of the case; a case study too extensive may affect the researcher’s interpretation of the results; the selected case may not be representative of the main problem under study; and if the selection is to represent a unique phenomenon or problem for the study, the interpretation of the results may only apply to that particular case (Yin, 2009).

Adapting the case study method developed by Yin to design and territories research, some requirements had to be adjusted (Teegavarapu et al., 2008, p. 7), namely:

- In problem definition: to help determine the main question, formulate the hypothesis, form theories, and define the units of analysis in context.
- In data collection: to help find data in the design principles, be adaptable to qualitative and quantitative studies, accept indirect observation of variables, be suitable for statistically invalid sample sizes, and be able to obtain implicit and explicit information from the subject.

- Data analysis and conclusions: to help analyse/interpret data by introducing specific techniques, help generalize results, and provide means for validation.

In short, the case study method in design and territory research does not require a large sample, seeks analytical generalization, employs various methods of data collection and analysis, and uses data triangulation to converge the information collected to assess the consistency and reliability of the study. All this is done in the context of the problem and with minimal intervention. However, case studies are limited in their representativeness and generalization and cannot predict all causal effects of variables.

### ***Co-design***

The evolution in design research from a user-centred approach creates new domains of collective creativity and the development of the designer's role. Thus, the relevance of co-design with stakeholders in design and territory research focuses on identifying how participatory study methods involving the local community, applied in design research for the territory, are relevant to understanding the territory.

Co-design is a complex, sometimes contradictory and antagonistic process, in which different stakeholders (including designers) present their skills and culture in a collaborative study method. It can be seen as a social conversation in which all participants can exchange and generate ideas, even if these ideas may create problems and tensions (Manzini, 2015).

The notion that people have different voices and opinions is fundamental to the elaboration of a collaborative design process divided into different phases and formats, which can result in a relevant and diverse set of data (Meroni et al., 2018). Thus, involving people as subjects – rather than objects – in a co-design process where the study object is the territory could lead to both knowledge about the community and a design knowledge to be worked out with and for the community.

In co-design, several people collectively explore, define, develop, and evaluate solutions for a given problem. “A process in which participants are able to express and share their experiences, to discuss and negotiate their roles and interests, and to jointly bring about positive change” (Steen, 2013). In this sense, one should reflect on the importance of stakeholders as a target to acquire knowledge and experiences from different cultures.

The way the designer interacts with stakeholders influences the effectiveness of the process. To this end, it is important to outline a guidance style that is appropriate to the circumstances of a co-design initiative. Thus, we can argue that the orientation approach to a stakeholder in co-design can vary between two attitudes (Meroni et al., 2018):

- Active listening. Promotes the free flow of thoughts and the growth of empathy and sympathy among participants.
- Thought-provoking. Allows participants to generate thoughts and ideas to generate responses and solutions to a given problem.

The importance of these two perspectives can be seen through “the creation of a collaborative environment aimed at ‘making things happen’ depends on the understanding of the values, needs and behaviours of such diversified players” (Meroni et al., 2018). With this point of view, two areas of competence are involved: the first one is the ability to achieve knowledge about the community and its “habitat”, and the second one should be the ability of collaborating with non-designers in a creative way.

## **Conclusions**

This chapter aims to improve the knowledge of design methods in the study of territory. Therefore, a preliminary study defined design research and how it can be applied when the subject is the territory. Some of the most used methods in design and territory research were analysed, identifying interdisciplinary literature review, case studies, and co-design as significant. Analysing each of these methods and how they can be best applied to the field, it was concluded that:

- Interdisciplinary literature review is a fundamental step in the investigation or development of projects related to territories. The historical, anthropological, and sociological aspects of a territory must not be dissociated from the other areas of knowledge involved in the investigation, which can range from public management to art, passing through disciplines as diverse as medicine or tourism. Design investigations are, by nature, comprehensive and may require a high degree of complexity. Therefore, studying the different disciplines that will be interactively present in a research project requires methodological clarity to conduct the investigation with a knowledge balance.
- Case study is useful when the problem starts from a “how” or “why” and when the theoretical framework of the research and its objectives are clear. However, it requires thoughtful reflection from the researcher about its qualitative/quantitative aspects, its higher or lower holistic nature, the lack of systematization and the possibility of generalizing the results.
- Co-design is a collaborative, design-oriented method that resorts to the involvement of stakeholders. It allows different actors to actively collaborate with knowledge, experiences and values that make possible finding multiple solutions to problems related to the territory. When researching design and territory, one should think about the importance of stakeholders as a source of knowledge and experiences from different cultures. Co-design should be seen, in this perspective, as a set of methods and tools useful for experimenting new models of collaboration that allows key stakeholders to work together and find innovative solutions.

## ***Acknowledgements***

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**Note**

- 1 “Design research is systematic inquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value, and meaning in man-made things” (Archer, 1981, p. 30).

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## 20 Photovoice and research with children in design and architecture – proximity between researchers and research subjects

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### Introduction

Speaking about the Right to the City, the Instituto Pólis states that all citizens build the city little by little in their everyday life, having the right to inhabit, use, occupy, produce, rule and enjoy cities on an equal basis. Originally outlined by Lefebvre (1968), the Right to the City is a human and collective right concerning both present and future generations.<sup>1</sup> The challenges of contemporary cities highlight the urgency to value and include local knowledge, energies and creative powers of all urban dwellers. In particular, children, individuals, groups and communities living in marginal and vulnerable contexts need to be considered for the democratic transformation of the whole society and the city itself.

As highlighted by Enrique Peñalosa (Peñalosa & Ives, 2004/2021), former Mayor of Bogotá, “children are a kind of indicator species. If we can build a successful city for children, we will have a successful city for all people”. Defining Child Friendly Cities based on the Convention on the Rights of the Child (Office of the High Commissioner for Human Rights, 1990), the United Nations Children’s Fund (UNICEF) states that “every child has the right to grow up in an environment where they feel safe and secure, have access to basic services, and clean air and water, can play, learn and grow where their voice is heard and matters” (UNICEF, 2019).<sup>2</sup> By listening to what they like the most and/or are lacking in their daily lives, to their concerns and dreams, to their own voices and how they look at the spaces they inhabit (different from adults’ look), we will be helping to guarantee their rights and children will be able to contribute to the construction of more just and inclusive cities. However, their participation in decision-making processes is still very marginal. Considering children as agents of change, “rights’ active subjects, authors of their history, relevant interlocutors and experts in the

understanding of their own ways of life”<sup>3</sup> (Fernandes & Caputo, 2020, p. 16) and recognizing the importance of their voice (Cohn, 2005) in the discussion about the places supporting their material and social existence, it is necessary to widen their active involvement by providing suitable mechanisms to promote their effective participation in decision-making processes of city construction.

Regarding the involvement of children in design and architecture projects, Melo et al. (2008) consider it crucial for the co-authorship of products (and spaces) for their use, also including them into the construction of meaning and the possibility of their direct participation throughout the entire process. Sharing and understanding their universe and incorporating their ideas into a proposal means designing more meaningful places to them. In the context of research with children aiming to transform the city, learning from them should begin with the choice of methodologies and tools appropriate for the age group we’re working with. Working with children requires a different approach from the one we usually have with adults. As Santos and Guimarães (2021, p. 232) state:

In research with children, traditional approaches, including interviews and surveys in their most established forms, won’t be able to handle the task of gathering information from this public in an efficient and effective way. Using pure quantitative and qualitative methods, not adapted to children’s universe, may result in objective answers, leaving aside important nuances of meaning that could be transformed into project requirements.<sup>4</sup>

Also, for Santos and Guimarães (2021, p. 232):

To understand the desires and needs of this public [the children], there are several strategies to be adopted by researchers/technicians, to get project answers. These strategies are efficient, not just to ask the children questions and expecting objective answers, but also to enable a deeper look, facilitating the access to information beyond what they can verbalize. To include these aspects and to look at the world through the eyes of the subjects, direct and participant observation, inherent to anthropology, as well as the theories of child development, may provide this proximity with children’s universe and their understanding of the world.<sup>5</sup>

Accordingly, starting from the need to adapt the research methodology to the children’s empirical universe, the authors adopted the photovoice as a tool for producing research data. The photographic language is widely spread, and the use of this technique does not present big obstacles for the children. It also promotes proximity between researchers and these peculiar research subjects, amplifying their voices. Based on the photographs produced, the authors worked with the children to create new paths for (re)thinking the city in a more just and inclusive way.



