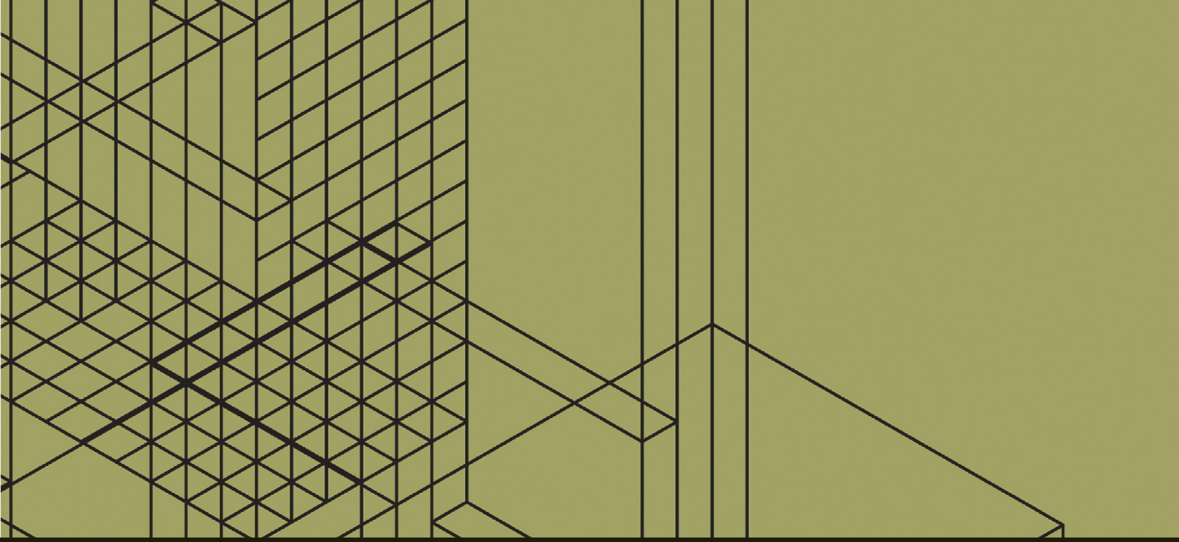
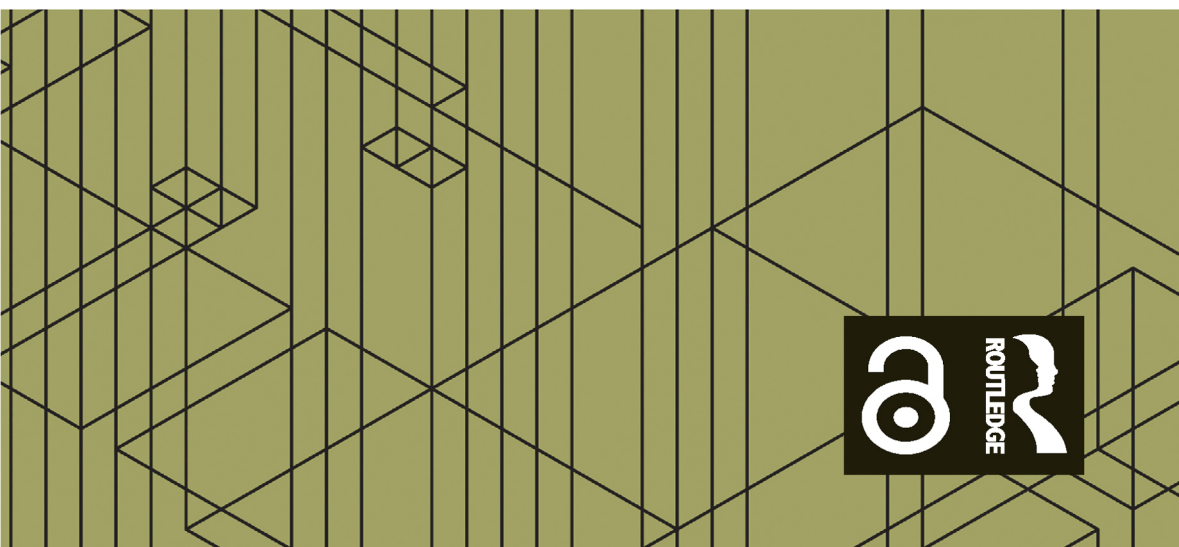


Routledge Studies in Accounting

QUALITY MANAGEMENT AND ACCOUNTING IN SERVICE INDUSTRIES

A NEW MODEL OF QUALITY COST CALCULATION

E. J. Lowe and T. L. Smith



Quality Management and Accounting in Service Industries

The process of globalisation in world markets, and the growing number of enterprises competing with one another in terms of the products and services they offer, naturally leads to the improved efficiency of management systems. Efficiency is required in order for these entities to maintain competitiveness. To assess the efficiency of their management systems, enterprises use quality cost calculation.

This book fills the research gap concerned with the scientific study of the quality cost calculation, with regard to service companies. It offers the authors' concept of using the cost of quality calculation as a tool for assessing the efficiency of the management systems of service companies. The book consists of six chapters that present both a theoretical and an empirical part. In the theoretical part, the following issues are discussed: quality costs; the evolution of quality cost calculation; quality cost calculation models and their applications to date; and the specific way in which service companies operate. The practical part presents the authors' model of quality cost calculation along with the adopted assumptions and cost structure, as well as the research methodology and verification of the use of the developed model in a selected service company. The research gives credence to the role and importance of this tool in economic practice.

The book will be desired reading by both theoreticians and practitioners of quality management and accounting. It is also a valuable resource for master's and doctoral students wishing to broaden their knowledge of quality costs and their calculation in the fields of economics and management.

Wojciech Sadkowski holds a doctoral degree in management sciences. He works as a researcher and lecturer in the Department of Finance and International Economics at the Jagiellonian University. His interests, research and publications focus on issues related to quality costing, managerial accounting, and quality management.

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Quality Management and Accounting in Service Industries

A New Model of Quality Cost Calculation

Wojciech Sadkowski and Piotr Jedynak

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Preface

The management of a service enterprise often requires the use of approaches and methods different from those typical of manufacturing enterprises. This statement is certainly true of quality management and accounting practices.

The book presents an interdisciplinary problem located on the border between these two domains and concerning quality costing in service enterprises correlated with accounting practices.

The authors' main achievement is the construction of a new model of quality cost accounting dedicated to service enterprises. A presentation of the model is preceded by a reflection on quality costs as a major area of concern for managers and a review of the existing structural and processual types of quality cost accounting.

The proposed general model of quality cost accounting is validated by the authors in practical applications, which shows its strengths and weaknesses.

The book is addressed to practitioners of quality management and accounting, consultants in these fields as well as academics.

Wojciech Sadkowski and Piotr Jedynak

Credits list

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Introduction

The globalisation process progressing on world markets and the growing number of enterprises competing with each other by offering a continuously growing range of products and services make it necessary to increase the efficiency of management systems. It becomes indispensable if business entities want to maintain their competitiveness.

In order to assess the efficiency of management systems, enterprises may use quality cost accounting. Its implementation provides a basis for actions optimising costs of quality.

So far, quality cost accounting has been a tool used mainly in production enterprises due to the lack of models of such an account appropriate for service enterprises. Meanwhile, the number of service enterprises is significant; they play an increasingly important role in the Polish economy and account for more than a half of people in active employment.

From the point of view of the management of service enterprises that strive to achieve numerous goals (including economic ones), it is extremely important to assess and improve the efficiency of management systems.

The objective of this book is to present in an understandable and practical way the authors' original concept of using quality cost accounting as a tool for assessing the efficiency of management systems in service enterprises. The publication consists of six chapters, which form the theoretical and empirical parts.

The theoretical part consists of the first three chapters constituting a logical sequence. Chapter 1 contains reflections on quality costs in the perspective of the discipline of management sciences. The authors present a synthetic review of the definition of this concept, classifications of quality costs and their place in the assessment of the efficiency of enterprise management systems. This chapter also illustrates the evolution of quality cost accounting over the years. Chapter 2 discusses and presents selected models of quality cost accounting together with their applications to date based on an analysis of domestic and foreign literature on the subject. In addition, the chapter presents a review of structural models of quality costs and activity-based models of these costs, which constitute an important element of quality cost accounting. Chapter 3 is devoted to a discussion of the specificity of the functioning of service

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enterprises. At the beginning, the essence of services and service activities is shown. In the next part, the authors indicate processes taking place in service activities and summarise the knowledge of service quality management. The discussion comprises selected concepts of quality improvement in service enterprises, quality management systems, methods of service quality measuring and service quality management tools. In the last subsection, an attempt is made to identify the determinants of quality costs in service enterprises.

The theoretical part of the book is complemented by the empirical part, which consists of three subsequent chapters. Chapter 4 presents premises adopted in the construction of a quality cost accounting model along with an analysis of the sources used in the creation of the authors' original model. In this part, the authors also present a proposed structure of quality costs for service enterprises, a pattern of its formation and tools created for the model: a process matrix of quality costs and a process budget of quality costs. The chapter closes with a procedure for conducting quality cost accounting in service enterprises presented by means of a modified Bernatene-Grün diagram. Chapter 5 shows the course of conducted empirical research, as well as the characteristic features of the enterprise selected for the research. Chapter 6 is devoted to a verification of the use of the developed model of quality cost accounting in assessing the efficiency of management systems of selected service enterprises. This chapter consists of three parts. The first one contains graphical and descriptive results of the implementation of the developed model of quality cost accounting in three selected service enterprises. The next two parts constitute an attempt to evaluate the obtained results and to indicate the possibilities, directions and limitations of using the model to improve the efficiency of management systems in service enterprises.

1 Quality costs as a subject of research in management sciences

1.1 A review of the definitions of quality costs

The existence and functioning of an enterprise in the global market depends on its ability to provide products or services that not only meet customers' requirements but also are competitive in terms of quality, price, lead time and distribution. To meet these conditions, it is necessary to identify, measure and control all quality-related costs (Skrzypek, 2000; Chiu and Su, 2010; Raßfeld et al., 2015).

The starting point in reviewing the definitions of these costs is to become familiar with the notion of quality. The first mentions of the concept of quality were found in philosophical sciences literature dating back to antiquity (V–IV centuries BCE). Plato related quality to objects and phenomena occurring in life. He also claimed that it is a certain degree of perfection that cannot be defined, but can only be understood through experience. Plato's idea was further developed by Aristotle, who recognised quality as one of the ten basic philosophical categories. In Aristotelianism, quality defines why a thing is the thing that it is, and it does not depend on the subjective view of the beholder (Biadacz, 2018).

Also, other great philosophers, including R. Descartes, J. Locke, I. Kant, F. Hegel, dealt with the concept of quality. R. Descartes and J. Locke understood quality dualistically: as a primary quality that is objectively present in an object, e.g. shape, and as secondary quality that is emitted by an object, e.g. smell, colour. Their approach was undermined by Kant, who regarded primary qualities as also subjective. Also, F. Hegel did not recognise the dualistic character of quality, treating it as a logical category equivalent to being (Bareja and Giedroyć, 2007).

A significant contribution to the contemporary theory and practice of quality was made in 1931 by W.A. Shewhart (1931) in his study on the economic control of product quality. The reflections of this scientist became the basis for the works of the so-called Great Teachers of Quality, also referred to as Quality Gurus: W.E. Deming, J.M. Juran, Ph.B. Crosby and K. Ishikawa, who were practitioners in the field of quality management. According to W.E. Deming, J.M. Juran and Ph.B. Crosby, product quality meant the

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degree of freedom from defects and errors, conformity to requirements or suitability for use or application (Bank, 1996). It should be considered in a broad context that includes the producer, the user and the environment; the creation of good quality should be the result of taking into consideration and agreeing on the quality requirements of these three groups of entities (Lisiecka, 2002).

The Polish standard PN-EN ISO 9000:2015 defines quality as the degree to which a set of inherent characteristics of an object meets requirements. According to this standard, quality can be low, good or excellent (ISO 9000…, 2016).

On the other hand, the quality of products and services provided by an organisation is defined by its ability to satisfy customers and exert influence on them (ISO 9000…, 2016). The quality of products and services should refer to not only obtained results but also the customer's expectations and requirements in relation to a given product, since the entity that verifies the quality of a manufactured product or a provided service is the consumer, and it is their needs and expectations that must be taken into account (Ciechan-Kujawa, 2005). Furthermore, quality is a key element in measuring productivity (Al.-Dujaili, 2013).

According to K. Sato, three types of quality can be distinguished: required quality which is expected by customers in the market, target quality which is in the sphere of desires of the management of an enterprise and conformance quality which means the quality provided by an entity and fulfilling the needs of customers (Sato, 1998).

In fact, it is impossible to define this concept unambiguously. The literature on quality fails to provide a single unambiguous definition (Mohanty and Tiwari, 2005; Mukherjee, 2019). This is related to the fact that quality is an interdisciplinary concept and an object of interest of researchers from different fields of science such as economics, philosophy, law, psychology and pedagogy. Each of these groups perceives the term in its own way, adapted to its own needs and requirements (Bareja and Giedroyć, 2007).

The survival of an enterprise in a business environment where change is the only constant in social and economic development depends on its ability to focus on quality and customer satisfaction (Andrijasevic, 2008). Effective and efficient management very much depends on management by quality, which is regarded as a basic driver of success in an enterprise.

The notion of quality constitutes the starting point in deliberations on quality costs. The first mentions of such costs appeared in the United States in the 1940s (Hellman and Liu, 2013). The growing demand for the supply of military equipment to the Allies during World War II contributed to the growth of interest in the subject of quality (Dahlgaard-Park, 2015). There was a problem of very high defectiveness of manufactured equipment reaching up to 80%, which was caused by the lack of skilled workers in this field. The greatest difficulty was in identifying the costs of quality. It became a priority to find a way of eliminating defects. Production

control and inspections were initiated, which began the era of evaluation costs (Szymula, 2005).

The 1940s were the period when the concepts of internal and external quality costs were formulated. Internal quality costs concerned the repair or sale at a lower price of a product whose defectiveness was detected during the production process. External quality costs, on the other hand, were defects detected by users (Szymula, 2005).

The interest in quality costs in the 1950s exceeded all expectations and Japan became the main centre of research on quality: J.M. Juran and W.E. Deming transferred their ideas to the Japanese manufacturing sector, thus launching the great Japanese quality revolution (Wawrzynek, 2013). In that decade, the concept of quality costs was introduced into the scientific literature by J.M. Juran and A.V. Feigenbaum. Developing the concept, the former of them referred to the principle of *gold in the mine*, i.e. benefits to be delivered by high product quality. It is only possible to acquire knowledge on how to control quality if it is measured. And it was costs that became a tool used to measure quality (McLaughlin, 1995).

The first books on this topic, *Total Quality Control* by A.V. Feigenbaum and *Quality Control Handbook* by J.M. Juran, focused on cooperation among employees of different departments of an enterprise based on costs of quality, i.e. the costs of evaluation, prevention and deficiencies (Feigenbaum, 1961; Juran, 1974; Szymula, 2005).

Another important part of the history of quality is a publication issued by the American Quality Control Association in 1967, which classified quality costs as: costs of preventive measures, costs of quality assessment, losses on internal deficiencies and losses on external deficiencies (Wood, 2013).

The increased interest of business entities in costs related to quality resulted from several factors, including the growing pressure to reduce costs and improve profitability. In many countries, an important stimulus raising the importance of quality costs was also the introduction of the ISO 9000 series of international standards, published in 1987, which contained quality assurance and management models and guidelines for building quality systems (Lisiecka, 2002).

Quality costs are not a precisely and unambiguously defined concept. As M. Ciechan-Kujawa points out, "it results from (...) differences in approaches to quality and from the fact that, in business enterprises, the areas of activities related to quality and other processes permeate each other" (Ciechan-Kujawa, 2005). Therefore, the authors have prepared a review of the most important definitions of quality costs. They are presented in Table 1.1.

The first definition of the term "quality costs" appeared as early as in 1951. Almost 1/3 of all definitions were created in the 1990s, and more than 1/3 in the first decade of the 20th century. This may indicate a growing interest in quality costs at the turn and in the first decade of the 21st century.

The authors notice numerous common characteristics in defining this concept. Both theoreticians and practitioners recognise the aspect of

Author	*Year*	*Definition*
J.M. Juran	1951	An instrument used to measure quality. "Gold in the mine".
A.V. Feigenbaum	1961	Costs associated with quality-oriented measures, including: prevention, appraisal and control, consequences of errors, related to an entire product life cycle.
American Society for Quality Control	1967	Resources used for activities that prevent poor quality, activities related to the evaluation of the quality of products or services, as well as the result of internal and external deficiencies. Having such data allows an organisation to estimate potential savings that can be achieved, thanks to process improvements.
J.M. Groocock	1974	Costs incurred for defective production and those that would not occur if quality assurance measures were taken and no defects or faults occurred.
F. Nixon	1974	Costs of ensuring that the consumer receives only those products that have been made in accordance with their requirements.
Ph.B. Crosby	1979	Quality costs nothing, but lack of quality, i.e. doing the job wrong the first time, is costly.
Ministry of the Machinery Industry	1980	Expenditures (outlays) incurred for or attributable to establishing and controlling a certain level of product quality.
S. Sojak	1981, 2015	The costs of those business operations that are carried out as part of a comprehensive quality control system and are aimed at improving the existing quality of manufactured products, reducing costs and losses caused by defective production, as well as costs and losses resulting from it.
T. Borys	1982	Incurred expenditures or lost profits that are the result of imperfect operations.
B. Oyrzanowski	1984	Expenditures incurred to achieve a certain level of quality, to analyse costs that affect the achievement of a certain level of quality, as well as measures aimed at minimising quality costs in an enterprise. Referred to as a quality control method.
ISO 8402 standard	1986	Expenditures incurred for defect prevention, evaluation activities as well as losses caused by internal and external errors.
J.M. Juran and F.M. Gryna	1989	Certain expenditures associated with ensuring that a product is fit for its intended purpose.
G. Taguchi	1990	Any deviation of product characteristics from customer requirements and expectations is a loss contributing to lower customer satisfaction and a deteriorated image of the manufacturer.

J. Bank	1992	The notion of quality costs comprises all costs related to quality.
Y.S. Chen and K. Tang	1992	Quality costs are the costs of inspection and prevention, as well as the costs of corrective measures and imperfect quality.
J.J. Dahlgaard, K. Kristensen and G.K. Kanji	1992	One of the most important aspects in the development of quality management systems.
E. Skrzypek	1993	A measure of the efficiency of activities that ensure the functioning of a quality management system. It is a synthesis of all operating costs related to quality assurance. It is also a tool for showing weaknesses in an organisation's primary and secondary processes.
ISO 9004-3 standard	1994	Measures used to assess the efficiency of a quality system.
J. Pike and R. Barnes	1996	The outcome of deviations that occur in systems and processes. Expenditures incurred on monitoring, controlling and preventing planned and unplanned deviations.
K. Lisiecka	1997	An important diagnostic indicator of weaknesses occurring in an enterprise's departments such as procurement, assembly, control and research. For the management, they constitute synthetic information on the degree of the streamlining of quality assurance system activities. They express a quantified objective of quality assurance that is connected with the selection of a structure of expenditures at which the sum of losses and costs of ensuring the appropriate quality will be the lowest.
E. Nowak	1997	The costs of adjusting quality to the needs and expectations of the customer, which includes prevention and appraisal, as well as the costs of inadequate quality resulting from manufacturing deficiencies and external influences.
T. Wawak	1997	An integral part of a Total Quality Management system. They arise throughout a product life cycle – from the moment a decision is made to start the production of a product until its disposal – and are defined as the so-called social costs of quality.
F.M. Bland	1998	Costs that are the difference between the actual cost of production and the cost that would be incurred if there were no system failures or employee errors.