The photovoice constitutes a participatory action-research tool in which the subjects portray their own reality through photographs, guided by the research object. According to Wang and Burris (1997, p. 369):

[Photovoice] is a process by which people can identify, represent, and enhance their community through a specific photographic technique. It entrusts cameras to the hands of people to enable them to act as recorders, and potential catalysts for social action and change, in their own communities. It uses the immediacy of the visual image and accompanying stories to furnish evidence and to promote an effective, participatory means of sharing expertise to create healthful public policy.

Research methodologies using photographs to produce research data can be found in the literature as participatory photography or photovoice (Wang & Burris, 1997), photo-elicitation (Harper, 2002), photo studies (Martin & Hanington, 2012) and picture cards (Martin & Hanington, 2012), among others. Despite their different names and slightly different specific characteristics, these forms of data collection, quite widespread in the social sciences, aim to foster the protagonism of the research subjects into the processes so that they can express their vision of the world according to their own wishes and needs, although guided by the research object. In this study, photovoice methodology was elected as it allows research subjects to produce their own images, directly recording them with the help of cameras. In a photovoice, the perception and interpretation of reality happens through the act of producing images, which are the result of a set of choices reflecting the imaginary of the one recording them (Meirinho, 2016). The images resulting from these records have the potential to constitute an important resource to enhance the dialogue and the proximity between researchers and children as research subjects.

The text discusses how the photovoice action *A Minha Cidade pelos Meus Olhos: fotografia participativa com crianças das margens urbanas de Lisboa*,<sup>6</sup> used as strategy to produce data within the framework of participatory research with children in the fields of design and architecture, promoted proximity between researchers and children research subjects and what the benefits are of this proximity. After a brief description of the action, the implementation process of the action will be discussed, highlighting its successes and limits, gains and gaps in achieving the objectives of the action through this type of approach.<sup>7</sup>

### **Context and application of the method**

Held through a photovoice process, My City through My Eyes is an action of participatory research developed by the authors to achieve part of the objectives of their doctoral studies in design – on children's participation in the planning of play spaces and equipment on urban margins – and in architecture – on participatory processes and requalification of the self-produced marginal city.

The photovoice process presented here was part of the study *Vozes do Direito à Cidade – fotografia participativa com as crianças do Bairro da Torre e do Alto*

*da Cova da Moura*<sup>8</sup> (Arma, 2022), which started in 2018 as part of the seminar Right to the City (1968–2018),<sup>9</sup> of Grupo de Estudos Sócio-Territoriais, Urbanos e de Ação Local (GESTUAL) of the School of Architecture of the University of Lisbon (FAUL).<sup>10</sup> The action *A Minha Cidade pelos Meus Olhos* proposed in 2021 and held within the framework of the same study, involved participants from 2018 still living in Bairro da Torre (self-produced<sup>11</sup> suburb in Greater Lisbon), as well as those who had been rehoused from this neighbourhood to distant social housing neighbourhoods (also in Greater Lisbon). In the context of architecture and related to the ongoing research of Rosa Arma, the aim of the study was to understand, through the photographic records of the children and the stories they reported based on their photographs, the transformations the neighbourhood underwent after the intensive rehousing process, as well as their perception of the new places to which children had to move, leading them to face new spaces, new relationships and a completely new everyday life. The process also aimed to stimulate in the children their capacity to read and interpret the spaces they inhabit, to recognize their personal and community identity and to know their rights, in order to strengthen their sense of belonging and active citizenship. Within the framework of the design field of knowledge and the research of Camila Andrade dos Santos on the right to play and the participatory design of play spaces and equipment in marginal urban areas, the action aimed to understand which formal and informal spaces children choose to play in within their neighbourhoods. The purpose was to understand how these places are characterized, how important the existence of these spaces is and, above all, what children, as users, would change if they had the power to do so.

Nine children of Roma ethnicity (seven) and of African origin (two), aged between six and 14 years, four girls and five boys, took part in the action *My City through My Eyes*. Initially, we contacted the parents or legal tutors and the children to confirm their availability to participate in the new action. During a first visit to the families, we provided the participants with a disposable camera and a script (Figure 20.1) to guide their photographic record. We explained the activity and the objectives of the new photovoice process to our research subjects, giving them basic instructions about photography and the use of the cameras, and collected the necessary authorizations.

The scripts given to the children were designed in a playful manner, with graphic elements from their everyday lives to make them more attractive. They included, in addition to the title of the activity, a space for the children to fill in their name, age and neighbourhood, as well as to take notes. The script also contained a short introduction and some questions aimed at stimulating in the participants a more attentive and critical observation of their reality. They were asked to answer these questions through their photographs.

Think about the place where you live, where you play, near your home, in your neighbourhood, or near your school. Maybe a little space in your house, all yours, a street, a tree, a square where you like to be alone or with your family and friends. Observe: what is good about these places? And bad? How did they change? And take photographs. Talk to your family and friends and show

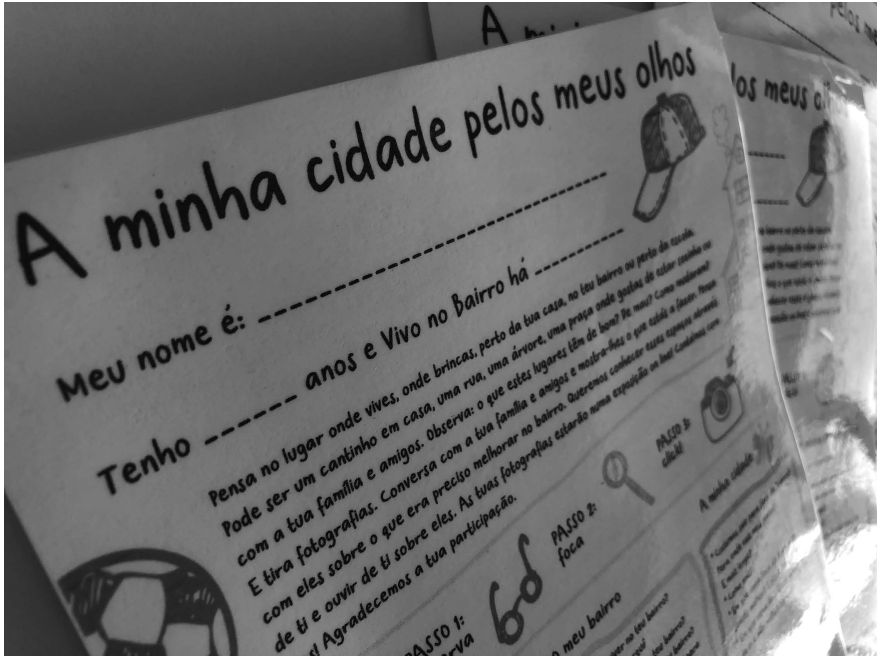


Figure 20.1 Script guiding children's photographic records. Camila Andrade dos Santos (2021)

them what you are doing. Think with them about what could be improved in the neighbourhood. We'd like to get to know those spaces through you and hear about them from you. Your photos will be exposed in an online exhibition! We are counting on you! We thank you for your participation.<sup>12</sup>

The following observation topics were identified in the script: “My house”; “My neighbourhood”; “My city”; “The way I play”; “Green areas and safety in the neighbourhood”, containing questions such as “What do you think your neighbourhood is lacking to make you like it more?” and “Are there playgrounds? Do you like them?” During the time the cameras were with the children, we contacted them to check whether the activities were going well and to clarify any doubts. Later, we returned to the families to collect the cameras and develop the photographs. During a third visit, we had a conversation with the children to review their photographs together. Through a semi-structured interview (whose script was prepared based on a preliminary analysis of the photographic records), we asked the children to reflect on the captured images and the places they portrayed, expressing their points of view. We also displayed the photographs they took in 2018 and invited them to remember and reflect on the changes that had occurred in their lives, comparing the spaces they currently inhabit and those they previously inhabited (Figure 20.2).