(Continued)

Author	*Year*	*Definition*
J. Campanella	1999	The difference between the actual cost of a product or service and the cost that would arise in an ideal situation where there are no deficiencies (i.e. no substandard services, defective products or failures in production processes).
S.K. Krishnan	2000	Costs incurred to avoid quality deficiencies and failures to meet customer requirements, as well as costs that arise when customer quality requirements are not met.
ISO 9000 standard	2000	An economic factor that affects quality. Costs incurred to guarantee and ensure satisfactory quality, as well as losses incurred due to failure to achieve satisfactory quality.
G. Giakatis	2001	The costs of all actions taken in order for a product to meet certain requirements.
N. Chiadamrong	2003	The total cost of quality is the difference between the actual cost of a product/service and the cost occurring if quality were perfect.
Z. Zymonik	2003, 2013	Expressed in monetary units, the consumption of resources to create value for the customer that they will accept, and a loss of value of such resources. A measure to assess the degree of implementation of the principles of responsibility for product quality in an enterprise's strategy.
A.R. Mukhopadhyaya	2004	Costs associated with preventing, identifying and correcting defective work.
J. Gryc	2004	Expenditures incurred to obtain the expected level of quality and costs resulting from the absence of the expected level of quality, i.e. defects and all their consequences.
S.M.H. Collin	2007	Costs incurred when goods produced or services provided do not meet quality standards.
V. Kajdan	2007	The difference between the ideal cost and the real cost.
D.C. Wood	2007	Costs associated with both achieving and failing to achieve the desired level of service/product quality.
L. Weinstein, R.J. Vokurka and G.A. Graman	2009	They are a financial measure that expresses relevant information in the language of management.
L.A. Sedevich Fons	2011	Quality costs are the amount of money a company has given up (lost, incurred or failed to gain) as a result of inefficiency or ineffectiveness during its development activities.
K. Szczepańska	2017	Costs of not meeting the identified (specified) requirements of an enterprise's (internal and external) customers.

Source: The authors' own work.

imperfection and emerging defects in products and services (e.g. F.M. Bland, J. Campanella, Ph.B. Crosby, Y.S. Chen and K. Tang, J.M. Groocock, S.K. Krishnan, D.C. Wood, ISO standards). Researchers stress that one of the goals of any business enterprise should be to operate in an error-free manner (Ph.B. Crosby, J.M. Groocock). They regard quality costs as expenditures allocated to achieving the expected quality level and occurring in all spheres of product manufacture (T. Borys, A.V. Feigenbaum, J. Gryc, B. Oyrzanowski, Ministry of the Machinery Industry, T. Wawak, Z. Zymonik). They concern activities related to prevention, identification and correction of defective work, and their structure is predefined (ASQC, Y.S. Chen and K. Tang, A.V. Feigenbaum, A.R. Mukhopadhyaya, E. Nowak, S. Sojak, J. Pike and R. Barnes). What can be noticed in the definitions is the interpenetration of the areas of quality activities and other processes carried out in an enterprise (E. Skrzypek, J. Pike and R. Barnes). Researchers point out that these costs are used as a tool to measure and control the quality of products/services (J.M. Juran, B. Oyrzanowski). It is also a resource for reducing total production costs. Failure to achieve a satisfactory level of quality contributes to the generation of losses and defects (ISO standards, S.M.H. Collin); therefore there is emphasis on product manufacture and service provision without defects. Quality costs are also defined as the difference between the actual cost of production and the cost that would be incurred if there were no failures and errors (F.M. Bland, J. Campanella, N. Chiadamrong, V. Kajdan).

Quality costs are defined differently by L. Weinstein, R.J. Vokurka and G.A. Graman, as well as by G. Taguchi, J.J. Dahlgaard, K. Kristensen and G.K. Kanji and K. Lisiecka. In their view, these costs are an important diagnostic indicator (K. Lisiecka), as well as a financial measure expressing relevant information (L. Weinstein, R.J. Vokurka and G.A. Graman), a measure that represents a significant aspect of the development of quality management systems (J.J. Dahlgaard, K. Kristensen and G.K. Kanji). The cost of quality is any deviation from customer requirements defined as a loss (G. Taguchi) and a failure to meet identified customer requirements (K. Szczepańska).

For quality management experts, quality costs are an element or a separate part of manufacturing costs that may constitute a resource of opportunities for reducing total production costs. For economists, quality costs may mean "the sum of costs incurred for the manufacture of a specific product of a specific quality that meets the requirements and expectations of the customer" (Balon, 2006). Quality costs can also be defined as "all expenses that serve to maintain, ensure and improve the level of quality of products and services that is expected by the customer or has been bindingly agreed with the customer" (Fajczak-Kowalska, 2004).

J.M. Juran and F.M. Gryna define quality costs as "certain expenditures related to ensuring that a product is fit for its intended purpose" (Juran and Gryna, 1989). However, production processes are disturbed by many factors and not every manufactured product is fit for its intended purpose. Thus, deviations from quality requirements occur in the course of production; they

are errors that constitute a part of the production process and have to be accepted. J.M. Juran divides such errors into (Zymonik et al., 2013):

- sporadic errors, i.e. suddenly appearing deviations from quality requirements, drawing the management's attention, of a drastic nature; quality costs are relatively low,
- chronic (systemic) errors, i.e. continuous deviations from quality requirements, unnoticeable, do not arouse suspicion; quality costs are relatively high, as it is necessary to analyse occurring problems and change the existing conditions.

A.V. Feigenbaum polemicises with J.M. Juran on the question of the acceptable level of defectiveness. He believes that what is important is not only the production area but also the three spheres of product delivery where quality costs appear: pre-production, production itself and post-production. A.V. Feigenbaum defines quality costs as those related to quality-oriented measures, including prevention, appraisal and control, consequences of errors, related to the entire product life cycle (Feigenbaum, 1961). The author of the concept of quality costs in a product life cycle believes that quality can only be influenced by feedback, when there is information about the behaviour of a product in subsequent activities, especially in operation. He also argues that every company has a "hidden factory" that manufactures up to 1/10 of the total output and includes products of inadequate quality, correction of errors that have occurred and replacement of defective products. The existence of such a factory proves the direct link between quality and productivity; the increase of the latter is possible only with the use of the resources of the "hidden factory" (Muhlemann et al., 1995).

M. Omurgonulsen agrees with A.V. Feigenbaum that it is necessary to have a feedback loop because quality costs alone will not improve quality in an organisation (Omurgonulsen, 2009).

Meanwhile, in his reflections on quality costs, Ph.B. Crosby emphasises their relation to a process. An organisation is a set of processes, so its primary objective should be error-free operation. For Ph.B. Crosby, quality is free (Crosby, 1979). What is costly, however, is a lack of quality, i.e. not doing the job right the first time (Gryc, 2004). He incorporates the costs of quality into a so-called matrix of maturity of quality management in an enterprise. It consists of five levels. At the first level, the enterprise does not perceive problems that may relate to quality; it is unaware of their existence. The second level is the organisation's knowledge of the concepts of measuring the regularity of processes in the form of quality costs. At the third level of the matrix, measurement attempts take place, the fourth level is the use of quality cost accounting, and at the fifth level, the enterprise manages these costs in support of managerial decisions (Zymonik et al., 2013). Ph.B. Crosby also refers to quality costs in his four absolutes, which constitute new foundations of quality management. They are contained in the following statements: quality

is defined as compliance with specifications; quality is achieved through prevention; a quality standard means the absence of defects; quality is measured by means of the cost of noncompliance with specifications, not by means of indexes (Bank, 1992).

G. Taguchi presents a concept of social quality losses in which he emphasises that customers and society accept product defectiveness only within a certain range. Therefore, manufacturers must respect the tolerance range recognised by customers. If a product complies with the requirements and expectations of buyers, then its quality is high, but when deviations occur, the customer becomes dissatisfied, which is a loss for the manufacturer. This idea is captured by G. Taguchi in the form of a quality loss function. This researcher emphasises the manufacture of products without losses (Taguchi and Clausing, 1990).

J. Campanella defines quality costs as the difference between the actual cost of a product or service and the cost that would arise in an ideal situation when there are no shortcomings (i.e. there are no substandard services, defective products or defects in the production process) (Campanella, 1999; Wood, 2007). A different opinion on this subject is presented by D.C. Wood, who is of the opinion that quality costs are connected with both achieving and failing to achieve the desired level of service/product quality (Wood, 2007).

Similarly to J. Campanella, N. Chiadamrong argues that the total cost of quality is the difference between the actual cost of a product/service and the cost occurring if quality were perfect (Chiadamrong, 2003). Meanwhile, for A.R. Mukhopadhyay, the cost of quality is associated with preventing, identifying and correcting defective work (Mukhopadhyay, 2004).

Another definition of costs of quality is proposed by S.K. Krishnan, who claims that these are costs incurred to avoid quality deficiencies and failures to meet customer requirements, as well as costs that arise when a customer's quality requirements are not met (Krishnan et al., 2000). Quality costs are viewed similarly by G. Giakatis, who believes that they are the costs of all activities undertaken in order for a product to meet certain requirements (Giakatis et al., 2001).

For J.M. Groocock, quality costs are those "that are incurred for defective production and would not occur if quality assurance measures were taken and if no defects or faults occurred" (Groocock, 1974).

According to F. Nixon, these are the costs of ensuring that the consumer receives only those products that have been made in accordance with their requirements (Nixon, 1974).

In scientific terminology, the term "quality costs" is used synonymously with the term "cost of poor quality" (Yang, 2008). Y.S. Chen and K. Tang indicate that these are the costs of inspection and prevention, as well as the costs of corrective measures and imperfect quality (Chen and Tang, 1992). Similarly to J. Campanella and N. Chiadamrong, F.M. Bland defines quality

costs as costs that are the difference between the actual cost of production and the cost that would be incurred if there were no system failures or employee errors (Bland et al., 1998).

A different definition of quality costs is presented by V. Kajdan, who is of the opinion that they are the difference between ideal and real costs (Kajdan, 2007). For L. Weinstein, R.J. Vokurka and G.A. Graman, quality costs are a financial measure that expresses relevant information in the language of management (Weinstein et al., 2009).

According to L.A. Sedevich Fons, the costs of quality are nothing but the money given up by an organisation as a result of undertaking ineffective and inefficient development activities (Sedevich, 2011).

ISO 9000:2000 standards also define the concept of quality costs, treating them as an economic factor that affects quality (ISO 9000…, 2000). They are defined as costs incurred to guarantee and ensure satisfactory quality, as well as losses incurred due to failure to achieve satisfactory quality. Most attention to the issue of quality costs is devoted in ISO 9004 standards (ISO 9004…, 2018) concerning quality management and emphasising the impact of quality on the account of profits and losses of an enterprise, especially in a long-term perspective (Wawak, 1997c).

The concept of quality costs can also be understood and considered as (Kokot-Stępień, 2014):

- expenditures on quality resulting from the inefficiency of conducted activities,
- the value of losses resulting from the improper course of processes or improper supervision,
- a part of an enterprise's costs arising as a result of the implementation of certain activities and constituting an inherent part of such activities,
- costs incurred for obtaining an external product evaluation certificate,
- costs connected with improving an enterprise's production capacity.

A large variation in perceiving and defining costs related to quality confirms that they are an important subject of research for many academics from the areas of both quality management and accounting. A new perspective on quality costs is presented by Polish researchers.

T. Borys regards quality costs as incurred expenditures or lost benefits that are the result of imperfect actions (Borys, 1982). Meanwhile, for B. Oyrzanowski, they are expenditures incurred to obtain a certain level of quality, to analyse costs that affect the achievement of a certain level of quality, as well as measures aimed at minimising quality costs in an enterprise. This researcher defines them as a method of quality control (Oyrzanowski, 1984).

K. Lisiecka claims that quality costs are an important diagnostic indicator of the weaknesses occurring in an enterprise's departments such as procurement, assembly, control and research. They constitute "synthetic information for the management on the degree of the streamlining of quality assurance

system activities" (Lisiecka, 1997) and express a quantified objective of quality assurance that is connected with selecting such a structure of expenditure at which the sum of losses and costs of ensuring the appropriate quality will be the lowest (Lisiecka, 1997).

According to T. Wawak, quality costs are an integral part of a Total Quality Management system. They arise throughout a product life cycle – from the moment a decision is made to start the production of a product until its disposal – and are defined as the so-called social costs of quality (Wawak, 1997c).

Z. Zymonik defines quality costs as "Expressed in monetary units, the consumption of resources to create value for the customer that they will accept, and a loss of value of such resources" (Zymonik et al., 2013). Thus, they are the sum of costs and losses in the area of quality. She captures the conceptual issues of quality costs according to a historical criterion, presenting the following approaches (Zymonik et al., 2013):

- "Quality costs focused on excellence. High quality craftsmanship is costly.
- Quality costs focused on production. Every product has to be consistent with design objectives (mass production).
- Quality costs focused on process. A correct, undisturbed process makes it possible to manufacture a good product.
- Quality costs focused on a product life cycle. The safety of the use of a product and the need to protect the earth's resources make it necessary to monitor it: from its original idea and design, through production, sales and maintenance, to final disposal.
- Quality costs focused on the value created and delivered to the customer. Any shortcomings lowering this value are a waste of human, material and financial resources".

S. Sojak, on the other hand, defines quality costs as the costs of economic operations undertaken within the framework of a comprehensive quality control system, aimed at improving the quality of the manufactured products, lowering the costs and losses resulting from defective production, as well as related costs and losses (Sojak, 1981, 2015).

For K. Szczepańska, quality costs are costs closely related to the adaptation of a product to the requirements and expectations of (external and internal) customers, as well as showing the consequences of failing to adjust to such requirements and expectations (Szczepańska, 2017).

J. Gryc defines them as expenditures incurred to obtain the expected level of quality and costs resulting from the lack of the expected level of quality, i.e. defects and all their consequences (Gryc, 2004).

A dictionary of accounting terms defines quality costs as costs incurred when goods produced or services rendered do not meet quality standards (Collin, 2007).

The presented considerations of theoreticians and practitioners in the field of quality assurance, economics and accounting confirm that the concept of quality costs does not have a precise definition (Freeman, 2008). The differences relate to the scope and content of costs related to quality.

Based on the presented review of the approaches to quality costs, the authors define them as costs incurred by an enterprise at all stages of a process of manufacturing a product or providing a service. They contribute to obtaining a product/service of the highest quality, i.e. satisfying the consumer's requirements.

Market competition and customers' growing awareness of quality issues have a large influence on the management of an enterprise in the area of optimising the costs of quality of products and services. The tool used for efficient management of these costs is quality cost accounting.

1.2 Evolution of quality cost accounting in enterprises

So far, quality costs have been an element treated in accounting very often in a superficial way, which has resulted from the low and insufficient level of knowledge in this respect and the lack of implementation of integrated management systems. The current situation in the markets forces enterprises to implement quality costing in order to exercise control over their business activities more easily and to compete with other entities by increasing the quality of offered products or services (Bizoń, 2013).

Quality cost accounting is considered to be the most important element of the quality management system in an enterprise. It constitutes a separate part of an enterprise's cost accounting (Nowak, 2014). It is a system of recording, analysing and evaluating costs associated with ensuring quality at every stage of product manufacture and in all executed processes. It is also regarded as a system for taking action aimed at improving quality and optimising quality costs (Ciechan-Kujawa, 2005). It is also a tool combining an enterprise's intentions to optimise production, commercial and management processes with the necessity to use new management methods in order to detect and eliminate weaknesses and ensure high quality of supplied products and provided services (Astapczyk, 2011).

Furthermore, enterprises use quality cost accounting to transform information on costs into economic decisions (Sulowska, 2012). In quality-oriented enterprises, quality costing is one of the most important decision-making tools (Balon, 2007, 2012). It improves quality management processes and is an important element of economic analyses. It constitutes a source of information on the reasons for incurring particular quality costs. It allows an enterprise to identify the place and time of the emergence of a given cost. It provides the possibility to assess the necessity of incurring a given cost and its impact on the improvement of work effectiveness and quality, as well as quality cost optimisation in an organisation (Bareja and Giedroyć, 2007; Grudowski, 2016; Rehacek, 2018).

An increase in the efficiency of an enterprise to be obtained by identifying the sources of occurring deviations from quality requirements, their measurement and implementation of corrective measures eliminating irregularities is the main task of quality cost accounting (Zymonik et al., 2013).

J. Toruński identifies the following objectives of quality costing: assessing the efficiency of quality management, creating a basis for quality improvement programmes within an enterprise through the identification of problems to be solved, areas of key activities or opportunities as well as an increase in a company's goodwill (Toruński, 2012). They can be pursued by means of the functions of controlling and benchmarking. Controlling is cost control, i.e. planning, regulating and supervising the level of quality costs, which contributes to the rationalisation of quality assurance activities in a product manufacturing process. Benchmarking consists in finding a basis for conducting market comparisons of the quality costs of a given enterprise in relation to the quality costs of other entities operating in the same sector (Toruński, 2012).

The evolution of cost accounting can be divided into three stages:

- the first stage – before 1951,
- the second stage – until the mid-1980s,
- the third stage – from the mid-1980s to the present day.

At the first stage, there are attempts to divide quality costs and to define the concept of quality costs. In this period, it is important to distinguish the first division of quality costs developed by General Electric and presented in 1946 as a *Quality Cost Management System* (Kelemen, 2005). A very important event was also the first definition of quality costs proposed by J.M. Juran in 1951, in which he compared them to gold in the mine and considered them a tool for the economic measurement of quality (Juran, 1962).

The second stage is the period of the development of models of quality cost structures and the implementation of quality cost accounting in enterprises. The first model presentation of quality cost structures is the work of W. Masser (1957). The researcher distinguished three categories of these costs, i.e. costs related to prevention, appraisal and failures. In the second half of the 1950s, manufacturing companies in the United States and Japan were the first to start implementing quality costing. Polish and Western European companies did it only in the 1970s. An important moment in the history of the evolution of this type of accounting is the year 1967 and the Quality Cost Committee's publication of a structural model of quality costs in *Quality Cost – What and How* (ASQC, 1971). The development of quality costing coincided with the development of management accounting, within which numerous models of (postulated, budgeted, variable) costs were developed and expanded (Lew, 2017).

In Poland, the first attempts to record and analyse quality costs had to do with the guidelines of the Ministry of the Machinery Industry, which divided them into costs of preventing poor quality, costs of assessing a quality level and deficiencies. The ministry instructed enterprises to post such costs in off-balance sheet accounts 501 and 502 and the account "deficiencies" (Fedak, 1980). Such accounting applied only to costs incurred by a manufacturer.

Different concepts of recording costs related to quality were presented by B. Micherda, A. Łuckoś and S. Sojak. B. Micherda (1976) presented a proposal for the posting of quality costs in the following corrective accounts: "quality costs", "quality losses" and "quality gains". A. Łuckoś (1981) adopted the posting of quality costs in the following accounts: "quality costs of the pre-production sphere", "quality costs of the production sphere", "quality costs of the post-production sphere" and "quality losses". Meanwhile, S. Sojak (1979) proposed a division of all accounts of costs and losses by type into quality cost accounts and accounts for non-quality costs by type.

European countries became interested in quality and its costs only in the 1970s, whereas in the United States and Japan, the quality problem had been identified much earlier, as early as at the turn of the 1950s. The first quality cost structures were published by the British in 1981 in the form of the BS 6143 standard – *Guide to the Determination and Use of Quality Related Costs* (BSI, 1981).

The second phase in the development of quality cost accounting is characterised by very intensive activities to develop the concept of quality cost structure and attempts to record quality costs in the accounting systems of enterprises. The impulse for expansion was sent from the United States, reaching Japan first, and then European countries, including Poland.

The third stage of development of quality costing coincided with the beginning of the emergence of specialised IT solutions supporting management accounting and management processes. In that period, new concepts [ABC – *Activity Based Costing* (Kaplan and Cooper, 1998), BS – *Balanced Scorecard* (Kaplan and Norton, 1992), process cost accounting (Horvath and Mayer, 1989)] and tools supporting management accounting were developed; the development of some of them has continued until today (Lew, 2017). This stage is characterised by the dynamic development of the theory and practice of management accounting (Lew, 2017). It is a period of dramatic changes in objectives, tasks, tools used, orientation, time horizon of information and transformation of the role and tasks of specialists in this field (Sobańska, 2006).

A very important date is the year 1989 when managerial accounting was recognised by the International Federation of Accountants (IFAC, 1989) as an integral part of the management process. A year later, a guide to use quality costs in the BS 6143 standard – *Guide to the Economics of Quality* – was published (BSI, 1990). J. Bank (1992) was the first to relate quality costs and their accounting to service activities, and also to introduce the new categories of requirement exceeding costs and lost opportunity costs.

Published in 1994, the ISO 9004-1:1994 (ISO 9004…Part 1, 1994) and ISO 9004-3:1994 (ISO 9004…Part 3, 1994) standards present further approaches to classifying costs related to quality. It was also recognised that it was necessary to adapt these classifications to enterprises' own internal needs so as to ensure a close connection between the maintained quality cost accounting and the already used comprehensive accounting system. Quality cost accounting becomes the most important element of quality management systems.

At the turn of the 21st century, there occurs a change in the character of cost accounting in economic practice. Initially, its role was only to present costs retrospectively. The scope of its tasks included cost measurement, recording, settlement and calculation. Such a limited scope caused quality costing to be treated as a subsystem of recording accounting systems dealing with enterprises' operating costs (Nowak and Wierzbiński, 2010).

The growing interest of researchers in this type of accounting and the increasing need for enterprises to pay attention to the quality of services or products offered to customers had a great impact on the perception of this tool. It changed from a managerial tool providing *ex post* information and allowing the exercise of control to a tool providing ex ante information, allowing the exercise of control and facilitating decision-making.

The new perception of quality costing also contributed to a change in its status. It became an integral part of the management process and ceased to be a relatively passive element of information delivery systems (Ciechan-Kujawa, 2005). Optimising quality costs, increasing product quality and improving efficiency are the most important objectives of using this tool.

Changes taking place in the perception of quality costs as well as in the nature of cost accounting contributed in 2003 to the creation and publication of a new activity-based concept of quality costs by Z. Zymonik. This model emphasises that the estimation of quality costs is only possible with the use of appropriate input and output measures at each performance level and with the use of the strategic scorecard (Zymonik, 2003).

The dynamic development of quality costing is confirmed by the new categories of costs introduced by C.-C. Yang (2008): additionally arising costs and hidden estimated costs, as well as an innovative approach to the measurement of quality costs presented in the new ISO 9001:2008 standard, which provides for the adoption of a process approach in developing, implementing and improving the effectiveness of a quality management system (ISO 9001…, 2009; Sari et al., 2017).

Released in 2015 (Goranczewski and Szeliga-Kowalczyk, 2015), the new editions of the ISO 9001:2015 (ISO 9001…Wymagania, 2016) and ISO 9000:2015 (ISO 9001…Podstawy i terminologia, 2016) standards introduced modifications affecting quality cost accounting. The ISO 9001:2015 standard requires the implementation of a process approach, the adoption of criteria and indicators for evaluating processes, methods for their monitoring, the specification of necessary resources, the identification of opportunities and threats, as well as the implementation of changes (Fonseca and Domingues,

2017). The functioning of processes should be documented so that their efficiency in achieving objectives can be proven (ISO 9001…Wymagania, 2016; Wolniak, 2018; Abuhav, 2017). The new standard facilitates the building of a quality management system and a quality cost accounting system adapted to the actual needs of an organisation (Pacana and Stadnicka, 2017).

The latest version of the ISO 9004:2018 (ISO 9004…, 2018) standard provides guidance on how to systematically improve the overall performance of an organisation. It covers the areas of planning, implementation, analysis, evaluation and improvement of an effective and efficient quality management system (www1).

The elements distinguishing modern quality cost accounting are its subject matter and objectives, as well as sets of information on the costs of business activity. The subject matter is the costs of quality arising as a result of conducting business activity with the involvement of specific human, material and financial resources. The objective of this tool is to provide users with economic information that is necessary to evaluate the activity of an enterprise and make rational economic decisions. Quality costing systems process information on the value of the consumption of an enterprise's resources in connection with conducted business activity (Molenda et al., 2016). Quality cost accounting is also distinguished by the building of a set of information on the costs of an enterprise's activity. This process is conducted in accordance with the principles taking into account the needs of the users of cost accounting information (Nowak and Wierzbiński, 2010).

The evolution that took place in the functioning and perception of quality costing had an impact on redefining the tasks that it aims to perform. The most important ones include calculating quality costs; recording, i.e. posting all costs connected with quality in appropriate accounts; analysing changes in the particular groups of quality costs and identifying the places of their origin. The milestones of the development of quality cost accounting are presented in Figure 1.1.

The most intensive development of quality cost accounting occurred in the third phase, especially in the years 1989–2000, when numerous models of quality cost structures were created and quality costing became the most important element of quality management systems. The ISO standards have had and continue to have a significant impact on the formation of the procedure for implementing this tool. For service enterprises, a significant figure is J. Bank, who in his 1992 quality cost model refers for the first time in history to service activities. The development of quality costing after 2000 comprises mainly the introduction of elements facilitating its implementation in organisations and the dynamic development of specialist IT solutions.

This tool is currently used for the management and optimisation of quality costs, provides data for managerial quality reports, presents inflated quality costs resulting from the adoption of inadequate quality criteria and guarantees a better identification of economic quality requirements (Ciechan-Kujawa, 2005; Wójcik 2014, Kuzucu et al., 2017).

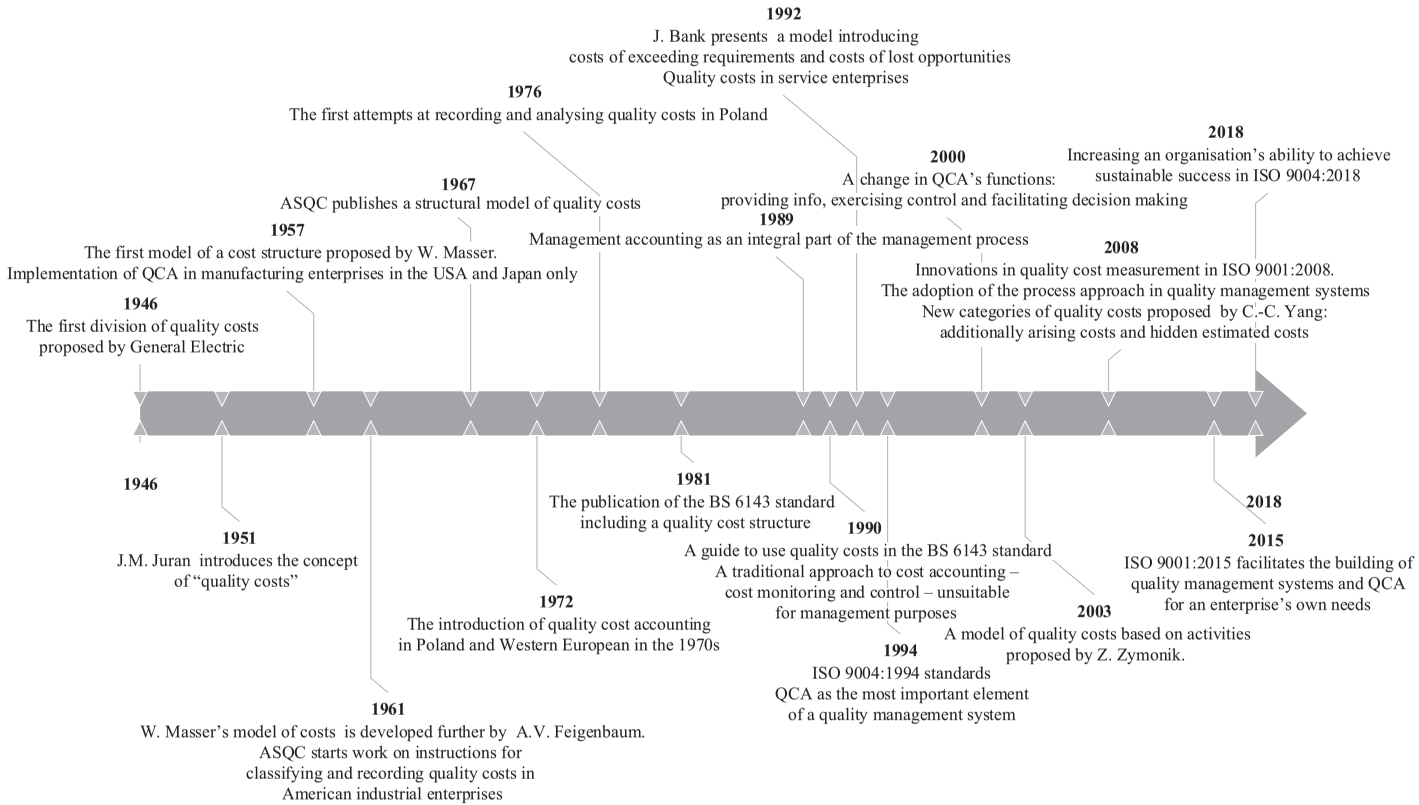

Figure 1.1 Milestones in the development of quality cost accounting
Source: The authors' own work.

The key to efficient quality costing is to use the best aspects of the existing accounting system, thereby reducing the cost of collecting the necessary data. Effective quality costing should not only cover selected parts of conducted business activity, but also address all areas that generate costs (Wood, 2013).

Quality costs are the most important element of quality cost accounting; therefore, it is so important to identify, classify and calculate them properly.

1.3 Classifications of quality costs

The growth of the interest in quality in the 1950s contributed to the intensification of the research on the structure and division of quality costs in enterprises. This part of the book provides an overview of the classifications of these costs.

The basic and necessary condition for the efficient management of quality costs is to know their types, which allows one to determine the structure of these costs in an enterprise. The authors propose the following approaches to classifying quality costs:

- original classifications of quality costs based on American, Japanese, Taiwanese, British and Polish ideas, as well as the philosophy of Total Quality Management,
- classifications of quality costs based on international ISO standards as well as national British and French standards.

The former classifications of quality costs represent the economic systems of the countries where their authors functioned and built their experience. The choice of the most important researchers from the United States is obvious, as it was they who laid the foundations for the quality revolution that took place in Japan in the 1950s. It was thanks to their knowledge and experience that Japanese quality theoreticians and practitioners made a "civilisational leap" in the development of the philosophy of quality management (Total Quality Management). Nevertheless, reducing the selection to the authors of quality cost classifications from these two countries only would be an unacceptable limitation, because Europe also became interested in the subject of quality costs, but much later, in the 1970s. A presentation of European researchers should also include the Polish approach to the issue of quality cost classifications.

The selected American authors of quality cost classifications include General Electric, W. Masser, A.V. Feigenbaum, J.M. Juran, J. Kelada and F.M. Gryna. The Japanese approach is represented by G. Taguchi, the Taiwanese one by C.C. Yang and the British one by J. Bank. Z. Zymonik, I. Sobańska and G. Broniewska are Polish authors of proposals for quality cost classifications.

Attempts to divide quality costs have also been made in international standards, such as ISO 9000 standards, and national standards, including British and French standards.

A review of the classifications of quality costs according to their authors should begin with *Quality Cost Management System* (Kelemen, 2005), an analysis prepared by General Electric in 1946, which proposed the first division of quality costs into (Kwintowski, 2013):

- costs of preventing the occurrence of deficiencies and errors,
- costs of control,
- costs resulting from manufacturing defects, costs of defectiveness.

This categorisation was possible thanks to historical analyses of costs related to quality assurance that started to be performed in the United States as early as in the 1940s.

The first model of a quality cost structure is the work of W. Masser (1957), who, divided quality costs into three categories:

- prevention costs,
- appraisal costs,
- failure costs.

A.V. Feigenbaum developed the cost structure proposed by W. Masser. In 1961, he divided quality costs into costs of quality control and costs of the absence of quality control (costs of errors). The costs of quality control comprise prevention costs and appraisal costs, which are perceived as capital expenditures. On the other hand, failure costs are losses, which the researcher divided into internal failure costs and external failure costs (Feigenbaum, 1961).

According to Feigenbaum, prevention costs include the costs of quality planning, process control, as well as quality system management and development. Quality audits (time), testing and inspection activities (time) or performance checks of testing and measurement equipment are just some of appraisal costs.

Internal failure costs are waste, corrections, materials necessary for corrections and involvement of employees in solving quality problems (time). Warranty complaints, product liability and product recalls are identified as external failure costs (Zymonik, 2003).

Referring to the division of quality costs developed by A.V. Feigenbaum, in 1967, the Quality Costs Committee formed within the American Society for Quality Control (ASQC, 1967) published *Quality Cost – What and How*, presenting a new structure of quality costs (Rehacek, 2018) that was popularised by J.M. Juran (1962) in his works. This researcher identifies quality costs as follows:

- precaution costs,
- evaluation costs,
- internal failure costs,
- external failure costs.

Precaution costs are costs related to preventive activities such as planning product quality or training employees in quality.

Evaluation costs concern the measurement of the level of quality in an enterprise. They include tests and inspections of materials, laboratory tests, as well as analyses of test and inspection results.

Internal failure costs are connected with the costs of correcting defective production, e.g. rework, repairs, additional work necessary to adapt materials to quality requirements.

External failure costs relate to the occurrence of deficiencies or defects after the delivery of a product/service to the customer (Kendirli and Tuna, 2009). These are customer complaints, alterations of returned products and technical errors (Juran and Gryna, 1974; Abd Razak et al., 2016).

J.M. Juran (1989) also presented another classification of quality costs, dividing them into good costs and bad costs. Good quality costs are allocated to ensure the provision of services/products at a level that meets or exceeds customer expectations, so these are expenditures on training, planning, a proper flow of information. Bad quality costs, on the other hand, are expenditures that could be avoided if products and processes were perfect, i.e. the costs of poor workmanship, rework costs, as well as costs of inspections and repairs (Juran, 1989).

The traditional approach to quality costs was criticised by J. Kelada (1990), who claimed that it took into account only direct and tangible costs. He proposed the following classification:

- direct quality costs (direct quality costs), which can be measurable (scrap, corrections) or nonmeasurable (loss of customer control),
- indirect quality costs, which are also divided into measurable costs (maintenance of inventories, supplier evaluations, standardisation) and nonmeasurable costs (keeping costs under control) (Stanciu and Pascu, 2014).

F.M. Gryna (1978) makes an attempt to put quality costs in a broad perspective. He claims that they are borne by not only organisations but also users. He divides such costs as follows:

- costs of repairs (replacement of parts and related wages),
- costs of losses in process efficiency (additional defective products made by, during and immediately after downtimes),
- costs of maintenance to avoid deficiencies (equipment and materials, direct and indirect wages),
- costs of damage caused by defective items (accidents at work, training of new employees to replace those who have suffered accidents),
- lost income (profit on production lost due to downtime caused by defects, penalties due to downtime caused by defective components – failure to meet sales or delivery deadlines),

- additional costs of installation compared to those of competing products (special installation requirements, costs of equipment testing and maintenance),
- additional costs of operation and maintenance compared to those of competing products (lower performance per operating cycle, special energy or fuel requirements).

Quality cost classifications based on the American approach to quality have several elements in common. Most authors recognise the occurrence of the costs of prevention, appraisal and failure (General Electric, W. Masser, A.V. Feigenbaum, J.M. Juran). The divisions proposed by W. Masser, A.V. Feigenbaum and J.M. Juran largely coincide, as they are based on the first classification presented by General Electric. J. Kelada and F.M. Gryna provide new approaches to capturing quality costs. For the former, quality costs are not only measurable elements but also those that are not nonmeasurable, while the latter raises the issue of a broad perspective of quality costs comprising both organisations and their customers.

Represented by G. Taguchi, the Japanese approach is based on the concept of social costs of quality and its basis of reference is the customer demanding improvement of the quality of products/services offered by organisations. The Japanese engineer regards quality costs as internal and external losses that can be either measurable or nonmeasurable (Taguchi, 1986; Dale et al., 2016).

C.-C. Yang (2008) divides quality costs into traditional costs and hidden costs. In his view, traditional costs include prevention costs, appraisal costs, as well as the costs of internal and external failures. Hidden costs are divided further into additionally arising costs and estimated costs.

The first type of hidden costs – additionally arising costs – is expenses caused by failures or errors; they can be observed and measured. C.-C. Yang includes in this new category such items as productivity losses, overtime spent on production preparation, costs of defects resulting from bypassing the quality management system, additional working hours, additional inventories, increased engineering time, increased management time, purchases, downtime, additional transport costs and excessive expenses on services (Yang, 2008).

The other new category concerns hidden estimated costs and includes many cost items that are difficult to analyse and estimate, such as sales revenues lost as a result of poor quality in the past, loss of reputation, consequences of failed preventive measures, development costs of failed products/services. The only way to calculate these costs is to estimate them from information on lost orders or lost market shares. Other similar costs are also difficult to estimate (Yang, 2008).

The term hidden or invisible cost is used to indicate costs that are inadequately recorded in an enterprise's accounting system and/or costs of errors

that are never actually discovered (Yang, 2008; Murumkar et al., 2017). G. Giakatis (2001) as well as C. Han and Y.H. Lee (2002) estimated that the value of hidden quality costs exceeds that of visible and obvious ones by more than three times. This invisibility may explain why so many organisations continue to tolerate and condone such high levels of avoidance of these costs. Consequently, they are not so much tolerated as simply ignored. The division of quality costs into measurable and hidden ones is illustrated by means of an iceberg (Figure 1.2) (Durmaz and Sevil, 2012). Many organisations only deal with costs that are located at the tip of the iceberg, while the majority of quality costs lie below the surface of the sea.

In accordance with the philosophy of Total Quality Management, developed mainly by W.E. Deming and J.M. Juran, quality costs can be

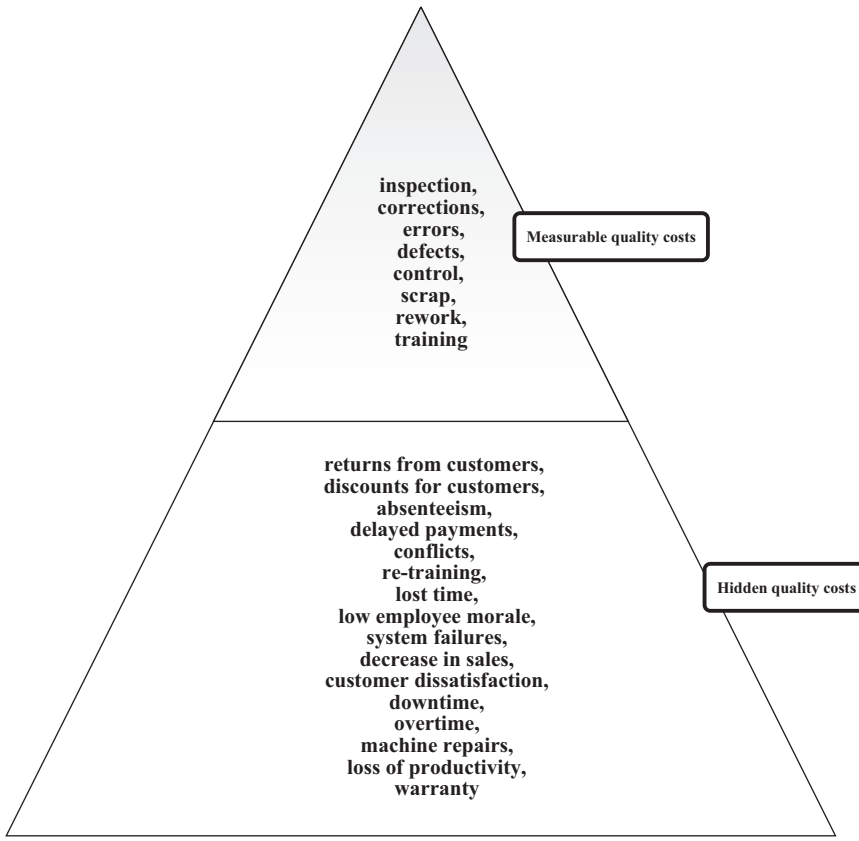

Figure 1.2 The iceberg of quality costs

Source: The authors' own work based on D.C. Wood, The executive guide to understanding and implementing quality cost programs: reduce operating expenses and increase revenue, ASQ Quality Press, the United States of America July 2007, p. 7.

divided into the costs of compliance, noncompliance and lost opportunities (Feigenbaum, 1961). The development of TQM took place in the 1970s and 1980s. In this philosophy, the customer is the subject of an enterprise's activities (Jakubiec, 2017; Chen et al., 2016; Antunes et al., 2017).

J. Bank presents the British approach to the classification of quality costs in his book *The Essence of Total Quality Management*, published in 1992 and translated into Polish under the title of *Zarządzanie przez jakość*. The author makes it clear that the term 'quality costs' applies to all costs connected with quality. He focuses on those cost elements that have previously attracted little or no attention. He divides quality costs into three basic categories (Bank, 1992):

- compliance costs,
- noncompliance costs,
- lost opportunity costs.