In the interviews, the participants were asked to select their favourite photographs, which we printed on paper and donated to their authors. A content analysis of the images produced by the participants and the interviews was carried out. The action



*Figure 20.2* Conversation between the researchers and participants about their pictures.  
Rosa Arma (2021)

concluded with two exhibitions (one at FAUL<sup>13</sup> and the other at a charity fair organized by the neighbourhood association) considering the dissemination of the photographs as a fundamental stage of all photovoice processes, spreading the young authors' voices and allowing them to be heard and considered (Blackman & Fairey, 2007).

### **Perceptions on the applied method**

Participatory research presumes the construction, sometimes over years, of relationships of trust with the interlocutors as a condition for their capacity to open up and for genuinely knowing and understanding their everyday. The direct and prolonged contact with the Bairro da Torre community by GESTUAL made it possible to create the conditions for the families involved to welcome the study and the researchers into their own homes.

The limited number of participants depended on the availability (and willingness) of the children who completed the action in 2018 to participate in a new action three years later. The first group was joined by two children who did not participate in the first action but expressed their interest in the activity. Only one child was not interested in continuing in the study. Contact with two other participants was lost after their rehousing.

Each child was contacted individually because, besides the pandemic context, at the time we proposed the action, only two families were still living in Bairro da

Torre, while the others, as mentioned, had been rehoused to other neighbourhoods in Greater Lisbon. The lack of a suitable collective discussion resulted in the possibility for the emergence of a dimension of “family participation” in the study. The families showed great interest in understanding the study and its objectives and in being present throughout the process. They were very collaborative in helping the children with the production of their photographs and were involved in the conversations between the researchers and the children about the images they produced, also contributing to the discussion. The final exhibition of the photographs was intended to create an opportunity for the children and their families to see and discuss each other’s photographs, partially restoring the dimension of exchange and collective discussion that is suitable for all photovoice processes and was lacking in our action. Such moments can also contribute to the (re)construction of the sense of community and belonging which was deeply affected by the rehousing process.

Disposable analogue cameras (Figure 20.3) were given to children for their ease of use and due to the limited access to technology among some of the participants. They were already familiar with this kind of camera, as the same type was used in the first action in 2018. The analogue photographic tools present some disadvantages compared to modern mobile phones or digital cameras, such as the limitation on the number of exposures on the film (only 27 in our case) and the irreversibility of the act of photographing (it is not possible to delete the photos from these devices). At the same time, we chose to use these cameras because these limitations have great potential to promote a more attentive and careful observation by the photographer before capturing an image, which, in the case of disposable analogue cameras, involves looking first inside a small viewfinder. This picture-taking process led the children to operate in a “slower time”, during which they also had to wait for the development of their pictures to “see how they looked”. Therefore, they were surprised by the results and, in some cases, by potential mistakes in



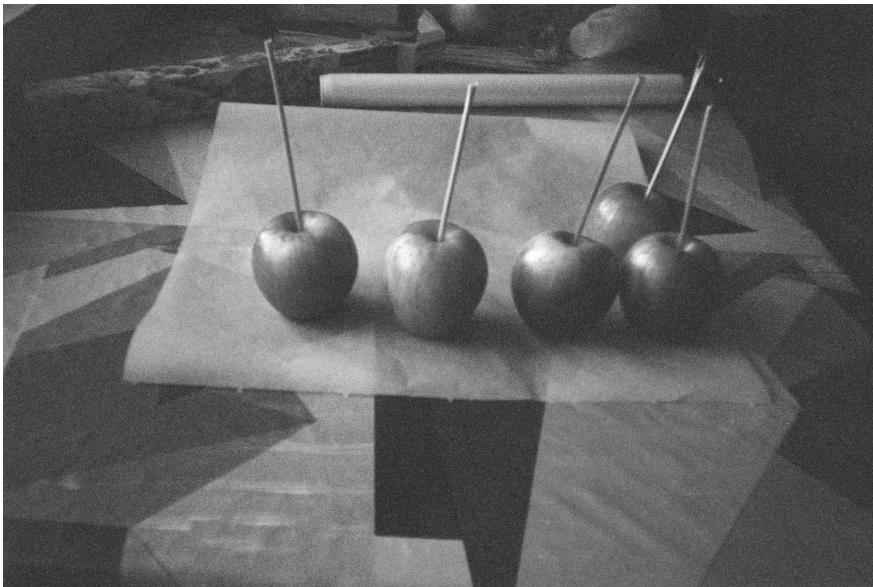
*Figure 20.3* Disposable analogue cameras provided to children to photograph. Camila Andrade dos Santos (2021)

framing, light or obstacles (like their own fingers) that interfered with subjects, situations and objects they intended to represent.

The participants showed great curiosity and enjoyment of the activity. The children took their cameras with them to capture the diverse spaces of their daily lives at different moments. They photographed the interior of their homes, the view through their bedroom windows, the school and other facilities in the neighbourhood or outside where they usually go and spend time. They also captured the spaces where they play and meet their friends and family, community gatherings as well as everyday family life situations that make them happy, such as preparing “love apples” (caramelized apples) at home (Figure 20.4). They stated that through participating in the photovoice, they deepened their knowledge of the spaces supporting their everyday life.

Children were also able to express and broadcast their points of view about their places through visual media and conversations, engaging in critical reflection with their families and the researchers, using their own images as a starting point for the discussion.

As the outputs of the activity briefly presented here point out, due to its ease of application, its participatory nature and the engaging dynamics for the children, the photovoice process described contributed, as research methodology, to fostering proximity between researchers and child research subjects. This approach stimulated their participation (they “had a voice”) and creative capacities, encouraged dialogue and, above all, facilitated thinking about the spaces of the city they inhabit, starting from and together with them, which was the main objective of the action.



*Figure 20.4* The “love apples”. Participant (2021)

### Concluding note

As a tool for participatory action research, photovoice functions as a relational practice, bringing together the researcher and the research subjects in a knowledge built on dialogue, understood by Freire (1987, p. 80) as “the meeting of men for the common task of knowing how to act”,<sup>14</sup> that is, for the joint search for more just solutions for their condition. The photovoice process, as envisioned and described here, provided the opportunity for close interaction between the researchers, the children and their families living in the urban margins of Lisbon. Their portraits (including both their photographs and the stories they told related to them) allowed us to identify their concerns and wishes about their own space, both at the individual and community level, making visible the factors of socio-spatial exclusion, as well as its hidden energy. The incorporation of children’s visions regarding their context aims to deconstruct stereotypes and collectively construct another knowledge about urban margins, contributing to the imagination of other approaches of intervention in design and architecture. By including local agents as co-authors of the transformation of their places and products for their use, tools of proximity between researchers and research subjects (such as the photovoice) help prioritize the specificities of each place. They also highlight the imperative of knowing and understanding it through deep immersion in the field, as a fundamental stage of intervention in urban margins. Such tools can thus contribute to learning how to observe and to transform the city more creatively and collectively.