Compliance costs consist of costs related to prevention (training of employees, development of quality programmes to make employees aware of the role of quality in the enterprise) and appraisal (inspections, audits, document reviews).

J. Bank divided noncompliance costs into costs of internal errors (rejects, corrections); costs of external errors (costs of warranty repairs, correction of wrong invoices) and costs of exceeding requirements (unnecessary documents or their copies, unnecessary reports).

The researcher introduced a third element in noncompliance costs, i.e. the costs of exceeding quality requirements, for example, the provision of unnecessary information. A characteristic type of costs occurring in this categorisation is costs associated with lost opportunities (loss of potential customers, loss of revenues resulting from the dissatisfaction of existing customers) (Bank, 1992).

The Polish approach to quality costs is represented by Z. Zymonik, who classifies them as compliance and noncompliance costs. She considers compliance costs as a contribution to an enterprise's success, while noncompliance costs are connected with wasting resources. Furthermore, the researcher takes into account added value and the risk of the occurrence of defects in a product (Zymonik, 2003). Such an approach emphasises feedback between the customer and the product and stresses the strategic character of quality costs.

An innovative structure of quality costs corresponding to the market orientation of enterprises is presented by I. Sobańska, who divides them into costs of achieving a product's compliance with the customer's expectations (these are resources consumed to achieve compliance) and the costs of deviations caused by wastefulness (resources consumed to produce defects and the unrealised gross margin from the products recognised as defects). In the new classification, quality costs are defined as the value-adding consumption

of resources in an enterprise to produce products or provide services of high quality (Sobańska, 2003).

Meanwhile, G. Broniewska claims that quality costs have a social dimension and divides them into the costs of social dysfunctions and the costs of environmental protection. In the costs of social dysfunctions, she distinguishes those resulting from improper use of human potential, concerning all psychosocial discomforts occurring in employees and costs occurring in consequence of improper ergonomic conditions of work performance. Among the costs of environmental protection (ecological costs), the researcher identifies ecological losses caused by environmental pollution, losses resulting from improper waste disposal, as well as losses resulting from the depletion of rare natural resources (Broniewska, 1998).

The presented divisions of quality costs proposed by Japanese, Taiwanese, British and Polish researchers enrich and complement the classifications of the authors of American thought. Almost every researcher introduces new cost categories (G. Taguchi – measurable and nonmeasurable losses, C.-C. Yang – two categories of hidden costs, J. Bank – costs of exceeding requirements, I. Sobańska – costs of deviations, G. Broniewska – costs of social dysfunctions and costs of environmental protection), which only confirms the development and growth of interest in this topic on different continents.

The next approach to the classification of quality costs is based on their perception within the contexts of standards. These can be international standards, such as ISO, or national (British, French, etc.) standards.

The issue of quality costs is reflected in the ISO 9004 standard that concerns internal quality management and indicates the provision of ways to assess the efficiency of quality systems and the creation of foundations for quality improvement programmes as the main objectives of reporting. It also states that the impact of quality on the balance sheet and profit and loss account can be significant (Skrzypek, 2000). Classifications of quality costs can be found in the ISO 9004-1:1994 (ISO 9004…Part 1, 1994) and ISO 9004-3:1994 (ISO 9004…Part 3, 1994; Zymonik, 1983) standards.

The ISO 9004-1:1994 standard *Quality management and quality system elements* presents three ways of grouping quality-related costs: quality costs, process costs or quality losses (ISO 9004…Part 1, 1994; Zymonik, 2008).

The first way of classifying quality costs refers to the traditional arrangement of costs (prevention, appraisal, failures) represented by American authors of the concept of division (e.g. W. Masser, A.V. Feigenbaum and J.M. Juran). Prevention and appraisal costs are regarded as expenditures, while failure costs are losses (Lisiecka, 2013).

The grouping of costs according to the second method as process costs refers to two types of costs (noncompliance costs and compliance costs). Expenditures that need to be incurred to keep the work running smoothly are the costs of ensuring compliance, and occurring nonconformities are the result of disruptions in a process (ISO 9004…Part 1, 1994).

The third solution refers to quality losses that are the result of deviations from quality requirements and can be seen as the direct effects of inadequate quality (the narrow view) or as the effects of any waste of resources in an organisation (the broad view) (ISO 9004…Part 1, 1994; Lisiecka, 2013).

The approaches to costs presented in the ISO 9004-1:1994 standard are only a general picture of quality costs, and the authors have not specified the components of the particular cost categories. Z. Zymonik is of the opinion that this standard has not lived up to its authors' expectations (Zymonik, 2003).

The ISO 9004-3:1994 standard treats quality costs as measures used in the assessment of the efficiency of a quality system and divides them into the costs of internal quality assurance (operating quality costs) and the costs of external quality assurance (ISO 9004…Part 3, 1994; Skrzypek, 2000).

Operating quality costs are elements such as prevention, appraisal and failures; similarly to ISO 9004-1:1994, they are analysed according to the PAF model (Lisiecka, 2002). On the other hand, a very practical and innovative element is the second type of costs, i.e. costs of external quality assurance, which concern evidence objectively confirming quality, e.g. the design and implementation of certified quality systems, demonstration tests and product evaluation by independent research institutions (Skrzypek, 2000).

Besides international standards, divisions of quality costs were also introduced in national standards. The first attempts were made in the United Kingdom by the British Standards Institute (BSI), which in 1981 prepared and published the BS 6143 standard – *Guide to the Determination and Use of Quality Related Costs*, in which quality costs were divided into four categories: prevention, appraisal, internal failures and external failures (BSI, 1981).

The standard presents the elements of prevention in a very detailed way and arranges the costs related to the pre- and post-production phases. With respect to the costs of external failures, attention is drawn to the notions of lost sales (market), product recalls and costs of compensation claims for product defects. Among the costs of internal failures, the standard introduces costs related to price reductions due to unsatisfactory quality and distinguishes between repairable and irreparable deficiencies (BSI, 1990).

The British standards were not the only ones developed in European countries. In France, the issue of quality costs was thoroughly researched and subsequently presented in the AFNOR standards (AFNOR, 1986). The French standards divide quality costs into costs related to obtaining quality (quality-related costs) and costs that are not related to quality (Skrzypek and Czternastek, 1995).

Within these two main groups, the standard distinguishes the costs of prevention, appraisal or detection, as well as an enterprise's own costs resulting from failure to meet contractual conditions, costs incurred in consequence of oversight of contractual conditions and external costs resulting from failure to meet contractual conditions (AFNOR, 1986). A detailed breakdown of quality costs according to the French standard together with relevant examples is given in Table 1.2.

Table 1.2 A classification of quality costs based on French standards

Area	*Prevention costs*
Concept	Costs of verification of concepts, methods of procedure, development and verification of control methods
Means of production	Costs of inspection of equipment
Cooperation with suppliers	Costs of preliminary selection and evaluation of suppliers
Maintenance	Costs of preventive maintenance and related contracts
Quality assurance	Costs of quality assurance and monitoring
Measures and control	Costs of verification and control
Training	Costs of personnel training
Corrective measures	Costs of functioning of quality committees and development of quality improvement plans
Information technology	Costs of IT security
Safety	Costs of fire drills
Concept	Costs of verification of concepts, methods of procedure, development and verification of control methods
Means of production	Costs of inspection of equipment
Cooperation with suppliers	Costs of preliminary selection and evaluation of suppliers
Maintenance	Costs of preventive maintenance and related contracts
Quality assurance	Costs of quality assurance and monitoring
Measures and control	Costs of verification and control
Training	Costs of personnel training
Corrective measures	Costs of functioning of quality committees and development of quality improvement plans
Information technology	Costs of IT security
Safety	Costs of fire drills
Protection	Costs of insurance against product liability, property insurance, insurance against natural disasters and business losses
Area	*Appraisal (detection) costs*
Prototypes	Costs of laboratory tests and trials
Quality of product control	Costs of functioning of the quality management as well as reception, inter-operational, summary, final inspections
Management	Costs of inventorying, monitoring of suppliers' performance
Customer monitoring	Costs of checking consumer satisfaction, customer preferences
Commercial department	Costs of delivery inspections, customer satisfaction assessment
Sales department	Costs of inspection of invoices
Finance department	Inspection of costs, deficit list, payments

Area	*Own costs resulting from failure to meet contractual conditions*
Inspection	Costs of inspection of rejected goods, goods rejected during production, costs of final inspection of rejected goods and costs of product improvement
Concepts	Costs of improving concepts
Procedure	Costs of corrections, conceptual errors
Commercial control	Costs of errors in acceptance and fulfilment of orders, partial deliveries
Warehousing and production process management	Costs of errors in purchases, delays in deliveries, overstocking, errors in inventorying and production downtime
Area	*Costs incurred as a result of oversight of contractual conditions*
Personnel	Costs of absenteeism and accidents at work, costs of extra hours to make up for delays and errors, staff turnover, dismissals, recruitment errors and social conflicts
Information technology	Costs of repairs and delayed rating
Finance	Costs of errors in invoicing, errors in cash credits granted to customers, unnecessary activities
Environment	Costs of pollution
Area	*External costs resulting from failure to meet contractual conditions*
Commercial department	Costs of urgent deliveries, costs of looking for a substitute supplier as a result of failure to meet conditions of the contract with the previous supplier
Production	Returns, costs of production, inspection and rejected goods
Finance	Cost of processing and financial costs
Complaints and repairs department	Costs of customer complaints, litigation, damages and repairs
Customer service	Costs of after-sales service and compensation
Inspection	Penalties for delays

Source: The authors' own work based on AFNOR, *Norme NF X pp. 50–126: Guide Norma d'évaluation des coûts résultant de la non-qualité*, Paris 1986; E. Skrzypek, L. Czternastek, *Koszty jakości, aspekty teoretyczne i praktyczne*, PTE, Lublin 1995, pp. 28–31; M. Ciechan-Kujawa, *Rachunek kosztów jakości*, Oficyna Ekonomiczna, Kraków 2005, pp. 68–70.

The classification of quality costs according to the French standards shows that they occur in all processes of an enterprise, including the area of environmental protection in the form of the costs of pollution.

The divisions of costs presented in the aforementioned ISO and British standards have common categories, such as prevention costs, appraisal costs and failure costs. The ISO 9004-1:1994 standard provides three divisions, but the most innovative approach to quality costs is presented by the ISO 9004-3:1993 standard, which introduces the category of external quality assurance costs. The French standards, on the other hand, distinguish such costs as an enterprise's own costs resulting from failure to meet contractual conditions

and pollution costs. The classifications of quality costs based on standards may be the starting point for the creation of a cost structure in each enterprise.

The presented approaches to classifying quality costs confirm the great diversity of views (e.g. original concepts developed in the United States or Japan, international and national standards, Total Quality Management) on this topic. What appeared in parallel with the growth of interest in quality was various categorisations of costs with overlapping structural types (prevention costs, appraisal costs and failure costs), as well as new criteria of division (additionally arising costs, hidden estimated costs, costs of exceeding requirements, costs of social dysfunctions, environmental costs, as well as measurable and nonmeasurable losses).

In the authors' opinion, the most important criterion for the division of costs related to quality is the various views presented by quality researchers from several continents. W. Masser and his first classification of these costs was an inspiration for subsequent authors who tried to develop and improve it in subsequent years.

Inconsistencies in quality cost structures result from the fact that quality cost models often differ significantly from one enterprise to another. Every quality cost system is adjusted to the specifics and needs of a given organisation (Glogovac and Filipovic, 2018).

From the perspective of an enterprise seeking to increase the efficiency of its management systems, improve quality and optimise the costs associated with it, it is necessary to correctly identify where they arise, so that they can be recorded according to where they arise, rather than where they are disclosed.

1.4 The place of quality costs in the assessment of the efficiency of management systems

Efficiency is a basic economic category and a category of assessment occurring in the theory of organisation and management (Ziębicki, 2014).

The ISO 9000:2015-10 standard defines the concept of efficiency as the relationship between achieved results and used resources (ISO 9000…, 2016). It can also be defined as the relationship between customer satisfaction (resulting from the product or service purchased) and expenditures (related to commitment, availability and risk in manufacturing the product or providing the service) (Adamczyk, 2015).

P.F. Drucker (1994) claims that efficiency is the main factor of human and organisational development determining society's ability to survive; it is also the degree of achieving the established objectives. For E. Skrzypek (1999), efficiency can only be achieved if it is treated as a development process that comprises phenomena within an organisation as well as between it and the environment (customers).

Enterprises are interested in measuring efficiency because it is a criterion for the assessment of the effect of synergy in an organisation, i.e. the benefits that arise from cooperative arrangements within a particular organisational

system (Piekarz and Stabryła, 1989). One of the most important systems in an organisation is a management system whose efficient functioning affects the management of an entire entity (Szczepańska, 2015). The management of a whole organisation or some area of it is possible only when processes and activities can be measured and analysed using such measures as costs and time (Skrzypek, 2000). One of the tools for measuring the efficiency of management systems is quality costs that constitute the basis of quality cost accounting. The measurement of these costs and the presentation of its results is a continuous information process constituting the basis for making decisions by managers (Jakubiec, 2017; Murumkar et al., 2017). The success of an enterprise depends on its efficiency in the implementation and application of quality costing (Durmaz and Sevil, 2012; Rehacek, 2018).

The contemporary approach to efficiency evaluation proposed by R.G. Eccles (1991) manifests itself in several aspects. Nowadays, organisations pay much more attention to efficiency evaluation than in the past. Quality management (Łukasiński, 2016) and customer satisfaction have become the key performance areas and the main planes for assessing organisations' efficiency. Achieving the established quality objectives is possible through a well-functioning quality management system that should provide an organisation with adequate process productivity and economic efficiency (Łunarski, 2012; Barcik et al., 2015).

The literature on the subject distinguishes many categories of efficiency. What dominates in management is the notion of organisational efficiency, also referred to as system functioning efficiency. It is understood as the ability of an enterprise to adapt to changes in the environment and to use its resources productively to achieve the established objectives (Szymańska, 2010).

Organisational efficiency should also be considered as a multidimensional category of assessment that includes various criteria concerning the attributes and positive results of a given organisation. The criteria and their scope depend on the type of an organisation and the objective of the evaluator (Ziębicki, 2014).

An organisation's efficiency consists of economic efficiency and non-economic efficiency. This division is shown in Figure 1.3.

Economic efficiency is connected with the principle of rational management, which means obtaining the desired results with the lowest possible expenditures or obtaining the best results with given expenditures.

Efficiency of an enterprise can also be referred to non-economic aspects and take place at the three levels (Table 1.3) of an organisation, process and job. However, if an organisation is to achieve maximum efficiency, it is required to implement an efficient management system based on such levels (Dobrowolska, 2017).

Organisational factors determining non-economic efficiency are connected with a strategy adopted and implemented by an enterprise in the form of achieving a series of short-term goals. A badly developed strategy may have

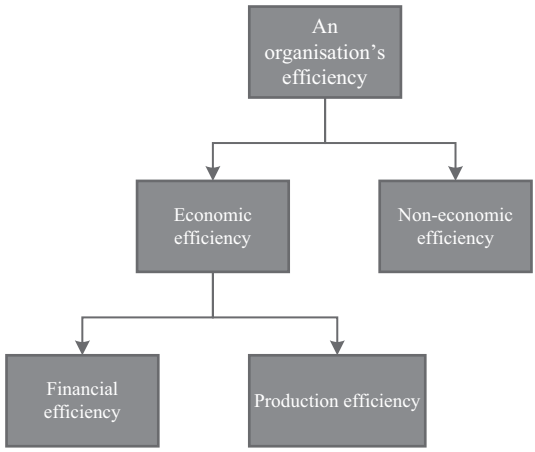

Figure 1.3 Categories of an organisation's efficiency
Source: E. Szymańska, *Efektywność przedsiębiorstw – definiowanie i pomiar*, Roczniki Nauk Rolniczych, series G, vol. 97, No. 2/2010, p. 156.

Table 1.3 Factors shaping the non-economic efficiency of an organisation

Level	*Factors*
Organisation	Strategy, objectives, methods of measuring them, structure, use of resources
Process	Processes occurring in organisations
Jobs	Recruitment, promotion, tasks and responsibilities of employees, work standards, rewards, training

Source: The authors' own work based on G.A. Rummler, A.P. Brache, *Podnoszenie efektywności organizacji*, Wydawnictwo Naukowe PWN, Warszawa 2000.

negative consequences in the form of unsatisfactory efficiency. The level of use of resources is an excellent measure showing how efficiently an entity manages them.

An organisation is a set of processes whose execution at all levels is to ensure the delivery of the highest quality product to the customer or the provision of a service that meets all consumer's requirements.

The level of individual jobs or positions also determines the efficiency of an organisation. Recruitment processes for new employees are supposed to have a positive impact on the more effective functioning of an entire enterprise. A policy of employee promotions and rewards can create a strong need for employees to fulfil their ambitions by obtaining a transfer to a new position with a higher salary. The achievement of this objective depends on the fulfilment of assigned tasks and responsibilities. The training of new and existing employees ensures that their professional qualifications are improved

and they develop new skills, which has a positive impact on their enterprise's efficiency.

Enterprise efficiency is considered from an economic and non-economic perspective. The most important aspect of the economic category is reliance on the principle of good management. The factors determining non-economic efficiency create the levels of process, organisation and position. Important measures of organisational efficiency include quality-related costs, as well as speed of response to market challenges and consumer expectations (Skrzypek, 2000; Gorbunova et al., 2017).

An assessment of efficiency requires answers to the following key questions: Is the efficiency of a given process such that obtained effects are/will be greater than incurred expenditures? Do the values of the ratios of productivity, return on assets (ROA), return on investments (ROI), return on equity (ROE), return on sales (ROS), profitability and liquidity satisfy stakeholders (Kwintowski, 2013)?

A functioning quality management system controls and ensures the efficiency of an organisation at every level. The functioning of an organisation is also influenced by its products, personnel, processes, programmes and enterprises (Wyrębek, 2013).

An efficient organisation is a productive entity that shows the ability to adapt to changes, has employees satisfied with their work and is creative, thanks to its ability to formulate and implement ideas generating new values for the customer (Wyrębek, 2013).

The efficiency of management systems in enterprises is measured by costs related to the course of production processes, resource consumption in relation to the obtained financial, marketing or production results as well as sales revenues. One of the most important groups of costs influencing efficient management is quality costs. An economic assessment of quality made on the basis of quality costs is extremely difficult, but necessary (Skrzypek, 1998).

Quality costs are an important means of verifying the efficiency of activity and a basis for making strategic decisions in an enterprise. Their skilful identification may contribute to the indication of weaknesses and dominant trends, the elimination of sources of errors and the reduction of production and service costs. Furthermore, it provides better knowledge of other areas requiring improvement and helps to assess the efficiency of the quality system, establish quality and cost objectives for subsequent periods and introduce innovative measurement methods, such as customer satisfaction and product quality (Gryc, 2004).

Improving efficiency is the most important source of increasing profitability and achieving the goal of increasing an enterprise's value (Nowak and Wierzbiński, 2010). It should be pursued by both increasing net profit and reducing costs, while maintaining a quality level that satisfies the customer. The appropriate level and structure of costs have an impact on the profitability and competitive potential of an organisation (Wierzowiecka, 2015).

The efficiency of a quality system depends on the amount of costs incurred in the quality assurance process and the value of sold production (provided services). The product of the difference in quality costs and net sales is an economic measure of the quality assurance programme followed in a given enterprise, as well as information on the pro-quality policy pursued by it in the longer perspective (Lisiecka, 2013).

One of the means of assessing the efficiency of management systems is quality cost analysis, which is a fundamental tool used in quality economics (Rehacek, 2017). A skilful examination of these costs determines the quality of decisions made by managers and applicable to quality management systems (Szczepańska, 2009a). Enterprises that measure their quality costs provide products and services of higher quality compared to those offered by their competitors that disregard these costs (Pekanov et al., 2015).

The subject matter of quality cost analysis is an interpretation of trends in the shaping of quality costs, an assessment of the effectiveness of their optimisation and an indication of directions for verification of quality improvement programmes (Szczepańska, 2009a). This analysis allows one to identify value-adding activities that the customer is willing to pay for, as well as activities that do not add value for the customer, but are indispensable for the performance of work that adds such value. It is also possible to identify useless activities that do not create value and whose elimination would not be noticed by the customer (Ciechan-Kujawa, 2004).

The general objective of quality cost analysis is to determine and assess the factors influencing the level, dynamics and structure of an enterprise's quality costs in the context of its processes and systems. The basic task of this exploration is to provide information on the formation of costs in different cross-sections. Such information constitutes a justification for the reasons for their formation (Szczepańska, 2009a).

Enterprises have numerous difficulties related to the inclusion of conclusions from analysis of quality cost in everyday management practices. It results from the lack of quality costs in financial statements. They are not shown in either a balance sheet or a profit and loss account as they are only a part of manufacturing costs. It is necessary to raise the awareness of the importance of quality cost analysis in reducing an enterprise's overall costs (Wojciechowski, 1998). If enterprises are to be able to record and analyse quality costs on a systematic basis, they should expand their company chart of accounts to include appropriate subsidiary accounts for quality costs (Lisiecka, 2013).

The results of quality cost analysis make it possible to determine the places and causes of the emergence of these costs, obtain information on differences between the planned and achieved cost volumes, identify the internal structure of quality costs and the structure of costs included in particular categories and determine the impact of costs on an enterprise's profitability. Such results also contain detailed information on the optimum level of quality costs and the implementation of plans and their effectiveness.

They are also useful in the process of quality planning (Szczepańska, 2009a; Balon, 2012).

Data on quality costs to be used in analysis can be drawn from two sources: operational records and accounting systems. Operational records are a quick, non-formalised way of collecting data, based on non-accounting documents and estimates. In view of the fact that the majority of enterprises do not separate quality costs from their overall costs, it becomes necessary to determine their size on the basis of operational documentation that comprises source records (e.g. bookkeeping accounts, periodic settlements of quality costs) and unrecorded documents (e.g. materials from inspections, audits, minutes from conferences, press releases, reports on errors, registers of complaints and claims, data on downtimes, maintenance and repairs) (Ciechan-Kujawa, 2005).

A proper assessment and interpretation of data on quality costs, which has an impact on the assessment of the efficiency of an organisation's management systems, should be considered together with the elements remaining in certain interdependencies with quality costs. Therefore, the identified quality costs should be compared with appropriate metrics such as net sales or direct costs. This kind of analysis is called comparative analysis and metrics define and measure tasks, simultaneously fulfilling an analytical function. They also indicate difficulties and help to establish the reasons for deviations of the actual value from the required one. Such metrics are to identify correctly the area where quality problems occur (Wójcik, 2014).

If indexes and metrics are to fulfil their functions in management properly, they must be adequate (reflect adequately the reality in the enterprise); relevant (provide only information relevant to a specific decision-making process); extensive (present as many actual states of a given decision-making problem as possible and signal problems as early as possible). In addition, they should be characterised by completeness (relation to the entire area of a problem requiring a decision); comparability (the values of indexes/metrics can be compared inside and outside the enterprise); compatibility (the information system should provide the information necessary to create a set of interrelated indexes); efficiency (the cost of establishing the value of a given metrics cannot be higher than the benefits to be derived from its use) (Pfohl, 1998).

Metrics used to evaluate quality in an enterprise are divided into synthetic and analytical ones. In the group of synthetic metrics, one can distinguish metrics of expenditures on the implementation of quality plans, productivity, efficiency, effectiveness of outlays and profitability. They indicate the impact on sales revenues, costs and profit exerted by changes in quality (of work, products, services) resulting from implementation of quality improvement measures. Analytical metrics describing in detail selected quality problems include the nonconformity index, downtime costs, excessive quality, losses due to internal and external deficiencies, costs of early, delayed and defective deliveries, reliability and availability. The effects of continuous quality improvement are reflected in quality cost metrics such as quality cost

dynamics, the internal cost structure or the ratio of quality costs to manufacturing costs, sales revenues or profit (Wawak, 1997a).

In view of the process-based approach to quality management, it is possible to distinguish the following metrics of the level and structure of quality costs (Table 1.4).

Table 1.4 Metrics of the level and structure of quality costs

Process	*Group of metrics*	*Metrics*
Purchasing	Loss metrics	- Value of rejected deliveries/value of deliveries - Value of deliveries accepted with reservation/value of deliveries
	Metrics of prevention and appraisal costs	- Input inspection costs/value of deliveries
Production	Loss metrics	- Internal failure costs/wages of direct production employees - Costs of repairs/value of production - Costs of unrepairable defects/value of production - Internal deficiency costs/value of production - Costs of discounts and rebates/value of production
	Metric of prevention and appraisal costs	- Appraisal costs/costs of production
Marketing and sales	Loss metrics	- Costs of complaints/value of sales - Warranty costs/value of sales - Value of returns/value of sales - Value of transport damage/value of sales - Value of returns and value of sales
	Metric of prevention and appraisal costs	- Costs of customer needs, requirements and satisfaction surveys/total costs
Quality management	Loss metrics	- Internal deficiencies/quality costs - External deficiencies/quality costs - Total deficiency costs/profit
	Metric of prevention and appraisal costs	- Prevention costs/quality costs - Appraisal costs/quality costs - Prevention costs/profit
	Organisation-level metrics	- Quality costs/sales revenues - Quality gains and losses/sales revenues - Quality gains and losses/quality costs

Source: The authors' own work on the basis of M. Ciechan-Kujawa, *Rachunek kosztów jakości*, Oficyna Ekonomiczna, Kraków 2005, pp. 117–118.

All presented metrics may be used by enterprises to assess trends in quality costs and relations among particular groups of costs, but each enterprise must choose the most appropriate ones, taking into consideration its own needs and the specificity of its business activities as well as the possibilities of obtaining data. Selected metrics should always be a source of complete and reliable information for those who work to improve the quality of offered products and services, and at the same time, enable the managers of an organisation to assess the efficiency of the management system (Konarzewska-Gubała, 2013), identify areas requiring special attention and establish plans for improvement (Ciechan-Kujawa, 2005).

The relationship between quality cost management and the efficiency of an enterprise's management systems is illustrated by the model prepared by A. Kister (2005) (Figure 1.4), which should take into account the following premises:

- input data are accounting documents taking into account the occurrence of quality costs,
- quality cost accounting concerns both costs that are disclosed (in accounting documents) and those that are invisible (based on estimates),
- cost records are maintained on a continuous basis,
- decisions made by managers in the area of quality management based on the data resulting from cost accounting,
- conclusions resulting from quality cost accounting are an important element of decision-making and affect many areas of management,
- the efficiency of the quality management system and the efficiency of the entire enterprise are influenced by effective decisions.

At the input, there is information on quality costs in the form of accounting documents. This information is classified, posted in accounts and analysed (changes of costs over time, the ratios of particular components of quality costs to total quality costs, cost budgeting). Decisions are made to optimise quality costs. Conclusions from conducted analyses, i.e. reports, are forwarded to relevant organisational units (M, DVM, DM, TL, LE). The management is at the top of the hierarchy and exercises control over an enterprise's policies (including the quality policy) and the process of pursuing objectives. Division managers (DVM) are to manage the execution of their division's tasks or the production of a group of products. Department managers (DM) ensure the fulfilment of their department's tasks. Team leaders or shift leaders (TL) perform the managerial and executive functions. Line employees (LE) fulfil the executive functions (operator, assembler, painter). Information on the course of processes is generated at every level on a bottom-up basis. At every level, decisions are made about the entire enterprise, processes and jobs. The management coordinates all activities (Kister, 2005).

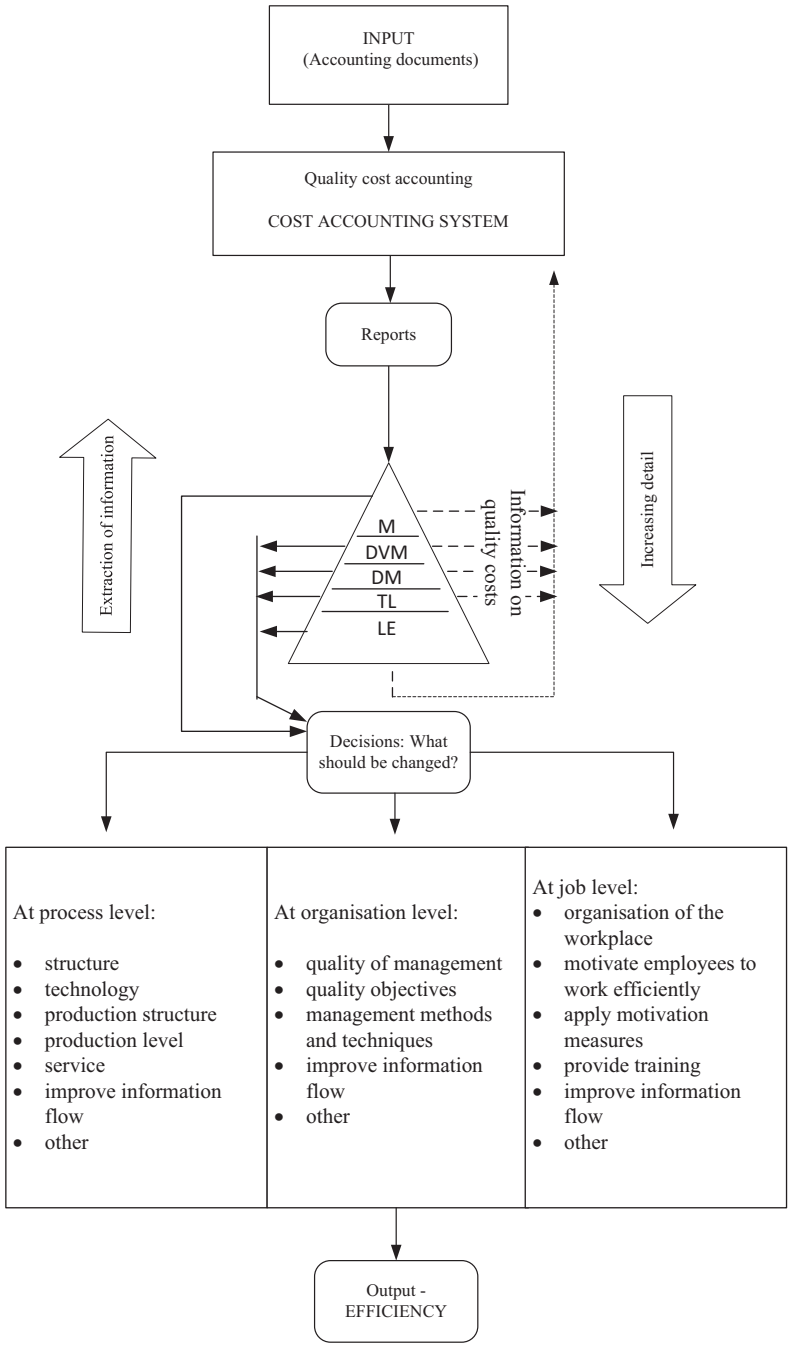

Figure 1.4 A model of the relationship between quality cost management and enterprise efficiency

The implementation of quality cost management should make all employees aware that their enterprise bears the costs of bad and good quality. The costs of errors show how much each employee lost and by how much his or her remuneration could have been higher if such errors had not been made. All decisions taken lead to an increase in the efficiency of the enterprise (Kister, 2005).

The intensifying global competition forces organisations to focus on providing their customers with products/services of the highest quality. For enterprises, high quality is simply a ticket of entry to the market, a chance to survive (Cokins, 2006). Quality cost accounting can be used to achieve this goal. Quality costs are a concept that clear categorisation in terms of both definitions and handling in accounting systems. This results in a situation in which only measurable quality costs are visible in the structure of an enterprise's processes (Szczepańska, 2009b). Moreover, most of quality costs are measured in the production sphere, with the other functional spheres of an enterprise excluded from such measurement. This practice is highly insufficient for any tangible improvement of the efficiency of management systems.

Various approaches to the classification of quality costs show that they can be considered and analysed using original concepts derived from the American, Japanese, British and Polish thought on quality, the criterion of visibility (visible and hidden quality costs), international (ISO) standards and national (French, British) standards, as well as the philosophy of Total Quality Management. Quality cost accounting is a tool used to ensure the efficient management of quality costs. Its implementation in an enterprise may be one of the more important decision-making criteria.

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2 A review of the existing quality cost accounting models and quality cost models

2.1 A review of quality cost accounting models

Cost accounting is most often understood as a set of activities performed in an accounting system, such as: capturing (measuring and documenting the course of processes), measuring (identifying, documenting and valuing resources used in processes), grouping (capturing and determining costs by type, place of formation and final carriers), processing, presenting and interpreting (preparing reports on costs and financial results) as well as analysing the quantitative and financial results of an organisation's resource consumption processes occurring in connection with its economic activities (Jarugowa et al., 1983). It also includes planning (budgeting), performance monitoring and generating information used to assess the financial position and make both operational and strategic decisions. Cost accounting is a system that provides ex post, ongoing and ex ante information (Jaruga, 2010).

A developed definition of cost accounting recognises it as a system of calculating costs and results consisting in the examination and transformation of information about costs and revenues of past, present and future activities, according to the implemented model and for the purpose of supporting the management of an organisation (Jaruga, 2010).

A cost accounting model comprises a set of guidelines and rules, as well as procedures assigned to them, on the basis of which information on costs is developed and adapted to the specific needs of the recipients of such information. Each model has specific principles determining the way of data processing (Nowak, 2017).

The emergence of specific cost accounting models is determined by external and internal factors. The most important external factors include market conditions and formal requirements (e.g. legal accounting regulations), while internal factors comprise an enterprise's organisational system, management system, as well as used techniques and technologies. These factors are empirical in nature. On the other hand, the development of cost theories, as well as the theories of organisation and management, constitutes the methodological basis for the functioning of cost accounting models and the principles of developing new ones (Szydełko, 2017).

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Over the years, the diversity of recipients of cost accounting information has contributed to the formation of many different cost accounting models (Nesterak, et al., 2017).

What stands out among various strategic cost management models is quality cost accounting. As a criterion for the classification of quality cost accounting models, the authors have adopted the type of business activities conducted by the enterprise for the purposes of which a particular model has been developed. This criterion allows one to distinguish the following:

- quality cost accounting for production enterprises,
- quality cost accounting for service enterprises,
- universal quality cost accounting for enterprises.

The purpose of this classification is to specify the most important elements forming quality cost accounting models and to systematise the knowledge of them. The most important models dedicated to production enterprises include those developed by researchers representing the Polish school of quality [The "ZETOM" Quality Research Centre for the Products of the Metallurgical and Machinery Industries (1978), S. Sojak (1981), A. Polak (2003), U. Balon (2007), Ł. Kraska and D. Stadnicka (2010), J. Toruński (2011)] as well as models proposed by researchers representing other countries [H.J. Harrington (1987), A. Chopra and D. Garg (2012), T.M. Malik, R. Khalid, A. Zulqarnain, S.A. Iqbal (2016)]. Quality costing models for service enterprises have been proposed by U. Sulowska-Banaś (2013) and J. Wierzowiecka (2015). Universal quality costing models have been presented by Polish [K. Lisiecka (1996) and (2002), Z. Zymonik (2003), M. Ciechan-Kujawa (2005), A. Kister (2005)] and foreign [D.C. Wood (2013)] researchers.

The aforementioned models of quality cost accounting are listed in Table 2.1. The models are arranged in chronological order according to the adopted criterion. The most important variables used in the comparative analysis are the following: the availability of the principles adopted in the construction of a model and a graphical scheme of the quality cost accounting procedure, the structure of quality costs, the adopted cost recording system, the presence of a specimen chart of accounts for quality costs, the sources of information on quality costs, the bodies responsible for the implementation and maintenance of quality cost accounting, as well as innovations in the form of improvements to the models introduced by their authors.

The foundation for the first model-based approaches to quality cost accounting was laid by H.J. Harrington (1987), who in his book *Poor-Quality Cost* presents 15 steps to be taken when implementing a system of accounting for poor quality:

1 Establishing an implementation team.
2 Presenting the concept to the top management of the organisation.
3 Developing an implementation plan.

Table 2.1 A list of quality cost accounting models

Author	*Year*	*Availability of principles adopted in model development*	*Graphical scheme of the QCA procedure*	*Quality cost structure used in the QCA model*	*Cost recording adopted in the model for accounting purposes*	*Presentation of a specimen chart of quality cost accounts*	*Sources of information on costs*	*Bodies responsible for the implementation and management of QCA*	*Implemented improvements*
Quality cost accounting models for production enterprises									
The "ZETOM" Quality Research Centre for the Products of the Metallurgical and Machinery Industries	1978	Yes	Yes	PAF model	By type/by function	Yes	On-balance sheet and off-balance sheet accounts	Management, implementation team	Developing a quality improvement programme based on analysis of quality costs in electrical machinery industry enterprises
S. Sojak	1981	Yes	Yes	Prevention costs, quality appraisal costs, external and internal bad quality costs; quality costs according product life cycle phases	By type/by function	Yes	Accounting records, non-accounting materials (documents from inspections and audits, management review reports, data from computer systems, error reports, records of complaints)	Management, quality manager, quality department, cost/payroll department	Financial ratios (metrics) of quality

(Continued)

Author	*Year*	*Availability of principles adopted in model development*	*Graphical scheme of the QCA procedure*	*Quality cost structure used in the QCA model*	*Cost recording adopted in the model for accounting purposes*	*Presentation of a specimen chart of quality cost accounts*	*Sources of information on costs*	*Bodies responsible for the implementation and management of QCA*	*Implemented improvements*
H.J. Harrington	1987	No	No	PAF model	Costs by function	Yes	General ledger, error and correction reports, warranty reports, budgets, complaints	Implementation team and management	Table of quality cost priorities
A. Polak	2003	Yes	Yes	PAF model and process approach	Costs by function	Yes	Places where expenditures on quality and losses occur	Quality Officer, heads of quality control, accounting and controlling departments	Developing a set of accounts for recording quality costs in set 5 (591, 592, 593, 594, 595, 596)
U. Balon	2007	Yes	Yes	PAF model	Costs by function	No	Accounting documents, defect sheets	Chief accountant, quality officer, quality cost team	Quality cost classification scheme, defect sheets, creation of account "53513 Quality costs"
Ł. Kraska and D. Stadnicka	2010	No	Yes	Quality cost model J. Banka	By type/by function	Yes	SAP database (process flow sheets), operational documentation	Quality director, IT director, quality manager, implementation team and its leader	Work schedule for implementation of full accounting, methods of calculating the value of quality costs

J. Toruński	2011	Yes	No	Internal and external quality assurance costs	By type/by function	Yes	Documents (invoices, payroll, information tables, etc.)	Management, quality assurance and accounting departments	Benchmarking and controlling
A. Chopra and D. Garg	2012	No	Yes	PAF model	By type/by function	Yes	Quality-oriented measures	Management and quality cost team	The system consists of two models: cost calculation and quality cost programme implementation
T.M. Malik, R. Khalid, A. Zulqarnain, S.A. Iqbal	2016	Yes	No	PAF model	Costs by function	Yes	Various reports (e.g. scrapping, payroll), interviews, cost breakdowns	Management, quality cost team, quality control department	Detailed templates for each stage of implementation
Quality cost accounting models for service enterprises									
U. Sulowska-Banaś	2013	Yes	Yes	Costs of conformance, nonconformance and lost opportunities	Costs by function	Yes	Invoices, internal calculations, internal documents confirming that costs have been incurred	hospital director, director's representative for quality management, chief accountant, accounting department, management of central sterilisation room and operating theatre	Off-balance sheet account "53101 Quality costs" and additional subsidiary accounts for recording individual quality costs, Procedure P/SZJ/8.4/01 Quality costs accounting

(Continued)

Author	*Year*	*Availability of principles adopted in model development*	*Graphical scheme of the QCA procedure*	*Quality cost structure used in the QCA model*	*Cost recording adopted in the model for accounting purposes*	*Presentation of a specimen chart of quality cost accounts*	*Sources of information on costs*	*Bodies responsible for the implementation and management of QCA*	*Implemented improvements*
J. Wierzowiecka	2015	No	U. Balloon's scheme	PAF model	Costs by function	Yes	Computerised accounting system and bookkeeping accounts	Accounting department, quality management system manager	Modified scheme for classifying quality costs, proposal for structure and chart of accounts for quality costs for laboratory and examples of such costs
Universal quality cost accounting models for enterprises									
K. Lisiecka	1996, 2002	Yes	Yes	PAF model, process costs, quality losses, ISO 9004 standard	By type/by function	No	List of quality-relevant costs, recording forms	Management, quality department manager, quality department, cost department	Quality cost ratios
Z. Zymonik	2003	Yes	Yes	Process approach	Costs by function	No	Strategic scorecard	Management	Model of quality costs based on activities

M. Ciechan -Kujawa	2005	Principles adopted by K. Lisiecka	Scheme of K. Lisiecka	ISO 9004 standard, ASQC	Costs by function	Yes	Accounting and non-accounting materials	Management, quality management, accounting and controlling departments	Development of procedure for quality cost accounting
A. Kister	2005	Yes	Yes	Model of failure, appraisal and prevention costs	Mixed system (costs by type – cost accounting – costs by function)	Yes	Accounting documents	Management and accounting department	Model linking quality cost management with organisational efficiency
D.C. Wood	2013	Yes	None	PAF model	Costs by function	Yes	Financial data, bookkeeping accounts	Management, quality manager, each employee	Quality cost classification scheme, quality cost data sheet template, quality cost report template

Source: The authors' own work.