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### Notes

- 1 In: Retrieved November 27, 2021, from <https://polis.org.br/direito-a-cidade/o-que-e-direito-a-cidade/>
- 2 In: Retrieved November 27, 2021, from <https://childfriendlycities.org/>
- 3 Authors’ translation.
- 4 Authors’ translation.
- 5 Authors’ translation.
- 6 My City through My Eyes: participative photography with children from the urban margins of Greater Lisbon.
- 7 In the context of this chapter, the purpose is to reflect on photovoice as a tool of proximity between researchers and children research subjects in the fields of design and architecture, that’s why results on children’s vision about their space won’t be presented here.
- 8 Voices of the Right to the City: participatory photography with children from the Bairro da Torre and Alto da Cova da Moura.

- 9 The seminar was held within the Africa Habitat research project coordinated by Isabel Raposo, architect-urban planner and former professor at FAUL, and funded by FCT – Fundação para a Ciência e a Tecnologia and Aga Khan Development Network.
- 10 As part of the seminar, an exhibition of photographs was organized at FAUL, including the images produced by the children from Bairro da Torre and Alto da Cova da Moura.
- 11 The notion of “self-production” emerged among researchers of GESTUAL and refers to the production of space as addressed by Lefebvre (1974) and not only to self-construction.
- 12 Text of the introduction to the activity inside the script provided to the children with the cameras (Figure 20.1).
- 13 As part of the Portugal PDC Place in 2022.
- 14 Authors’ translation.

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# 21 The DNA manifesto – its impact and challenges for design education

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## Introduction

Can we imagine a future world where even manufactured objects encode their own genetic information? Since objects are manufactured from natural resources, why should there be a divide between natural and artificial worlds? Why not consider objects as living beings with whom we share our lives and interact in close proximity? By giving them life, would they not be better integrated into the natural ecosystem and in the regeneration of the environment?

These are the questions that led to the DNA manifesto. Resulting from a major research-creation project involving a team of design researchers from two universities and nine graduate students, the project took the form of an interactive exhibition based on the metaphor of a scientific research lab where visitors are invited to envision objects from an unusual perspective, as if they were living creatures (Figure 21.1).

The point of departure of this project finds its origin through an overwhelming observation: the current economic model based on unlimited growth of production and consumption leads to the catastrophic environmental repercussions that we are currently facing. Natural resources are more and more limited and scarce, fossil fuel energy and greenhouse gas emissions lead to the warming of the atmosphere. The quality of soil, water and air is rapidly degrading, and this has dramatic consequences on human health, as well as the flora and fauna. As many ecologists are arguing, it is urgent to shift from the current model, based on constant linear growth, to a circular and cyclical model that is found in the natural world.

## Part 1. The DNA project, theoretical framework and manifesto

Benyus (2002) argues that “When we look at what is truly sustainable, the only real model that has worked over long periods of time is the natural world” (p. 3). The theoretical framework of this research project stems from speculative design (Dunne & Raby, 2013), the principles of biomimicry (Benyus, 2002) and the ‘Cradle to Cradle’ approach (McDonough & Braungart, 2002) while borrowing from the tradition of the manifesto in design and in the arts. A manifesto is understood as a written statement declaring publicly the intentions, motives or views of its



*Figure 21.1* The DNA expo presents the X-ray of an object

issuer. The objectives focus on taking a stand, exposing a program of action and provoking a change of paradigm whether in political, economic, artistic or social spheres. The manifesto proposed here aims to redefine our relationship with objects by considering them not as inanimate objects, but rather as living beings, hence the reference to DNA, i.e., the genetic code bringing together all life forms and determining the physical traits and characteristics of the human, animal and plant kingdoms. This conceptual approach has proven to be a fruitful tool for generating innovative ideas concerning our relationship with objects and allowed us to grasp more acutely the challenges of sustainable development (Figure 21.2).

### *The DNA manifesto*

In the future, objects will . . .

1. Reveal their anatomy
2. Declare their impacts
3. Tell their story
4. Express their emotions
5. Care for their descendants
6. Communicate amongst each other
7. Be free

In the statements of the manifesto, objects are associated with the characteristics of living beings, and it is with this speculative idea in mind that we can envision a sustainable future for the world of objects. Once again, if objects have the characteristics of living beings, they should follow the sustainable traits found in the natural world. This general framework, i.e., borrowing from the living world, biology and DNA, comes from the principles of biomimicry, which determines that the optimal ecological system is that of nature, hence the importance of mimicking



*Figure 21.2* An object displayed like an organ in formalin

this model. As J. Benyus (2002) points out, the ecosystem is based on a process of regulation and equilibrium (homeostasis) and regenerates itself; McDonough and Braungart (2002) specify that there is no waste in nature, the leaves of trees falling on the ground are not pollutants, but rather nutrients allowing soil regeneration and the survival of insects and microscopic organisms. Nature is thus the model to follow to allow real sustainable development, as it is based on renewable energies (wind and solar), reuse and biodegradable materials.

As mentioned earlier, the DNA project led to the creation of an interactive exposition where the public is called to play the game of speculation and envision objects as living organisms (Figure 21.3). To make the exhibition conceptually coherent, it was decided that each statement of the manifesto would be represented in the form of a ‘laboratory desk’ to explore each theme more in depth. These backlit modules integrate interactive elements, images, graphics, sounds and videos. The exhibit also features objects in formalin, much like laboratory organ conservation methods, adding to both the immersive and intriguing effect of the exposition.

### ***1. In the future, objects will reveal their anatomy***

The manifesto’s first statement states that “in the future, objects will reveal their anatomy,” that is, the materials they are made from, such as the organs of the



*Figure 21.3* The DNA exposition scenography evokes a scientific research lab

human body. More and more, objects are designed as sealed shells and nothing is known about the internal parts and materials. In addition, it has become difficult to open or disassemble them, which prevents any form of repair. The parallel can be drawn with the human body before modern medical science and the X-ray discovery. By learning about the anatomy of the human body, we have been able to detect diseases, observe broken bones and reveal clawed blood vessels. By disclosing the internal anatomy of the objects, we will be able to find out if a product contains toxic materials or if its life expectancy is likely to be reduced due to a defect or ‘malformation’, in the same way that we can identify diseases in the human body.

This module offers different ways to explore objects in order to discover what is hidden behind their ‘shell’. The visitor discovers sections of objects, X-rays that reveal internal components, such as those that allow us to see the human skeletal system. Moreover, by manipulating a button that activates an infrared ray, we can literally scan an object in real time, to discover every internal detail through a 3D animation projected on a screen. This module transports us into a futuristic world where, with a simple gesture, a scanner can show a detailed image of the internal parts of a product.

## **2. Declare their impacts**

Today, an object is sold with instructions and sometimes with a limited warranty; however, the environmental footprint associated with its fabrication is not specified. In the future, it should be possible for users to know the environmental impact of objects through a life cycle analysis (LCA), that is to say the overall environmental impact, accessible at the time of the purchase. From the extraction of natural

resources, all stages in the making of an object have impacts on air, water and soil. To this must be added the energy required to transform these resources into materials and to transport them by land, air or sea. This exhibition module makes it possible to visualize, using a 3D representation of the planet, the impacts of an object as common as a domestic kettle. An interactive installation allows visitors to find out which solution has a greater impact on the planet's resources: the glass kettle that heats up on the stove or the plastic one that you plug into an electrical outlet? In this case, the visitors are invited to manipulate the kettle as if they were pouring water into a cup. This manipulation generates a 3D animation that shows the impact on the planet: craters slowly form to represent the extraction of ores – silica, metals or oil; then clouds of dark fumes appear to signify air pollution. Simultaneously, graphic scales reveal the impact of each kettle on four LCA indicators, namely, the impact on human health, the quality of ecosystems, the carbon footprint and the depletion of non-renewable natural resources.