4 Selecting a testing area.
5 Initiating programme implementation.
6 Identifying and classifying cost elements.
7 Diagnosing each cost element of poor quality.
8 Entering input data into the system.
9 Determining output formats.
10 Defining additional data requirements.
11 Reviewing the status of the enterprise management system.
12 Commencing the trial period.
13 Reviewing monthly reports.
14 Modifying the programme based on gained experience.
15 Extending the programme to the whole organisation.

According to H.J. Harrington, a good manager is a person who can reduce costs while simultaneously improving quality, and the key tool used to achieve this goal is a system based on the aforementioned 15 steps. The main sources of data on the costs of poor quality are cost items from the general ledger, error and correction reports, warranty reports, budgets, operational reports, equipment list and complaint reports (Harrington, 1987).

In his model, H.J. Harrington proposes to implement the system first in a testing area of the enterprise, for example a production line. Such an approach makes it possible to check the functioning of the system and the employees responsible for its supervision before it is implemented throughout the organisation. All experience gained from the testing area should be used in the system extended to the whole enterprise. An important element is also reports on the costs of poor quality to be prepared and published on a monthly basis. The model can constitute an important point of reference for subsequent researchers dealing with this issue.

The rules for the implementation of quality cost accounting in enterprises were also developed by the "ZETOM" Quality Research Centre for the Products of the Metallurgical and Machinery Industries in cooperation with B. Oyrzanowski and K. Chlewicka-Goździk (MPM, 1978). Deciding on the implementation of this tool should be preceded by an initial estimate of quality costs ordered by the organisation's management. The management's assessment of the importance of the issue of quality is the basis for a decision to introduce and use quality cost accounting. The next stage is the establishment of an implementation team consisting of the chief accountant, chief engineer, chief designer, quality control officer and a representative of the economic division. The tasks of this team include the development of a quality cost accounting methodology, an instruction for its application and quality cost analysis. The developed instruction is implemented by the plant director by means of an internal regulation specifying the starting date for the use of a new quality cost accounting system, as well as assigning supervision and control duties related to its proper functioning. The next step comprises training for employees in the issues of quality costs. Information

on the level of quality costs and conclusions from their analysis should be communicated to the management of the enterprise, local government bodies and sociopolitical organisations. The last stage consists in using the aforementioned conclusions to build or verify the production quality improvement programme (Jędraś, 1989).

This model presents in an accessible way the particular stages of quality cost accounting. Each activity is discussed in detail. An additional advantage of the study is the presentation of the results of the research on the implementation of quality cost accounting in industrial enterprises (Jędraś, 1989). These results include a detailed description of additional balance sheet and off-balance sheet accounts used to record and measure quality costs.

A. Polak (2003) is the author of a quality cost accounting model dedicated to production enterprises. Its most important elements include the following:

- its scope encompasses all activities affecting the quality of processes, products and services,
- it takes into account the guidelines of the currently applicable quality management standard,
- based on the Accounting Act, it should not interfere with the enterprise's bookkeeping and cost accounting system,
- it does not allow the double recognition of quality costs,
- the places where expenditures on quality and losses occur are sources of data on quality costs,
- the management and persons responsible for particular areas of activity are the addressees of quality cost analysis,
- quality costs are divided according to their places of origin (based on the existing organisational structure) and on the basis of the process approach into conformance costs and nonconformance costs (the necessity to establish centres of responsibility or centres for quality cost control),
- costs should be recorded in four accounts of set 5 (based on the PAF model): 591 – prevention costs, 592 – costs of product quality appraisal and control, 593 – nonconformance costs, 594 – costs of external quality assurance,
- if the process approach is used, costs should be recorded in two accounts of set 5: 595 – conformance costs, 596 – nonconformance costs.

Deciding on the implementation of the quality cost account will result in the necessity to develop the principles of its functioning. The responsibility lies with the CEO's representative for quality and the managers of the quality control, accounting and controlling departments. Their tasks concern the development of a quality costing procedure, the preparation of a detailed quality cost accounting manual, as well as the preparation of information materials for employees on the impact of quality on the bottom line in order to overcome the potential appearance of barriers and resistance during the introduction of a new cost accounting system (Polak, 2003).

Furthermore, actions should be taken to determine the source documents on the basis of which the records of quality costs will be kept (Polak, 2003). The author also emphasises the importance of developing special forms allowing employees to capture the costs of prevention, appraisal and failure that are impossible to indicate in the existing accounting system of an enterprise. In the next phase, it is necessary to develop standard values for the new accounting system, prepare formats and methods of presenting information on quality costs, as well as choose methods for analysing such costs and their metrics. An enterprise implementing a quality cost accounting system should also conduct employee training in quality costs, determine the direction of its development account and allocate tasks related to quality cost management (Polak, 2003).

In her model, A. Polak presents two proposals for the approach to the costs of quality: from the traditional perspective and from the perspective of processes. The recipient has the possibility to choose the option of building a quality cost accounting system according to their objectives, which proves its high flexibility. The author also proposes specific solutions, such as cost accounts in set 5, which should be created during the implementation of quality cost accounting. The whole system is based on the clearly presented assumptions, in a way that is understandable for any potential interested party. It is characterised by considerable attention to detail. Conducting an effective quality cost accounting system based on the model proposed by A. Polak seems to be attainable for enterprises that aim at optimising the costs of quality as well as those that want to improve their processes.

U. Balon (2007) is the author of a quality cost accounting model developed especially for food industry enterprises. She indicates the following as the most important premises of her concept:

- creating an additional account "53513 Quality costs" for the recording of quality costs in the already used company chart of accounts (set 5),
- setting up subsidiary accounts for the detailed recording of quality costs,
- classifying quality costs according to the PAF model,
- defining the source documents of quality costs,
- appointing a quality costs team (two employees of the economic and financial department and the head of the quality department) responsible for supervising the system and conducting training in this scope,
- developing a scheme for qualifying quality costs,
- developing and implementing a "defect sheet",
- conducting an analysis of the structure of quality costs, comparative analysis, as well as value analysis.

The innovation of U. Balon's concept is the introduction of a quality cost qualification scheme that facilitates the determination of cost types by answering the questions included in the scheme.

The starting point of the model is the preparation of a list of quality-relevant costs, which is the responsibility of the chief accountant and the quality officer. The quality officer is also responsible for defining quality costs and preparing their classification. The chief accountant's duty is to define the source documents that will be the basis for the recording of quality costs. In the next step, the quality officer may introduce auxiliary source documents, such as defect sheets. Supplementing the company chart of accounts with the account "Quality costs" and auxiliary accounts, the posting of quality costs in appropriate accounts and the transfer of balances to an Excel sheet are the tasks of the chief accountant in the subsequent steps. Meanwhile, the quality officer is obliged in the next part of the procedure to calculate the quality cost ratios, analyse quality costs and prepare relevant reports. The final part of the process is a presentation of a quality cost analysis at a meeting of the management (Balon, 2007).

The model of quality cost accounting developed by U. Balon can help organisations to prepare for the implementation of quality cost accounting. Its additional advantage is a scheme for classifying quality costs, which has not been proposed by anyone so far. In the quality cost accounting scheme, the author presents in a clear way the stages of its implementation together with the persons responsible for each activity and the results of these activities. The weakness of this concept is a small number of guidelines adopted in its construction.

A model of full quality costing for large manufacturing enterprises has been prepared by Ł. Kraska and D. Stadnicka (2010). It includes three stages: decision-making and team formation, analysis and preparation and implementation. The activities of the first stage, for which the quality director is responsible, comprise taking a decision on the implementation of a full quality cost accounting system, appointing the implementation team, as well as training the implementation team in the use of this type of accounting. The analysis and preparation stage begins with a review of the current state. It is followed by developing a quality cost structure, identifying all quality costs, choosing a quality cost accounting system, establishing an operating procedure for the selected system and preparing operational documentation/instructions. Responsibility for the performance of these tasks lies with the implementation team leader. Next, the IT department director is to adapt the company IT system to the requirements of the quality cost accounting system. The second stage ends with a trial implementation of the new system in the administrative unit and subsequently on the production line. It is supplemented by an analysis of and conclusions from the conducted implementation process, necessary corrections and preparation of training materials for employees. This is the responsibility of the implementation team leader. The implementation stage comprises a sequence of the following activities: implementation of the operational documentation, training of the management team, training of employees, trial implementation of the quality cost accounting system in the whole organisation, formulation of conclusions and

reporting of corrections, possible adjustments to the system and start of full cost recording. The first two tasks of the third stage are overseen by the quality manager, the subsequent ones by the implementation team leader and full quality cost recording by the quality director.

A new solution available in this model is a schedule of tasks to be executed while implementing a full quality cost accounting system, divided precisely into particular weeks for the implementation of the individual stages of the project. The entire period includes 21 weeks of implementation activities. The initial stage should be completed within two weeks. The longest and most time-consuming is the second stage lasting from the third to the fourteenth week. Seven weeks are allocated for the implementation part of the project (from the fifteenth week to the twenty-first week) (Kraska and Stadnicka, 2010). Establishing a schedule for subsequent activities makes it possible for the enterprises implementing quality cost accounting systems to plan and perform them properly.

The authors of this model do not specify the principles followed in its development. Only the procedure may be used to infer the requirements for individual activities. In the opinion of the authors, the enterprise itself should choose the optimal structure of quality costs from among numerous available ones (Kraska and Stadnicka, 2010).

Another thing worthy of note is a method of precise calculation of particular types of quality costs proposed by Ł. Kraska and D. Stadnicka (2010).

A model of quality cost accounting constructed in this way is a well thought out and designed tool. It provides comprehensive solutions such as a full schedule of implementation tasks with descriptions of all activities or methods for calculating quality costs. In the authors' opinion, it is definitely the most advanced model which should be easy to implement in all production enterprises. The only disadvantage is the lack of all principles used in its development collected and presented in one place.

The system of quality costing for industrial enterprises designed by A. Chopra and D. Garg (2012) consists of two models: the quality cost calculation model and the quality cost programme implementation model. The quality cost calculation process consists of seven steps. The first step is the establishment of a quality cost team which should include the quality assurance manager, the production manager and the chief accountant. In the second step, the quality cost team defines the scope of work to include calculating the current level of these costs and indicating the actions that need to be taken to reduce this level. The next step is raising all employees' awareness of the issues of quality costs by organising meetings and training sessions. In the subsequent steps, the quality cost team must identify all quality-related activities and formulate a methodology for assigning costs to them. The final steps in the procedure comprise assigning costs to all activities that are related to quality and placing them in the appropriate quality cost categories.

The model for implementing a quality cost programme consists of four stages: presenting the current structure of quality costs, analysing it by means

of a Pareto diagram, preparing an action plan to reduce the current level of quality costs (focus on losses, inspection expenses, providing more training for employees on quality costs, increasing the emphasis on prevention and appraisal, launching a supplier evaluation programme) and sending a report on quality costs with a proposed action plan prepared by the quality team to the organisation's management. After the management has given their approval, the proposed quality cost reduction plan can be implemented (Chopra and Garg, 2012).

The model proposed by A. Chopra and D. Garg is an interesting alternative to those presented above. It is characterised by simplicity and universality. It can be used across all industrial sectors. Its weakness is the lack of clearly defined principles followed in its development.

T.M. Malik, R. Khalid, A. Zulqarnain and S.A. Iqbal (2016) are the authors of a nine-stage model dedicated to enterprises in the wood processing industry. The first stage is the introduction of the most important information about the organisation (its name, year of establishment, annual sales, type, list of main products/services and the place where the procedure is to be implemented – the whole enterprise or just selected departments). In the next stage, it is necessary to identify the processes that will be used to measure quality costs. The third stage involves the establishment of a quality cost team (the authors have prepared a table to include the particulars of team members). The next activity is the preparation of a process flow diagram for each process taken into account in the measurement of quality costs. The fifth stage concerns the classification of the quality cost elements occurring in the identified processes and their assignment to an appropriate cost category. The sixth stage is a specification of the sources of data on quality costs, the frequency of their collection (on a continuous basis, monthly, quarterly, half-yearly, other), as well as the selection of the periods of quality cost reporting. The seventh step includes a prepared template for a detailed report on quality costs (with tables, charts and comments). In the eighth stage, the areas of the processes that require improvement should be identified and analysed. The last stage comprises the preparation and implementation of an action plan for quality improvement by eliminating problems in the areas identified in the previous step.

The quality cost accounting procedure authored by T.M. Malik, R. Khalid, A. Zulqarnain and S.A. Iqbal is prepared in a very clear and detailed manner. Each stage contains a corresponding template that can be used during programme implementation. The authors classify quality costs according to the PAF model, which can be considered a comprehensive guide for enterprises implementing quality cost accounting.

Quality costing models dedicated to service enterprises have been prepared by U. Sulowska-Banaś (2013) and J. Wierzowiecka (2015).

U. Sulowska-Banaś has developed a model of quality cost accounting for independent public health care institutions. The whole procedure of quality cost accounting comprises the central sterilisation room (CSR), the operating

theatre (OT) and the cost accounting department. It consists of seven steps (Sulowska-Banaś, 2013).

In the first step, the CSR and OT manager, in cooperation with the quality management officer, assigns quality costs to the appropriate groups according to the adopted F1-F5 forms. The forms are subsequently forwarded to the cost accounting department (by the tenth day of a given month). Based on a chart of accounts together with control accounts, the records of quality costs (by type) are kept by the cost accounting department in the financial and accounting software (the Infomedics module) on an off-balance sheet basis. The balances of the quality cost accounts are reported to the quality management officer by the twentieth day in each month. The quality management officer calculates the quarterly quality cost ratios in accordance with the adopted procedure form F-6, verifies the conducted calculations and performs a quality cost analysis. The officer is also responsible for preparing quarterly quality cost analysis reports together with proposed corrective actions and submitting them to the management (Sulowska-Banaś, 2013).

The model designed by U. Sulowska-Banaś is a complex solution for hospitals; the whole procedure, the scope of duties of the responsible persons, the chart of quality cost accounts and the rules of calculating quality cost ratios are described in detail and presented in the quality cost account procedure documentation and its annexes.

J. Wierzowiecka is the author of a model of quality cost accounting dedicated to accredited laboratories. The procedure for implementing quality cost accounting and the quality cost classification scheme is based on the concept put forward by U. Balon. The latter has been modified and adjusted by the author to the needs of an accredited laboratory. The only added value of this model is the proposal of a structure and chart of quality cost accounts for a laboratory and specimen quality costs incurred by such an organisation (Wierzowiecka, 2015). The procedure does not present the basic principles followed in its development and their knowledge is necessary for its proper use. J. Wierzowiecka's model has some limitations, but it can be a useful tool for the identification of quality costs in laboratories.

Universal models of quality cost accounting for enterprises have been proposed, among others, by K. Lisiecka, Z. Zymonik, A. Kister, M. Ciechan-Kujawa and D.C. Wood.

Subsequent stages of the development and implementation of quality costing in an enterprise's accounting system are presented in K. Lisiecka's model. The starting point is the formulation by the management of the principles necessary for the implementation of quality cost accounting and the determination of research areas. Such principles need to take into account the organisation's policies, including the quality policy. The formulated system principles for the quality department manager should be included in the register of preliminary duties (Lisiecka, 2002).

The next stage comprises determining pro-quality measures, creating a list of costs that are important for quality assurance and earmarking elements of

quality costs. Its result should be the delivery of the list of quality costs to the accounting department. This task is the responsibility of the top management of the enterprise together with the head of the quality department (Lisiecka, 2002).

The cost department checks the possibility of recording quality costs based on the received cost list. At this stage, it is also necessary to discuss the possibility of changing the enterprise's cost accounting system, and the result of this discussion should be necessary changes to the cost accounting system and its adjustment for the purpose of quality cost recording (Lisiecka, 2002).

At the next stage, the management give their final approval for the quality cost elements proposed by the cost department for obligatory recognition and recording and determine which tools should be used to record quality cost. The result should be a list of quality costs subject to registration and the types of their registration (Lisiecka, 2002).

On the basis of the defined quality cost elements and the methods of their recognition and recording, the cost/payroll department in cooperation with the head of the quality department and the management of the organisation introduce quality cost appraisal formulas and select cost elements to be used in quality cost ratios. The outcome of these measures is a set of recording sheets and quality cost recognition guidelines. The guidelines developed for the quality department have to be approved by the enterprise's management. The quality department is responsible for adopting the accepted quality cost guidelines and implementing necessary measures (Lisiecka, 2002).

K. Lisiecka (2002) emphasises that an enterprise's quality costing system should be a subsystem integrated with its accounting system. Based on different approaches (the PAF model, process costs, quality losses, ISO 9004 standards) to classifying quality costs, the researcher treats them as operational quality costs and recommends taking into account the specificity of a given enterprise and its industrial sector when dividing quality costs into individual items.

The model of quality cost accounting authored by K. Lisiecka explains by means of detailed procedures how to proceed in the implementation of this system. At each stage, the departments responsible for the implementation are indicated. Each activity has initial requirements to be fulfilled and a result to be achieved after a particular task has been completed. The whole model is logical and clear to the recipient who plans to implement quality cost accounting in their organisation.

Using activity-based costing, Z. Zymonik (2003) has prepared a model of accounting for quality costs of individual activities. The starting point in the development of this model is the author's original proposal to adopt a matrix approach to the flow of errors and their consequences, which allows for the distribution of quality costs in the consecutive activities of the process under analysis in time t. Of key importance is the identification of those processes that are carriers of quality costs. What deserves attention is the use of the strategic scorecard as a source of comprehensive information on quality

measures. The success of the enterprise is possible only when efficiency is taken into account at the levels of an organisation, process and job position (Zymonik, 2003).

Another model of quality cost accounting has been created by A. Kister (2005). The author has followed detailed principles in its construction. The sources of information on quality costs are accounting documents, which need to be additionally marked, and the level of detail in dividing quality costs into particular categories is the result of specific needs of an organisation, its nature, structure and importance attached to quality costs. Costs should be grouped on the basis of a model of failure, appraisal and prevention and divided into costs of good quality (prevention and appraisal costs) and costs of poor quality (costs of internal and external nonconformance). Cost recording kept on a continuous basis in a mixed cost system (costs by type – cost accounting – costs by place of occurrence) on control and subsidiary accounts (quality costs in a company chart of accounts) will also be used for the purposes of management accounting (for analysis and decision-making). The size of an enterprise, the type of production, the implemented chart of accounts, the level of decentralisation and financial autonomy are recognised as factors determining the number of cost centres. In this model, a cost analysis is an analysis of a cost structure and changes in individual quality cost items. The author emphasises that the tasks related to quality cost accounting require the involvement of the management.

A. Kister distinguishes the following four stages in the procedure of quality cost accounting: recognition, analysis, optimisation and reporting. The first stage is the determination of a quality cost budget. The accounting department receives data on quality costs incurred in all areas of product manufacture. Quality costs are then recognised and posted on appropriate balance and off-balance sheet accounts. The stage of cost analysis includes examining and comparing changes in quality cost ratios over time, a comparative analysis of quality cost structures, as well as comparing obtained data to the objectives of the enterprise's quality policy. It is also necessary to investigate the causes of unfavourable changes whose elimination will allow the organisation to reduce the costs of inadequate quality. At the third stage, conclusions are drawn from the conducted cost analysis and the employed optimisation measures. The next activity is aimed at obtaining feedback from individual organisation units on their intended and undertaken measures. This knowledge makes it possible to prepare reliable reports for the management that will be the basis for their decisions on the actions aimed at ensuring the desired level of quality costs (Kister, 2005).

A. Kister divided her quality cost accounting procedure into four stages. Unlike K. Lisiecka and A. Polak, the researcher does not indicate the departments responsible for individual stages, thus giving the management some freedom of choice in this respect. The scheme of the quality costing procedure lacks input and output elements, which are a characteristic feature of the two previously discussed models and provide a better understanding of the

whole implementation process. The model put forward by A. Kister can be an alternative solution for enterprises that consider the implementation of this type of cost accounting.

In her model of quality cost accounting, M. Ciechan-Kujawa uses the principles and the scheme of developing a cost accounting system proposed by K. Lisiecka. The novelty is the author's attempt to develop a quality cost accounting procedure in which it is very important to determine precisely the following: the types of identified quality costs; the methods of their recording and reporting; the methods of, deadlines for and persons responsible for, collecting information on quality costs, quality irregularities and data analysis; the methods of disseminating information on quality costs and their use in making decisions aimed at quality improvement (Ciechan-Kujawa, 2005).

The whole procedure is divided into three stages: general principles of maintaining accounting records, guidelines for quality cost accounting (procedures and instructions) and management review (procedures for corrective and preventive actions). The first stage begins with the receipt of source documentation and cost statements by the relevant organisational units. In the next step, the correctness and completeness of the delivered cost documentation is checked. The second stage is the most extensive and consists of six activities: verifying whether the documents concern quality costs, assigning the positively verified documents, passing the documents to the units responsible for recording quality costs, recording quality costs, preparing and submitting reports on quality costs, as well as analysing the reports and presenting proposals for preventive and corrective measures. The last stage is determining the costs of improvement and transferring resources necessary for the implementation of improvement measures (Ciechan-Kujawa, 2005).

The model developed by M. Ciechan-Kujawa complements and expands that of K. Lisiecka by adding to it a quality cost accounting procedure. Quality costing is regarded as an element of an enterprise's accounting system; its development and implementation requires the involvement of the entire management, the quality management, accounting and controlling departments. A model of quality cost accounting designed in this way is by no means an innovative solution, although it provides valuable tips and indications that will facilitate a better organisation of work on the implementation of this tool in an organisation.

D.C. Wood (2013) in his model of quality cost accounting emphasises that its implementation should take place under the supervision of the quality manager. The first step in the quality costing procedure comprises verifying the benefits of this tool for the organisation and drawing the management's attention to quality issues. An initial assessment and analysis of financial data should be made, which consists in estimating the actual level of quality costs. Most of the data for the analysis should be readily available, and if this is not the case, these costs should be estimated and a preliminary appraisal should

be presented to the management team. The next phase of the project is to determine whether the top management of the enterprise is ready to accept and support the implementation of quality cost accounting. The lack of support and acceptance on the part of the management results in the necessity to prepare a plan to persuade the management to change their position on the basis of a more detailed report on quality costs, including the ways of calculating those costs and reducing them on the basis of conducted analyses and by means of corrective actions. Such a report indicating the areas offering the best opportunities for improvement should also guarantee a high probability of a successful implementation of a quality cost accounting system. Approval from the management allows the implementation of a pilot programme consisting of the following activities: measuring quality costs, linking them to basic quality measures, analysing trends and presenting graphs illustrating them, identifying opportunities for and objectives of improvement, leadership and support in solving problems with identification, conducting analyses and looking for solutions, ensuring the implementation of corrective measures and drawing up progress reports. The positive results (visible improvement) of the pilot programme in a selected segment of the organisation should persuade the management to adopt an enterprise-wide quality costing system (Wood, 2013).

A considerable advantage of the model developed by D.C. Wood (2013) is the proposed quality cost classification scheme, which also occurs in the approach adopted by U. Balon. The author has also created a quality cost data sheet template and templates of monthly and yearly quality cost reports. The guidelines adopted in the construction of the model are imprecise; moreover, there is no scheme illustrating the procedure of quality cost accounting. D.C. Wood describes in detail all the steps necessary for the implementation of this type of accounting, but he does not indicate the persons or teams responsible for their implementation and does not specify to what types of enterprises this proposal is addressed. The concept of this author is interesting, although the lack of clearly specified principles may cause problems with its implementation.

On the basis of the conducted analysis and the prepared list of quality cost accounting models, it should be stated that a model of this accounting consists of: a structure of quality costs, a chart of accounts, a scheme of the procedure of accounting for quality costs together with an indication of the persons responsible for this task, sources of information on quality costs, as well as proposed improvements. The main classification criterion of quality costing models is the types of activities conducted by enterprises. The majority of the proposed models are intended for manufacturing enterprises. There is a visible lack of models of quality cost accounting dedicated to service and trade enterprises. Only the model created by U. Sulowska-Banaś responds to the requirements of organisations providing health care services. Universal cost accounting models have been developed by K. Lisiecka, Z. Zymonik, A. Kister, M. Ciechan-Kujawa and D.C. Wood. The models proposed by

M. Ciechan-Kujawa and J. Wierzowiecka are based on the earlier projects developed by K. Lisiecka, A. Kister and U. Balon and use their principles and schemes of activities. The dominant structure of quality costs in the reviewed models is the PAF model, and the most often adopted arrangement in the grouping of costs is based on their functions. The majority of the models provide specimen classifications of quality costs in the form of a company's chart of quality cost accounts. The most important sources of information on quality costs are accounting documents, bookkeeping accounts, defect sheets, error reports and complaint reports. The responsibility for implementing and maintaining a quality cost accounting system lies with the management, the quality manager and the system implementation team. The implementation process should take place in cooperation with the accounting and controlling departments.

Practically, each model provides new tools such as a quality cost priorities table (H.J. Harrington), quality cost ratios (K. Lisiecka), a quality cost classification scheme (U. Balon, D.C. Wood), a schedule of implementation tasks (Ł. Kraska and D. Stadnicka), defect sheets (U. Balon) and detailed templates for implementation stages (T.M. Malik, R. Khalid, A. Zulqarnain and S.A. Iqbal), which can provide a more efficient organisation of work related to the quality costing procedure. The majority of the discussed models were developed after 2000, and the most advanced ones are those authored by A. Polak and Ł. Kraska and D. Stadnicka. Nevertheless, only the model proposed by T.M. Malik, R. Khalid, A. Zulqarnain and S.A. Iqbal includes appropriate templates to be used at each stage of quality cost accounting implementation.

In conclusion, it should be stated that the reviewed models of quality cost accounting by Polish and foreign researchers present in a more or less complex way the successive steps to be taken in the building of a quality costing system. The authors use proven models and experiences of their predecessors, modifying them to meet their own purposes. Unfortunately, some approaches lack clearly specified principles, which may lead to misunderstandings and mistakes during implementation. Numerous models confirm the interest of researchers in the subject of quality cost accounting. What deserves attention and recommendation is the procedure developed by T.M. Malik, R. Khalid, A. Zulqarnain and S.A. Iqbal, which can be particularly helpful in organisations without any previous experience in quality costing.

2.2 Previous applications of quality cost accounting models

Quality costing is playing an increasingly important role in optimising the costs of business operations. It provides information that supports the process of making managerial decisions. It influences the shaping of quality in organisations, allows them to identify areas generating large losses, as well as to determine those cost items that can be reduced or eliminated without the consequence of lower product quality (Golińska and Zemczak, 2017).

Over the years, many models of quality cost accounting have appeared, with time they have become more and more advanced and better suited to the prevailing reality. The lack of uniform principles of recording quality costs caused a situation in which such costs were recognised on the basis of a cost accounting system used in a given enterprise.

Table 2.2 lists the collected applications of quality cost accounting models. To prepare this list, the authors have used the data presented at the beginning of this chapter and examples of applications available in the literature on the subject.

Table 2.2 A list of the applications of quality cost accounting models

Application	*Quality costing model*															
	ZETOM	*S. Sojak*	*H.J. Harrington*	*K. Lisiecka*	*A. Polak*	*Z. Zymonik*	*A. Kister*	*M. Ciechan-Kujawa*	*U. Balon*	*Ł. Kraska and D. Stadnicka*	*J. Tomański*	*A.Chopra i D. Garg*	*U. Sulowska-Banaś*	*D.C. Wood*	*J. Wierzowiecka*	*T.M. Malik, R. Khalid, A. Zulqarnain, S.A. Iqbal*
Controlling and benchmarking quality costs				✓			✓	✓	✓	✓						
Improving the quality management system	✓				✓		✓		✓	✓			✓			
Providing quality cost reports		✓	✓											✓	✓	
Identifying key processes					✓	✓			✓				✓			
Identifying problem areas			✓		✓				✓		✓		✓	✓		
Identifying, measuring, recording, analysing, interpreting and evaluating quality costs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓
Motivating employees and raising their awareness of quality issues			✓			✓	✓						✓			
Identifying places where quality costs arise	✓		✓		✓	✓	✓	✓	✓			✓				

Acquiring and sharing information on quality costs (schemes, diagrams, charts, etc.)				✓			✓	✓	✓				✓	✓			
Developing quality improvement programmes	✓	✓		✓		✓							✓				
Optimising total costs		✓	✓	✓			✓		✓				✓	✓			
Optimising quality costs	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		
Taking corrective measures						✓	✓	✓			✓			✓	✓		
Measuring and evaluating the effectiveness and efficiency of the quality management system		✓		✓	✓	✓	✓		✓		✓		✓		✓	✓	
Measuring the organisation's overall performance	✓						✓					✓			✓	✓	
Improving quality of offered products/ services		✓		✓	✓	✓		✓		✓			✓	✓		✓	
Improving the organisation's overall quality			✓	✓		✓								✓		✓	
Improving the bottom line		✓					✓								✓		
Improving the organisation and functioning of the quality control personnel	✓																
Assisting managers in understanding and controlling processes						✓					✓						
Improving the organisation's competitiveness							✓	✓		✓						✓	
Increasing profitability								✓								✓	

(Continued)

Application	*Quality costing model*															
	ZETOM	*S. Sojak*	*H.J. Harrington*	*K. Lisiecka*	*A. Polak*	*Z. Zymonik*	*A. Kister*	*M. Ciechan-Kujawa*	*U. Balon*	*Ł. Kraska and D. Stadnicka*	*J. Toruński*	*A.Chopra i D. Garg*	*U. Sulowska-Banaś*	*D.C. Wood*	*J. Wierzowiecka*	*T.M. Malik, R. Khalid, A. Zulqarnain, S.A. Iqbal*
Increasing the organisation's goodwill											✓					
Increasing customer trust and satisfaction		✓					✓									
Increasing the efficiency of processes and the entire organisation			✓		✓	✓			✓	✓						
Source of information for determining the organisation's financial, investment, production and commercial policies	✓			✓	✓		✓	✓	✓	✓	✓					

Source: The authors' own work.

Quality costing is most often used in enterprises for the purposes of identification, measurement, recording and analysis of quality costs (in 14 out of 16 models), as well as their optimisation (also in 14 models). Furthermore, it is used in the measurement and assessment of the effectiveness and efficiency of quality management systems (ten models), supports the improvement of the quality of offered products/services (nine models), makes it possible to identify the places where quality costs arise (eight models) and is a source of information used to formulate the financial, investment, production and trade policies of organisations (eight models). Table 2.3 presents the types of enterprises implementing models of quality cost accounting.

A general analysis of the applications of quality costing models allows one to conclude that quality cost accounting systems are implemented the most often in industrial enterprises representing the manufacturing, metallurgical, machine production, power generation, wood processing, food

Table 2.3 A review of the types of enterprises implementing quality costing models

Author	*Year*	*Type of enterprise implementing QCA*
The "ZETOM" Quality Research Centre for the Products of the Metallurgical and Machinery Industries	1978	Enterprises from metallurgical and machine production sectors, industrial enterprises
S. Sojak	1981	Industrial enterprises
H.J. Harrington	1987	Production enterprises
K. Lisiecka	1996, 2002	Enterprises
A. Polak	2003	Production enterprises
Z. Zymonik	2003	Enterprises
A. Kister	2005	Enterprises
M. Ciechan-Kujawa	2005	Enterprises
U. Balon	2007, 2008	Enterprises from food processing industry, automotive industry enterprises
Ł. Kraska and D. Stadnicka	2010	Large production enterprises
J. Toruński	2011	Dairy cooperative
A. Chopra and D. Garg	2012	Industrial enterprises
U. Sulowska-Banaś	2013	Hospitals
D.C. Wood	2013	Enterprises
J. Wierzowiecka	2015	Accredited laboratories
T.M. Malik, R. Khalid, A. Zulqarnain, S.A. Iqbal	2016	Enterprises from wood processing industry

Source: The authors' own work.

processing and automotive sectors (MPM, 1978; Sojak, 1981; Harrington, 1987; ZETOM, 1989; Mroczkowski, 1990; Żuk, 2000; Borkowski and Prus, 2001; Polak, 2003; Kister, 2005; Balon, 2007, 2008; Kraska and Stadnicka, 2010; Toruński, 2011; Malik et al., 2016; Michałowska, 2016; Pristavka and Koloman, 2018; Teli et al., 2018).

Furthermore, quality costing also finds application in the agricultural sector [agribusiness enterprises (Błażek and Błażek, 2004)]. The authors note that quality cost accounting is not used in enterprises representing the service sector. The only exception to this rule is health care services and attempts at implementation undertaken in a hospital (Sulowska-Banaś, 2013, 2015) and an accredited laboratory (Wierzowiecka, 2015).

A research project undertaken in tourism (hospitality) services has shown that despite the fact that 67% of enterprises have a quality assurance department and all of them monitor costs, only 33% of them have implemented a quality cost accounting system, with the others not being interested in its implementation. According to the respondents, this type of accounting helps to reduce the number of defective products and services to a minimum level and managers are not perceived as guarantors of its efficiency. Managers of tourism organisations believe that using this tool can have a positive impact on profitability, cost reduction and increased competitiveness (Kuzucu, 2017).

Quality costing models dedicated to all types of enterprises have been proposed by K. Lisiecka, A. Kister, M. Ciechan-Kujawa and D.C. Wood.

Each of them presents, from different perspectives, a methodology and procedure for implementing quality costing, a structure of quality costs, their measurement, recording, analysis and reporting. Adapting an enterprise's pro-quality measures to a particular model, one should take into account how costs connected with quality are classified. The success of the implementation of this tool depends on their proper identification.

Quality cost accounting is used by enterprises whose objective is to measure and assess the efficiency of quality management, the growth of their value, as well as the establishment of a basis for quality improvement through the identification of problem areas (Toruński, 2009).

D.C. Wood (2013) emphasises that the main purpose of maintaining any quality cost accounting system is to take quality improvement measures that will contribute to reducing operating costs. For H.J. Harrington (1987), quality costing is to expose the main financial opportunities for improvement and to show trends of improvement.

A. Chopra and D. Garg (2012) are of the opinion that this tool is intended for the calculation/estimation of the current level of quality costs and its analysis. According to J.J. Plunkett and B.G. Dale (1988), it is used as a basis for budgeting quality operations, motivating employees, measuring and comparing the cost efficiency of all improvements in the area of quality. It also allows managers to identify opportunities for quality improvement and quality cost reduction.

On the basis of the above considerations and the presentation of the applications of quality costing models, it should be stated that this type of accounting is used as an effective tool for monitoring and assessing the effectiveness of management systems, identifying, measuring, recording and analysing quality costs, as well as optimising total costs in an enterprise. Furthermore, it is used to identify its key processes and their weaknesses, facilitates laying foundations for quality improvement programmes, supports taking corrective measures and improving the quality of offered products/services, measuring productivity, increasing the competitive advantage of the organisation, improving its financial performance, as well as increasing customer confidence. Quality costing is considered an integral part of the organisation's accounting system and an element of its management system that constitutes a source of valuable information for making economic decisions.

Another example of the application of quality cost accounting is German enterprises, where the sum of the costs of low quality is estimated at several per cent of turnover. Their experiences indicate that initial attempts to minimise the costs of poor quality are very difficult. Research confirms that expenditures for this purpose pay off after a few years and result in increased competitiveness, improved profitability, better trust and communication within the enterprise, as well as increased safety (Wawak, 2011).

An analysis of a representative group of German mechanical engineering companies has shown that only 17% of them fully utilise the potential of quality costing and 6% carry out thorough analyses of the reasons for defectiveness. In the past, DM 6 billion was spent annually on quality assurance in this sector (Pfeifer, 1993).

In the automotive industry, quality cost accounting is used as a system for monitoring and identifying areas of opportunities for improvements related to costs, as well as supporting the elimination of activities that do not ensure quality and helping managers to find the sources of hidden costs (external and internal errors) constituting up to 30% of revenues. It is also used to make employees aware of the impact of quality on products, services and process errors, which is to help to provide support and financial justification for quality initiatives to be undertaken in future periods. Quality costing also allows managers and employees to better understand and control processes (Teli et al., 2018).

The experiences of enterprises with implemented ISO standards have highlighted the need to further develop the certified quality assurance system based on quality improvement programmes. Maintaining a quality cost accounting system is one of the elements of such an improvement programme. This tool makes it possible for managers to exert a more rational influence on the shaping of quality in the processes carried out by organisations. Quality costs constitute a quantitative assessment of a quality assurance system (Lisiecka, 2002).

Cost accounting has been used for a long time by many American, Japanese and European corporations. In Poland, it started to be used on a larger scale in 1977, mainly by enterprises in the electrical machinery industry (Jędraś, 1989). In the first half of 1980, quality cost accounting systems were used by close to 100 organisations; unfortunately, the years 1981–1983 were a period of gradual withdrawal from its use in the majority of the enterprises that had previously implemented them. A breakthrough occurred in 1984 when the "ZETOM" Quality Research Centre for the Products of the Metallurgical and Machinery Industries published a handbook for conducting quality cost accounting with its modified methodology based on the introduction of additional costs and losses accounts, social quality costs, as well as continuous quality cost accounting (Jędraś, 1989; Kister, 2005). The enterprises such as the "UNIMOR" Electronic Industry Plant in Gdańsk, the Compact Cars Manufacturing Plant in Bielsko Biała, the "PONAR-ŁÓDŹ" Grinding Machines Manufacturing Plant and the "ZATRA" Radio Transformers Plant consistently maintained quality cost accounting systems and used them to take measures aimed at improving the quality of their manufacturing output (Jędraś, 1989).

The enterprises reach for quality cost accounting also due to the possibility of controlling costs in order to rationalise quality-oriented activities, using it as a basis for comparisons with other enterprises in the same industry in order to increase the awareness of the shaping of quality costs in the organisation,

classifying particular quality costs, as well as creating a database to support the calculation and planning of costs and the reduction of the number of rejects and customer complaints (Lisiecka, 2002; Jafari and Rodchua, 2014; Wójcik, 2014).

The use of quality cost accounting for decision-making purposes by managers of enterprises allows its classification as one of the management accounting tools. Therefore, it is important to pay attention to the following global trends in this managerial activity: the shift of focus from the product to the customer and product profitability analysis, the growing role of performance management, the focus on predictive accounting, business analytics, the use of improved and concurrent accounting methods, information technology management and shared services, as well as the need for better skills and competencies in behavioural cost management (Cokins, 2016).

In conclusion, it should be stated that so far quality costing has been used mainly by enterprises representing the industrial sector. It has enjoyed negligible popularity among service and commercial organisations. Academic publications focusing on various aspects of quality cost structures present quality cost accounting models. Their authors emphasise the need for quality cost accounting in order to be able to identify, measure, record, control, optimise and manage quality costs, as well as assess the efficiency of management systems.