### **3. *Tell their story***

In our throw-away society, broken or out-of-service items usually end up in the dump; there are fewer and fewer means or interest in extending their life – parts are no longer available, repair costs are becoming too high, etc., so they lose all their value. Yet every object has a story to tell, it was acquired to meet a need or was given as a gift to bring joy to a loved one. In a way, the object has followed the course of an individual or a family, it has been a travel companion, a witness to scenes of everyday life, and thus has recorded a story that deserves to be shared. At the time of the artisanal manufacture of furniture, for example, the worn wood took a particular patina, the leather became more flexible, these traces of aging gave character and a memory which added value to the objects. This is not the case in the current trend found in object design, where products' glossy surfaces degrade or crack at the slightest impact, losing their aesthetic appeal, thus contributing to their obsolescence.

To regain their historical value, objects in the future should be designed to last and to be disassembled (a principle referred to as 'Design for Disassembly' [DFD]). This will add more flexibility for maintenance and bring users to take care of them, repair them and prolong their lives, as was done in the days of the handicraft. This module shows the fragments of a broken object (a hair dryer) like an archaeological artifact that needs to be reconstructed (Figure 21.4). The object presented then reassembled takes the precious and unique form of a kintsugi artwork, i.e., a Japanese method to repair broken ceramics using lacquer sprinkled with gold powder. In this case, the repair adds value to the object by giving it a unique appearance and a new, sophisticated aesthetic. As a philosophy, it treats breakage and repair as part of the history of an object, rather than something to disguise.

### **4. *Express their emotions***

A number of designer-researchers (Chapman, 2005; Norman, 2004; Rose, 2014) evoke the idea of maintaining an emotional relationship with objects as a strategy



*Figure 21.4* This module shows the fragments of a broken object (a hair dryer) like an archaeological artifact that needs to be reconstructed

to prolong their lifespan. Can we share feelings with objects? Develop an emotional attachment, like the one we have with our domestic animals? How can this emotional connection be expressed? Through a sound and tactile interaction, we discover in this module objects that have a personality and character. Visitors can press different buttons and controls of four objects on display, which generates different sounds whose effect is sure to surprise. We thus discover the sensitive and ticklish iron, the cheerful fan, the grumpy toaster, the curious portable radio; each object reveals its own and endearing character. By creating a special emotional bond with an object, users will be called to take care of them in order to keep them for a long period.

### ***5. Care for their descendants***

It seems today that there is no clear strategy to deal with the end of life of objects. Repair is often more costly than replacement, and technical obsolescence frequently renders objects prematurely useless. The only alternative becomes the trash bin. Would it not be more reasonable to recognize the value of the natural resources of which objects are composed, rather than throwing them into the trash? In all of history, humans have elaborated rituals of mourning to deal with death. Most individuals seek to care for their descendants by donating their organs and by leaving an inheritance to their children. Why should it be any different with objects? In the future, we have to develop strategies for the re-utilization of objects' component parts, as well as for the recycling of materials and composting of all organic matters, which is in line with the principles of the circular economy based on the cyclical model of nature (Figure 21.5).



*Figure 21.5* This module presents various molds of cell phone cases in which a substrate of hemp and mycelium grows, to fabricate a completely biodegradable product

## **6. *Communicate amongst each other***

Just as human beings, objects will be able to communicate. Indeed, the next step in the digital revolution leads to interconnected objects, defined as ‘the Internet of Things’ (IoT). Objects will acquire the capacity of storing data and sharing information with each other. In the future, we will have the ability to remotely consult an inventory of the contents of our fridge, we will have access to usage statistics on every electric appliance in our home as well as information specifying the energy consumption of each item. Our shirt will monitor our pulse, evaluate our level of stress and send this information to our car so that it can activate the appropriate driver assist modules. Each of our possessions will be geolocated and its operation remotely tracked. The Internet of Things will bring great advantages to users, but this revolution should be informed by ethical considerations. In a world where objects accumulate data and communicate personal information to each other, we should be wary of the potential menace this could represent to the privacy of our lives. In this module, we see a display of objects sending information in the form of light rays, constantly flashing back and forth, to illustrate the data exchange in the Internet of Things. How does this relate to the natural world? More and more, a

number of biologists such as Wohlleben (2016) underline that the roots of trees exchange information:

Some are calling it the ‘wood-wide web’, all the trees here, and in every forest that is not too damaged, are connected to each other through underground fungal networks. Trees share water and nutrients through the networks, and also use them to communicate. They send distress signals about drought and disease, for example, or insect attacks, and other trees alter their behavior when they receive these messages.

(Peter Wohlleben, Retrieved October 23, 2021,  
from [www.smithsonianmag.com/science-nature/the-whispering-trees-180968084/](http://www.smithsonianmag.com/science-nature/the-whispering-trees-180968084/))

## **7. *Be free***

Should we own an item or use the service it provides us? The rental of self-service items has already started in the sharing economy (shared cars, house exchanges, urban bicycle rental), which puts into question the idea of possession. Moreover, with the evolution of artificial intelligence, by being connected and by storing information, objects will come to develop an awareness of their reality and be able to compare their existence with that of other objects. In the future, objects that are mistreated, poorly maintained or who realize they are not being used enough will have a new path – the freedom to leave their owner to engage in new relationships. The last exhibition module takes a humoristic approach, by presenting pending legal cases in the form of letters submitted by ‘misused’ objects to their owner:

Farewell letter from a food processor:

Dear Lucie, I am writing to you today to tell you that I am going to leave you. You no longer see me, no longer consider me. . . . Besides, have you ever had any consideration for what I do for you? In the 10 years we’ve been together, you’ve only taken me out on six occasions! Most of the time I’m in the back of the closet, in the dark. Worse, you push me around, you say I take up too much space. I’ve been realizing for years that I’m nothing to you; I can’t take it anymore. I’ve finally found someone who really recognizes me for who I am and who dreams of what we can achieve together. A drone will pick me up tomorrow at dawn, please don’t try to contact me, it’s over.

The objects will be there to be of service, but owning them should no longer be taken for granted in the proposed prospective scenario. Why acquire objects that use resources and energy if one does not use them? The exhibition thus ends on a critical view of consumerism, and the questions raised by the exhibition point to a future that is both inspiring and disturbing. This engenders lively reactions and discussions on the part of the public, which testifies to the relevance of such research exhibition that questions the current world of objects, as much for citizen-consumers as for producers and designers.



## Part 2. Integrating the DNA manifesto in design education

Arguably, integrating the suggested principles of the DNA manifesto in design education calls for a major shift in design pedagogy, as essentially objects are to be viewed as living creatures instead of non-human, inanimate things. In this prospective scenario, designers are ‘giving life’ to objects and need to consider, more than ever before, all the ethical, social, political, cultural and environmental consequences of their role and of their projects.

Typically, design schools have been focusing their education programs on the following fundamental categories of knowledge and practices: 1) design process/design thinking (how to design – the methodology of design; 2) artistic knowledge (how to create form – the question of aesthetics, proportions, harmony); 3) humanist knowledge (how to serve the society and people – psychology, ergonomics, sociology, history, ethnography, etc.); 4) the tools to communicate (how to represent the project – sketching, perspective drawing, 3D modeling, technical drawing, etc.) and 5) scientific knowledge (how things are made – properties of materials, mechanical and structural principles, etc.), including fabrication knowledge (industrial processes, 3D printing, CNC manufacturing technologies, etc.). The issue of sustainable design is more and more putting into question this traditional education model, which takes its roots in the curriculum of the Bauhaus in the early 20th century. With sustainability in mind, the model is no longer the machine and



*Figure 21.6* Seat and wall panels of a metro car made with a substrate of hemp and mycelium (full-scale model). Research-creation project by Master of Design graduate Théo Chauvirey

its technological possibilities, the prevalent model to follow for a truly sustainable world is nature.

In the second part of this chapter, we describe a Master of Design graduate project focusing on biomimicry, which led to the use of a biomaterial called mycelium. The presentation of this project, including the difficulties and challenges of such a sustainable approach, gives us the occasion to question if current design education institutions are adapted to support such research approaches and if they can face the underlying challenges at stake.

It is to be noted that the project presented here, which focused on a truly innovative and sustainable approach, was partly inspired by the DNA project and manifesto. A Master of Design student, Théo Chauvirey oriented his research toward the use of mycelium, as he was actually involved in the DNA project as research assistant and working under the supervision of the head of the DNA research unit. Dr. Martin Racine's team envisioned promoting biological materials while considering the DNA manifesto statement that says, "objects will take care of their descendants". While replacing a material that contains toxic glues and resins by a biomaterial that can be composted, one replaces pollution by a material that regenerates and enriches the soils in the same way that decomposing organisms become nutrients. Initially, Théo Chauvirey's research proposal was to find solutions for the hundreds of metro cars of the Montréal metro that had ended their useful life (Chauvirey, 2018). As they were to be disposed of, the researcher realized that many components of the metro cars were made in fiberglass and polyester, a material containing hazardous resins that proves nearly impossible to recycle. The student turned his attention to mycelium as an alternative to the use of fiberglass for seat fabrication and side panels. He established a liaison with Ecovative, a company focusing on the development of mycelium products that encourages designers to find interesting applications for this biomaterial.

### **Challenges for design education: understanding biology and ecosystems**

One of the primary issues designers face while focusing their practice toward a biomimicry approach is to clearly understand how nature works, i.e., to grasp the complexity of life forms and the interdependence amongst species in a given ecosystem. While designers have been trained to understand industrial production and synthetic materials, they have rarely been educated to understand the fundamentals of biology and ecosystems. Therefore, this gap needs to be addressed by design educators concerned about environmental issues. Of course, for many centuries, the observation of nature has had a major influence on the arts and on design. Leonardo da Vinci's flying machines were directly influenced by the study of birds, and the aesthetic proportions of the Golden Rule lies on the observation of the natural world. A biomimicry perspective, or a 'Cradle to Cradle' approach (which is directly influenced by the study of nature), calls for a systemic perspective and deep understanding of the natural environment. This is of crucial importance if we aspire to make the shift toward the circular economy.

Understanding ecology is therefore fundamental, but there are also pragmatic considerations involved in biomimicry design. In our example, while the student successfully managed to construct a life-size metro car for his master's project, he had to face many challenges that are pertinent to address here, as they pertain to the sustainable design education discussion underlined in this chapter. An important challenge was to understand the processing of the mycelium and to find an appropriate environment to grow and to create the molds for this living material. The fabrication of the mycelium seats and wall panels could not be done in a wood or metal workshop. Actually, these workshops are totally incompatible with the sanitized environment required to process biomaterials. Indeed, while manipulating mycelium is not life threatening, it does involve health and safety precautions, and it is necessary to work in an environment that allows the decontamination of surfaces and tools. It also requires the wearing of gloves and a proper room ventilation. These requirements are only possible in a biosafety level 2 laboratory. A biosafety level (BSL), or pathogen/protection level, is a set of biocontainment precautions required to isolate dangerous biological agents in an enclosed laboratory facility. The levels of containment range from the lowest biosafety level 1 (BSL-1) to the highest at level 4 (BSL-4). For the manipulation of mycelium, an ideal environment would be a BSL-2, which is suitable for work involving agents of moderate potential hazard to personnel and the environment. Working in such an environment requires a specific training about the precaution measures to respect. Another element at stake is the time factor. Once you have inoculated the mycelium to a mixture of natural fibers, several days are required to let the mushroom grow and develop into a solid material that espouses the contour of the mold. Once the process is done, the part needs to be demolded and dried in an oven at moderate temperature to stop the growing process.

Luckily, the graduate student had access to a biolab within one of the universities' research centers, but this type of facility is far from being part of typical design institutions. If environmentally driven design programs wish to explore biomaterials as alternative solutions to traditional materials (such as plastics, wood or metal), they need to take into account that manipulating biomaterials that 'grow' require very specific knowledge and adapted working environments.

In conclusion, while considering the ethical vision proposed in the DNA manifesto and the importance of a better understanding of biology and ecosystems, many questions are to be raised. Are design institutions ready to adapt to the implications and challenges of a revolutionary shift imposed by environmental sustainability? Do current design curriculum models truly integrate the necessary knowledge to understand how nature 'functions'? Are the design institutions equipped with the facilities to work with the specificities of biomaterials? At this stage, there needs to be a much more in-depth reflection about a shift toward sustainable design, and the DNA manifesto is presented here as an inspiring tool to address these questions.

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## 22 Ready-to-(dis)assemble

Experimentations on elastic joinery  
for engaging and environmentally  
friendly furniture

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### Introduction

Joints are crucial for the performance and durability of a piece of furniture (Nandanwar et al., 2013). They are even more relevant in the case of ready-to-assemble furniture (RTA furniture), as the product needs to be assembled by the user.

This type of furniture, popular mainly since the 1950s of the twentieth century (Bernstein, 1992) and originally limited to a few products (such as television stands) increased the typologies of products and sales over time. Indeed, the value of the global RTA furniture market was forecast to reach a value of 18 billion U.S. dollars by 2025, from around 12 billion U.S. dollars in 2018 (Simonato, 2022).

Over the years the joints between wooden components have been constantly evolved and rethought under the influence of various factors. Most joints have undergone adjustments based on specific needs and the development of new tools (Bullar, 2013). An example comes from the Japanese joinery which underwent a great revolution during the Yayoi period (200 B.C.–250 A.D.) following the diffusion of iron tools. This technological innovation has consequently allowed the development of new solutions for joining wooden components (Seike, 1977).

Traditional tools, like saws, planes and chisels, stimulated the polyhedral stereotomy. The most common joints are characterized by planar surfaces that meet forming sharp edges. This typology causes the crushing of the fibres and the concentration of stresses at the edges, resulting in the need to oversize the structures. Today, computerized drawing techniques and numerical controlled machines allow to overcome this constraint. Therefore, it is now possible to think of rounded joints without sharp edges that guarantee new and more efficient solutions (Ragazzo & Villani, 2018).

Currently, the field of RTA furniture is represented by products that are composed of different pieces and accessories, mainly of plastic or metal, to be assembled with tools. Despite the advantages related to the wide diffusion and the low price of the fastening means, various critical issues could arise. This research focused on the following ones. Firstly, many accessories could make products less inviting and engaging to assemble. Secondly, in some cases they could limit the

formal expression and the performance of products. Finally, in products made of a sustainable and renewable material, such as solid wood, the presence of plastic and metal components could adversely affect the environmental impact. In fact, low environmental impact and renewable materials are key characteristics for the eco-sustainability of a product. At the same time, thanks to the absence of plastic and metal elements, problems related to the disposal and recovery of end-of-life material are also alleviated.

Focusing on the sustainability of wood, a fundamental aspect is the lawful origin of the material. In this context, one of the most relevant certifications is the FSC, which ensures that the raw material comes from sustainable and legal sources, generating environmental, social and economic benefits (Forest Stewardship Council, 2020). Consequently, wood could be a valid choice towards more circularity in the field of furniture.

Environmental sustainability as objective to be pursued for a company is of relevant importance not only for the environmental benefits but also for the competitiveness of the company itself. Indeed, it has been found that a supply chain that reflects the principles of sustainability is also more resilient in the event of shocks and emergencies. The consideration of companies regarding more responsible environmental policies has changed considerably over the years, passing from being perceived as a burden to being used as a factor of competitive advantage (Fondazione Symbola – Unioncamere, 2020).

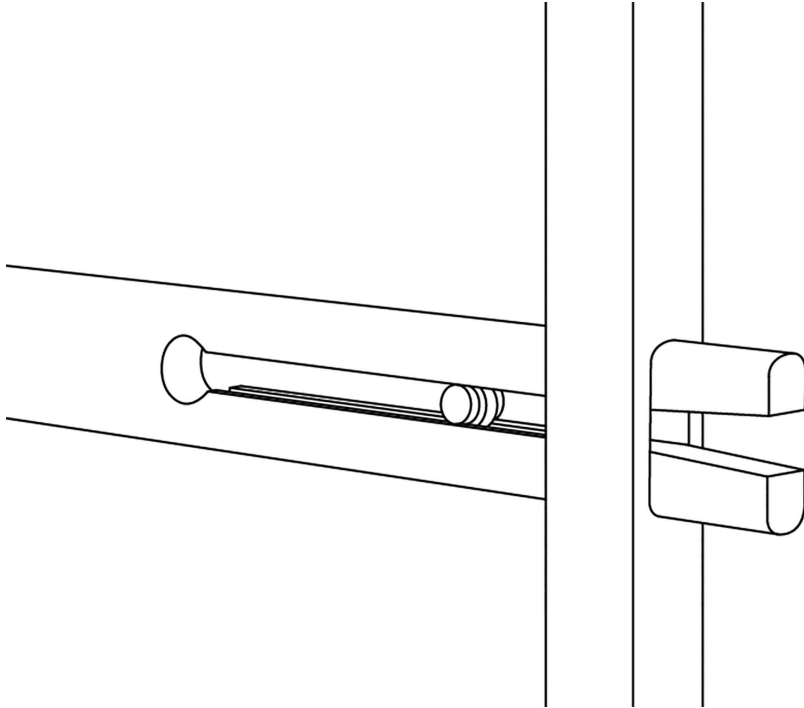
In this framework, the goal of this research is the development of a new type of all wooden joints for RTA pieces of furniture to be easily and quickly assembled without tools and accessories, feasible with numerical control milling machines and characterized by the a-polyhedral geometry.

The present chapter is structured as follows. The second section is dedicated to the analysis of the state of the art divided into two parts: one relating to selected products in the RTA furniture field and another dedicated to the study of the new typology of a-polyhedral joints to understand the possible advantages that could be obtained from these solutions. The third section presents the new project which has the aim to mitigate the identified issues. Finally, the discussions and conclusions make up the fourth and fifth sections respectively.

### **State of the art**

Customers of RTA furniture, having to assemble the final products, perform a key task in this context. For this reason, the actions required of them should be as simple and intuitive as possible. Over time, the role of the users has been the focus of several studies and projects.

One of these is the wedge dowel project, developed by IKEA. This system, used for the first time in 2013, is based on the bonds that small grooves made on different wooden components, pushed against each other, can generate between them. This solution was born with the aim of simplifying assembly, reducing assembly time, and innovating the aesthetic of this type of products by removing visual fittings. According to IKEA, this system can reduce the assembly time for a piece of



*Figure 22.1* Graphic elaboration of Spänna (Authors). Original image available from: <https://kallemo.com/furniture/tables/25-downloads/616-spanna> [Accessed: February 15, 2022]

furniture by 50 to 80 percent (Anderson et al., 2012) (Inter IKEA System B. V., 2015, 2016).

Among the projects taken into consideration, particular attention has been paid to those that involved the deformation of some wooden parts for assembly. Some among them are presented next.

Spänna is a table designed by Gustav Person and produced by Kallemo. Some elements of its structure have bifurcations at their ends that are inserted into specific holes of other components. Inside each pair of bifurcations there is a metal element that is moved towards the end with the result of spreading the wooden elements in the opposite direction. In this way, the two ends push against the internal surface of the hole, holding the joint firmly (Figure 22.1) (Person, 2014).

Another project that implies the deformation of some wooden elements is Squee Spree, designed by Robin Weidner. It is composed of horizontal panels to which vertical wooden elements are connected. The vertical elements consist of two rods separated by another element in the middle. The two rods need to be bent by hand and inserted into the respective hole. Once the ends, which have grooves, are released, they push against the edges of the hole (Figure 22.2) (Weidner, 2013).

Different products examined are made of panels (such as plywood or fibre-board), such as Gypsy Modular, a line of furniture designed by Clark Davis. The

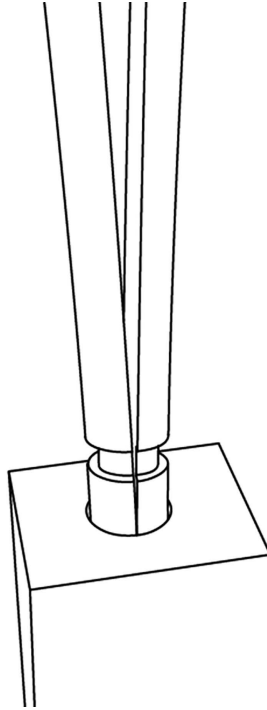


Figure 22.2 Graphic elaboration of Squee Spree (Authors). Original image available from: [www.robin-weidner.com/common.html#squee](http://www.robin-weidner.com/common.html#squee) [Accessed: February 15, 2022]

products do not require tools or hardware for assembly. The system consists of pins made at the side of the panels that need to be inserted into differently shaped slots of the next component. In this way the first piece undergoes a deformation and thus the tension created between the various pieces holds the joints firmly (Davis, 2012).

In this second part of the section, attention has been paid to the new typology of the a-polyhedral stereotomy benefiting from the technological revolution. Different experimental projects in this area have been carried out by Felice Ragazzo. A first example is the “Curve di Giunone” joint (Figure 22.3), which represents an evolution of the traditional “trait de Jupiter”, where flat surfaces with sharp edges are rethought to become rounded. This feature allows the creation of greater constraints and larger contact surfaces between the various pieces (Ragazzo, 2009).

A more recent example is the experimentation of temporary facilities for bathing services, all wooden, where particular attention has been paid to the innovations of the joints and to the perishable nature of the wood, with a view to the reuse of the components (Figure 22.4) (Ragazzo & Villani, 2018).

These issues have been also investigated to limit the negative effects of a possible fire in the structural nodes. For this purpose, Felice Ragazzo designed different



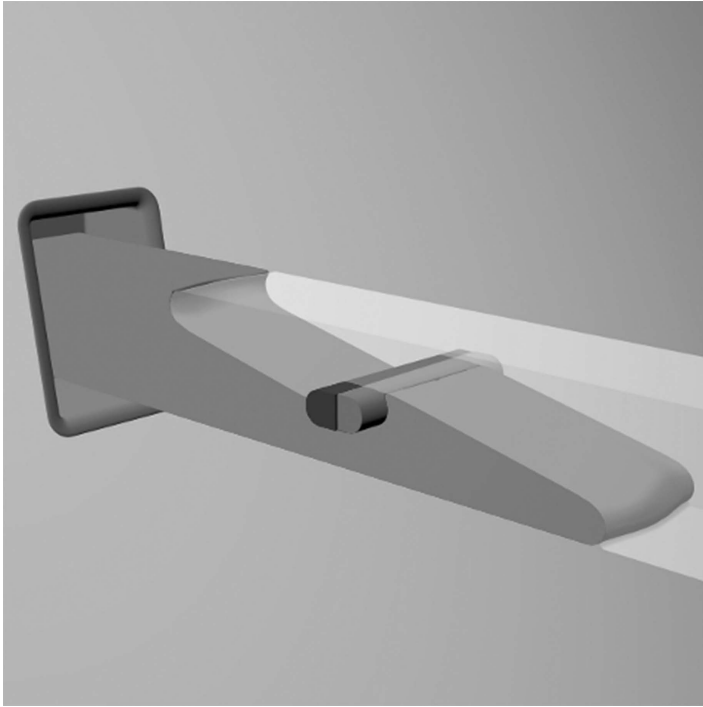


Figure 22.3 “Curve di Giunone” joint, F. Ragazzo. [https://materialdesign.it/it/post-it/evoluzione-ikea\\_13\\_748.htm](https://materialdesign.it/it/post-it/evoluzione-ikea_13_748.htm)

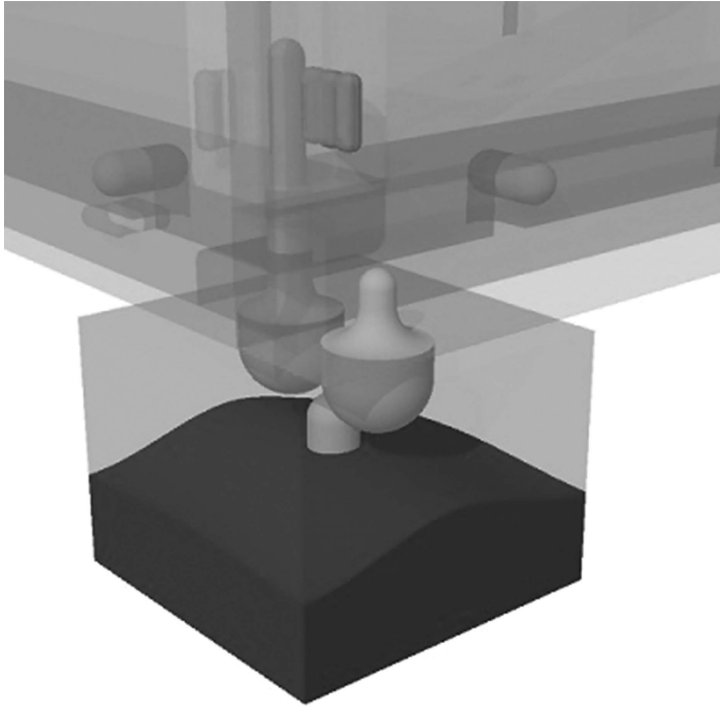
a-polyhedral wooden joints for the architectural field and studied their behaviour both at the beginning of the adverse event and thirty minutes after the start (Ragazzo, 2018).

The innovative scope of these new methodologies is also demonstrated by the recent granting of the patent certificate for industrial invention to Massimiliano Coni, Felice Ragazzo and Fabio Spera with the title “Construction system with framed panels for the construction of buildings and other applications in the structural field”. This patent refers to a construction system mainly of wood characterized by a high flexibility of shape given by the parameterization of the system and the connection systems (Ragazzo, 2020).

Finally, the new stereotomy highlights the importance of and the need for a paradigm shift in relation not only to numerical control fabrication but also to the use of increasingly widespread robotic assembly systems (Ragazzo, 2019a, 2019b).

### **Experimenting new joints**

An experimental project has been carried out with the aim of exploiting the elasticity of wood to design new joints with the following criteria: no need for fastening



*Figure 22.4* Detail of experimentation on bathing services, F. Ragazzo, T. Villani. [www.feliceraffitto.it/ultime-notizie/il-legno-tra-piacevolezza-e-deperibilita/](http://www.feliceraffitto.it/ultime-notizie/il-legno-tra-piacevolezza-e-deperibilita/)

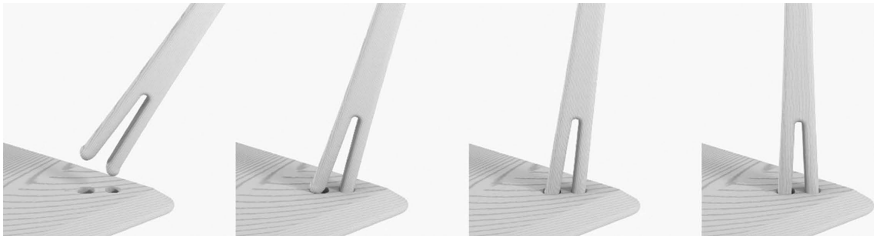
means and glue; easy and quick to assemble and disassemble without tools; feasible with numerical controlled milling machines; entirely made of wood. These joints have been used to design a set of table-chairs (Figure 22.5) to investigate and verify their potential.

The elastic behaviour of the wood is of particular interest since in addition to having the capacity to undergo the initial deformation, the components can also return the energy stored during the previous deformation.

The first part of the present study was dedicated to understanding how to exploit this feature in a way practicable by anyone and that does not require relevant physical strength from the users. The idea was inserting the pins of a component with bifurcation into the cavities of the next component, which have undercuts. To make this possible, the first component must undergo initial deformation. The key aspect was therefore to study how to cause this deformation in a simple and intuitive way. The solution, which initially required the bending of the first component by hand, has been then evolved into a much more performing and simpler system. The deformation is in fact caused during a rotation of the first piece, thus exploiting a very favourable lever (Figure 22.6). The simplicity of assembly can be appreciated even more considering the symmetrical geometry of the element with the pins.



*Figure 22.5* Set of table-chairs



*Figure 22.6* Joint detail

This project reflects the characteristics of the a-polyhedral stereotomy, respecting the advantages emerging from the examined literature. As a result, there are not sharp edges in the most crucial parts of the system. The processing required to make these joints, which are impossible to perform through traditional tools, are instead easily feasible with numerical controlled milling machines. Thanks to this type of joint, it has been possible to design a table and a chair composed of a small number of components entirely of wood. In fact, they are composed of only five and six components respectively (Figure 22.7). Users can assemble them through easy actions without tools, and again without tools they can disassemble them. In addition, the chair has evolutions of this system to respond to different needs. The products in the figures are an example of application of the new joints. Other products have been designed and others are in development and will be presented soon.

## **Discussion**

The potential advantages of this type of joint are not limited to the end users. In fact, with the development of wooden solutions that do not involve the use of



Figure 22.7 (Left): exploded perspective view table. (Right): exploded perspective view chair

plastic and metal accessories, the environmental impact benefits, as the products are made entirely of a sustainable material.

An aspect that is considered relevant in this research concerns the design freedom offered by these choices. Overcoming the traditional joint solutions and the barriers due to the traditional wooden stereotomy allowed to design completely new systems. Furthermore, the technologies considered for this project are already widespread in the industry (Sanela & Atif, 2017). As a result, companies are partly ready from this point of view to welcome this development in the field.

The performance necessary for this project are not always satisfied by any wood species. This feature limits the choices of plausible wood species, noting a difference compared to more traditional pieces of furniture that could instead be made with more different wood species. However, hard-to-find wood species have been excluded, focusing on widespread and common ones. Another relevant aspect concerns the numerous tests required when a new type of product is developed. A goal set for the next steps of this experimental project is therefore to continue testing these systems, the results of which will be discussed in depth in a further publication. At the same time, another goal is to further develop the concept of elastic joinery to identify different solutions for other types of products. In fact, although the joints presented in this chapter have been applied to a table and a chair, these systems could be used in other types of products. Even the table and the chair could receive various functional and aesthetic modifications.

## Conclusion

Nowadays, the field of ready-to-assemble furniture is mainly characterized by products that need accessories and tools for assembly. This is because fastening

means are widespread and cheap. This research shows how it is possible to arrive at equally advantageous solutions, in some cases even more advantageous, following different paths.

Wood has remarkable mechanical properties that can be exploited in different ways to develop new concepts, as was, for example, the elasticity in this project. In this case, this feature has been studied and experimented starting from the concept of a deformable bifurcation, achieving the advantages described earlier. A different approach to this feature could create further positive aspects. Similarly, different experimentations starting from the same concept of this system could also bring to different solutions. For this reason, investigating in depth the different properties of wood, even those reserved only for some wood species, could be profitable to pursue new results.

The development of a new joint could require significant time and resources. In this path, designers are increasingly supported by computerized drawing and numerical control fabrication technologies, tools that guarantee a significant step forward compared to old tools. A purpose of this research is to investigate this field with the aim of collecting notions that will be useful for the progress of these new solutions.

A hope is to help stimulate greater interest in this field and bring designers and companies closer to these new concepts. At the same time, the goal is to continue the experimental development of the new joints presented in this chapter by making use of the stimuli received during this step. Furthermore, it will be studied how these new solutions can be applied to different types of products.

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