2.3 Structural models of quality costs

A structure of quality costs constitutes an important element of all the models of quality cost accounting presented in the previous sections. It is necessary for preparing a list of costs relevant for quality, determining the elements of quality costs, building additional accounts for posting these cost items in the enterprise's chart of accounts and the cost accounting system, as well as identifying and recording quality costs. It constitutes a basis for analyses and reports on quality costs, provides data for the calculation of quality cost ratios and highlights the areas where it is possible to improve quality or reduce the level of quality costs (Lisiecka, 2002; Polak, 2003; Balon, 2007; Kraska and Stadnicka, 2010; Chopra and Garg, 2012; Wood, 2013; Emmanual et al., 2017; Murumkar et al., 2018) and minimise the global costs of the enterprise (Gruszka and Kurzawski, 2018). The lack of a quality cost structure, which constitutes the foundation of a whole system of quality cost accounting, makes it impossible to maintain such a system in a reliable manner.

The authors have reviewed the quality cost models available in the literature on the subject. What deserves particular attention is structural approaches to these costs, which are discussed in this section, and activity-based quality cost models, presented in the next section.

The most characteristic structural models of quality costs are the PAF model proposed by W. Masser, the quality loss model developed by G. Taguchi, A.V. Feigenbaum's model, the ASQC (American Society for Quality Control)

model, the BS 6143 model, J. Bank's model, the ISO 9004-1 and ISO 9004-3 models, Z. Zymonik's model, E. Kindlarski's model and the hybrid model created by M. Czajkowski.

The first structural divisions of quality costs were appearing in the literature on the subject along with the progressing socio-economic changes in the late 1950s and early 1960s. They were intended to measure the efficiency of enterprise management in the area of quality. They originated from American economic practices, while the subsequent ones, being their continuation, were prepared in European countries.

The sources of the first divisions of quality costs are to be found in the Shewhart-Deming cycle (in which four consecutive stages are distinguished, i.e. planning, doing, checking and acting) and in the quality-related processes distinguished by J.M. Juran, i.e. planning, controlling and improving (Bareja and Giedroyć, 2007; Sadkowski, 2016; Biadacz, 2018). The currently used classifications of quality costs draw on the best elements of these historical categories of quality costs.

Quality cost classification models were presented in Technical Report ISO/TR 10014 devoted to the issue of quality costs and entitled *Guidelines for managing the economics of quality.* The document distinguishes the PAF model, the process model, the life cycle model and the model in which the quality costs are grouped by identifying and measuring the losses of added value resulting from badly designed or poorly performed business activities (ISO/TR 10014, 1998; Omar and Murgan, 2014).

2.3.1 The PAF model

The PAF model groups quality costs according to the criteria of prevention, appraisal and failure (Masser, 1957; Fajczak-Kowalska, 2004). Developed by W. Masser in 1957, it is very often used by enterprises of various types (Oakland, 1993; Murumkar et al., 2018). Prevention costs are the costs of actions aimed at avoiding defects or the costs of quality improvement. The following categories appear for the first time in prevention costs: evaluation of suppliers, development of quality improvement programmes, as well as preparation of procedures and instructions. Appraisal costs include the costs of tests and inspections carried out to check whether quality requirements are met. The costs of failures (nonconformance) arise as a result of failure to meet quality requirements. Failures include periods when machines and employees do not work due to errors occurring at workplaces, and special attention is paid to such elements as loss of sales (markets), product recalls and product liability (Zymonik et al., 2013).

The PAF model includes an extensive set of elements related to prevention according to the rule that costs incurred for these activities should be higher than those spent on control. It also rearranges costs relating to the pre- and post-production phases. In quality planning, the specific metrics should comprise customer requirements and a product design in order to achieve

Table 2.4 Cost categories in the PAF model

Prevention costs	*Appraisal costs*	*Failure costs*
- Quality planning - Quality capability testing - Supplier appraisal and guidance - Control planning - Quality audit - Administration of the quality division - Quality assurance training - Quality improvement programmes - Comparison of quality of competing products - Other measures aimed at failure prevention	- Input control - Production control - Output control - Quality control for outdoor assembly operations - Acceptance and handover inspections - Control and measuring equipment - Consequences and improvement of control and measuring equipment - Quality assessment - Laboratory testing - Inspection documentation - Other measures and supplies relating to quality control	*Internal:* - Additional work related to elimination of failures - Quantitative nonconformance - Reduction in value - Sorting check - Triple checks - Problem testing - Downtime caused by lack of quality - Other costs of failures within the plant - External: - Additional work related to elimination of failures - Warranty costs - Manufacturer's liability - Other costs of failures outside the plant

Source: Masser, 1957; Skrzypek and Czternastek, 1995.

the required quality (Wood, 2013). All costs included in the PAF model are presented in Table 2.4.

Enterprises using the PAF model should invest in prevention (e.g. quality planning, quality improvement programmes) and appraisal (e.g. quality inspections, tests) measures, which will contribute to the reduction of failure costs. Meanwhile, in the longer perspective, further commitment of resources to prevention will result in a reduction of appraisal costs (Schiffauerova and Thomson, 2006; Moschidis e al., 2018). The majority of the structural models of quality costs are based on the classification proposed by W. Masser; therefore, it is the most important division of quality costs.

2.3.2 The quality loss model

G. Taguchi's approach to quality management has been used in the quality loss model. For the manufacturer, the point of reference is the customer, who demands improvement in the quality of the offered product and is willing to pay extra for its improvement.

A product that does not meet the expectations and requirements of the customer is a loss for the manufacturer. The occurrence of nonconformance (failures) in a given product causes a loss of quality, decreases customer

Table 2.5 Quality losses in G. Taguchi's model

	Internal losses	*External losses*
Measurable losses	Nonconformance costs hidden inside the organisation	Nonconformance costs hidden outside the organisation
Nonmeasurable losses	Arise from reduced productivity that is caused by operational improvements, poor ergonomics, missed opportunities	– Losses due to customer dissatisfaction – Costs of lost opportunities (lower revenues resulting from the loss of existing and potential customers)

Source: The authors' own work on the basis on: Taguchi, 1986.

satisfaction and worsens the manufacturer's image in the eyes of the consumer (Taguchi, 1986). As a result, the manufacturer incurs losses in the form of costs resulting from customer complaints and warranty repairs, as well as a loss of reputation in the market, which causes a decrease in sales revenues and sometimes also a loss of some sales markets. The survival of the enterprise and its development is conditioned by the risk of the occurrence of failures (Balon, 2006).

The concept of quality costs proposed by G. Taguchi (1986) is based on solving three problems: measuring quality, improving quality by minimising costs, as well as supervising and maintaining costs at a required level.

The essence of this Japanese engineer and statistician's approach is lossless production. Quality should be improved especially in the pre-production phase and it is processes rather than product features that should be in the centre of attention (Taguchi et al., 1989). This model focuses very strongly on internal and external losses resulting from poor quality. Their classification is presented in Table 2.5.

2.3.3 A.V. Feigenbaum's model

The quality cost model popularised in Japan by A.V. Feigenbaum in his book *Total Quality Control* is a development of W. Masser's ideas (categorisation of quality costs) and includes activities related to the prevention, appraisal and consequences of errors. It also builds on the concept of economic quality formulated by J.M. Juran. In this model, costs are divided into the costs of quality control and the costs of the lack of quality control, referred to as the costs of internal and external failures. The costs of quality control recognised as prevention costs and appraisal costs are investment expenditures. The costs of failures, on the other hand, are losses (Feigenbaum, 1961).

A.V. Feigenbaum's model is dedicated to mass production enterprises. Quality should be considered in the subsequent phases of the product

manufacturing process – from the idea to the disposal of the used product. Therefore, such elements appeared in it as quality planning, quality system development or training, which are classified as preventive measures. Mass production causes control measures to prevail over preventive ones (Feigenbaum, 1961; Zymonik et al., 2013).

A.V. Feigenbaum (1961) also drew attention to a then-new legal instrument related to the costs of failures, i.e. liability for the quality of a product/service, which includes costs caused by dangerously defective products/services. All the costs of this model are summarised in Table 2.6.

Table 2.6 The structural model of quality costs of A.V. Feigenbaum

Quality control costs	
Prevention costs	*Appraisal costs*
– Quality planning – Process control – Design of equipment providing information on product and process quality – Quality training – Product design verification – Quality system management and development – Other costs of failure prevention	– Testing and control of purchased materials – Laboratory testing of incoming materials – Functional control of testing and measuring equipment – Testing and control activities (time) – Assessment of fulfilling product technical requirements (time) – Division of product batches into compliant and noncompliant with requirements – Self-control (time) – Preparation of testing and measuring equipment (time) – Materials for testing and control – Quality audits (time) – Appraisal conducted by external testing and inspection entities – Operation of equipment indicating product and process quality – Activities resulting in the issue of product operation authorisation – In-service product testing
Costs of lack of quality control	
Internal failure costs	*External failure costs*
– Waste – Corrections – Materials for corrections – Commitment of employees to solving quality problems (time)	– Warranty complaints – Non-warranty complaints – Product liability – Product recall – Taking product out of service

Source: Feigenbaum, 1961.

2.3.4 The ASQC model

The ASQC quality cost model was prepared at the request of the US government because the so-called large principals were not satisfied with the quality of raw materials, products and cooperative elements supplied to them by enterprises. The demands addressed to their suppliers concerned quality-oriented measures that should cover the entire process of product realisation, from placing an order for materials and cooperative elements to dispatching the finished product to the customer. It was necessary to determine the level of defectiveness of products and components, as well as the amount of quality costs (ASQC, 1971; Sadkowski, 2016).

Table 2.7 The ASQC structural model of quality costs

Prevention costs	*Quality appraisal costs*
- Product quality planning and production quality control: quality planning work of a technical nature; implementation work related to quality planning and quality control procedures - Designing of measurement methods for measuring and control equipment - Quality planning by other functional units (besides the quality control department) - Training of employees in the field of quality - Other costs connected with preventive measures	- Testing and inspection of incoming materials - Laboratory testing of incoming materials - Product testing and inspection - Auxiliary work relating to product testing - Organisation of tests and inspections - Periodic collective quality inspections - Attestation of products by external entities - Maintenance and calibration of testing and inspection equipment - Analysis of test and inspection results - Work relating to in-house product testing and acceptance for production purposes - Assessment of quality of materials and parts in warehouses
Internal failure costs	*External failure costs*
- Irreparable deficiencies - Rework and repairs - Identification of causes of production process disruptions - Repeat inspections and testing - Additional work to adjust materials to quality requirements - Repeat sorting of rejects - Reclassification of products to lower quality classes	- Customer complaints - After-sales service - Rework of returned products - Repairs of returned products - Replacement of products under warranty - Technical errors - Errors in product installation

Source: ASQ, 1999.

Responding to the needs of the American industry in the brochure entitled *Quality Cost – What and How*, the American Society for Quality Control (ASQC, 1971) presented a structural model of quality costs based on the model developed earlier by A.V. Feigenbaum. The ASQC model divides quality costs into the costs of preventive measures, the costs of quality appraisal and the (internal and external) costs of low quality. Their structure is oriented towards high volume and low mix production (Zymonik, 2003; Weinstein et al., 2009; Kraska and Stadnicka, 2010; Biadacz, 2018). The model focuses on prevention, the distinction between repairable and irreparable deficiencies and control measures aimed at isolating defective products and preventing their release outside the enterprise. In contrast, external costs of poor quality are treated rather marginally in the model. The cost categories of the ASQC model are presented in Table 2.7.

2.3.5 The BS 6143 model

The British Standards Institution (BSI) developed and published its BS 6143 standard in 1981. In this standard, the quality cost model consists of two schemes: the traditional PAF scheme and a scheme of process costs (BSI, 1990; Sadkowski, 2016).

Characterised by innovation, the latter scheme was a response to the then new economic and social conditions and trends in the management of enterprises. Every activity having input, output, control instruments and resources is defined as a process. In this model, prevention and appraisal are considered together as the costs of meeting requirements, while the costs of errors constitute a failure to meet requirements (Dale and Wan, 2002). The first person to use the model was J. Marsh (1989). Both approaches to quality costs included in the BS 6143 standard are summarised in Table 2.8.

The quality cost model based on the BS 6143 standard allows the selection of the best cost structure and its adjustment to the enterprise's currently used accounting system. The organisation itself decides whether it groups costs according to the places of origin or adapts their structure to the process approach (with the necessity of creating centres of responsibility constituting quality cost control centres) (Polak, 2003).

2.3.6 J. Bank's model

Initiated in the 1980s, the growing interest in, and importance of, services resulted in the creation of quality cost models adjusted to the requirements of service enterprises. Good practices and standards developed earlier in the manufacturing sector could be implemented successfully in service organisations. J. Bank analysed mistakes made in the provision of services in the United Kingdom by the government administration, health care organisations and the judiciary. He treated each organisation as a set of processes to which he allocated quality costs. The results of his research and the model

Table 2.8 The structural models of quality costs in the BS 6143 standard

Prevention, appraisal and failure costs model	
Prevention costs	*Appraisal costs*
- Quality planning (development of an overall quality plan, control plan, reliability plan; development of procedures and instructions for implementation of plans) - Design and development of measuring and control equipment - Quality review and design verification - Calibration and maintenance of production equipment used for quality assessment - Supplier assessment - Quality training - Quality system evaluation - Data analysis and processing - Development of quality improvement programmes	- Verification of test production - Control of incoming materials - Laboratory testing - Production testing and inspection - Assessment equipment set-up, maintenance and wear (depreciation) costs - Materials necessary for appraisal - Performance tests - Product validation by specialists - Stock assessment - Storage of documentation related to quality assessment
Internal failure costs	*External failure costs*
- Irreparable deficiencies - Repairable deficiencies - Activities relating to detection and rectification of deficiencies - Repeat inspection - Price reductions due to inferior quality - Downtime of machines and employees	- Activities relating to complaints - Warranty complaints - Consequences of returns and replacement of defective products (loss of confidence) - Discounts - Loss of sales (market) - Product recall - Product liability
Process cost model	
Costs of meeting requirements	*Costs of not meeting requirements*
- Costs of preventive measures plus costs of quality appraisal	- Costs of errors

Source: The authors' own work on BSI, 1990.

included in the BS 6143 standard were used by J. Bank to create a new model in which he distinguished three basic cost categories: conformance costs, nonconformance costs and costs of lost opportunities (Bank, 1992).

Conformance costs are incurred due to activities related to prevention (measures that are supposed to prevent the occurrence of failures – quality programmes) and appraisal, to which the author devotes little attention. Nonconformance costs include the costs of internal and external failures, as well as the costs of exceeding requirements. Extensive bureaucracy that

wastes tangible and intangible resources in redundant documents, reports, analyses or business trips is classified as nonconformance costs, which are rather superficially discussed in this model (Szczepańska, 2017).

J. Bank is the only researcher to introduce a new category of nonconformance costs, i.e. the costs of exceeding requirements resulting from activities causing mismanagement of available resources (Kraska and Stadnicka, 2010). The costs of lost opportunities are another characteristic element of his model. They relate, among other things, to orders withdrawn due to the slow pace of the order fulfilment process, purchases of products from competitors due to the enterprise's inability to provide them at a given moment or the provision of products that do not meet customers' needs (Bank, 1992; Sadkowski, 2016; Biadacz, 2018). Examples of costs in J. Bank's structural model are presented in Table 2.9.

The method of classifying quality costs proposed by J. Bank is an innovative solution for service enterprises. The adoption of such a cost structure in the quality costing system of an organisation raises questions and doubts:

Table 2.9 John Bank's structural model of quality costs

Conformance costs		
Prevention costs		*Appraisal costs*
- Employee training - Development of quality programmes to raise employees' awareness of the role of quality within the enterprise - Planning and organising quality workshops and quality circles		- Inspections and checks - Document reviews
Nonconformance costs		
Internal failure costs	*External failure costs*	*Costs of exceeding requirements*
- Rejects - Corrections	- Warranty costs - Product corrections - Correction of wrong invoices - Unplanned handling costs	- Redundant documents or copies - Redundant reports - Excessively detailed analyses - Unnecessary business trips to customers
Costs of lost opportunities		
- Loss of revenue resulting from the loss of customers	- Loss of potential customers	- Loss of potential sales revenue growth resulting from providing customers with products that do not meet their requirements

Source: Bank, 1996.

How can the costs of lost opportunities be measured? What documents will be the basis for their identification, assuming that such costs are understood as "a probable decrease in economic benefits in a reporting period, with a reliably determined value, in the form of a decrease in the value of assets or an increase in the value of liabilities and provisions for liabilities that will lead to a decrease in equity or an increase in its deficiency in a manner other than withdrawal of funds by shareholders or owners" (The Accounting Act, 1994)?

2.3.7 The ISO 9004 models

Quality cost models are also included in the ISO 9004-1 and ISO 9004-3 standards. They are based on the existing American and British models, as well as the concept of quality costs. They concern the standards that are no longer valid and have been withdrawn, but not revoked.

ISO 9004-1:1994 *Financial determinants of quality costs* classifies quality costs as generic costs, process costs and quality losses (ISO 9004, 1994).

Quality costs grouped by type into prevention, appraisal and failure costs refer to the ASQC model. Incurred expenditures comprise preventive measures (aimed at preventing the occurrence of failures) and appraisal measures (checking the fulfilment of quality requirements), while occurring failures (arising both inside and outside the organisation) constitute losses.

The process approach determines the division of quality costs into nonconformance costs and conformance costs. Conformance concerns customer requirements, as well as determined and assumed customer needs and expectations in relation to a product/service. Deviations from requirements, i.e. nonconformance, are losses. Expenditures incurred to ensure a smooth course of work constitute conformance costs (Crosby, 1979; Bareja and Giedroyć, 2007).

Quality losses are the basis for the third classification of quality costs in the ISO 9004-1 standard. They are grouped in accordance with the recognition of failure costs in the PAF model as direct consequences of inadequate quality. An innovative solution in the estimation of quality costs is their division into measurable and nonmeasurable losses being the effects of all actions that cause the enterprise to waste its resources (Lisiecka, 2013).

The structural models of quality costs presented in the ISO 9004-1:1994 standard indicate only a general range of areas in which it is possible to estimate such costs. Presented in the 1990s, the new scheme of quality costs included in the ISO 9004-3 standard divides them into operational quality costs and external quality assurance costs (ISO 9004…Part 3, 1994).

2.3.8 Z. Zymonik's model

The concept of a structural model of quality costs based on the risk principle has been proposed by Z. Zymonik (2003). She divides quality costs into conformance costs, which are a contribution to the success of an

organisation, and nonconformance costs, which constitute a waste of resources. As the author points out, this model is only a supplement to the content of the previously proposed models. The categories of quality costs in the model developed by Z. Zymonik are presented in Table 2.10.

Table 2.10 Cost categories in Z. Zymonik's model

Conformance costs	*Nonconformance costs*
- Costs of understanding customers' quality requirements and their profitability - Costs of cooperation with customers - Costs of product safety planning - Costs of creating service safety - Costs of developing complete product information - Costs of training related to raising employees' awareness of the consequences of improper quality - Costs of documenting the course of processes allowing the provision of evidence for avoidance of responsibility - Costs of activities related to product labelling and presentation	- Costs of extending the production cycle caused by the occurrence of failures - Costs of secret inspections - Costs of breakdowns and downtime caused by failures - Costs of recording customer complaints, claims, compensation amounts - Costs of analysing customer complaints, claims, compensation amounts - Costs of additional product testing when there is a suspicion that a product does not comply with safety requirements - Costs of informing the general public about product hazards
- Costs of observing the product on the market and gathering information on possible risks - Costs of collecting and maintaining the means to recall a defective product from the market - Costs of recording and analysing signals from the market concerning the behaviour of the product and competing products - Costs of developing and updating a programme to withdraw dangerously defective products from the market - Costs of developing action programmes to inform relevant state and local government authorities of possible dangers of a defective product - Costs of cooperating with insurance companies functioning as banks of information on cases of damage caused by a defective product - Costs of product liability insurance	- Costs of withdrawing a defective product from the market and from service - Costs of destroying a defective product - Costs of lost product liability litigation - Costs of compensation paid to injured customers - Costs of lost customer loyalty - Costs of restoring customer loyalty - Costs of loss of company reputation - Costs of rebuilding prestige and trust lost due to a defective product

Source: Zymonik, 2003.

Table 2.11 E. Kindlarski's structural model of quality costs

Costs of low quality	
Internal	*External*
- Costs of obtaining low quality semi-finished products - Remedial work within the organisation - Inspection of defective products - Overtime work	- Complaints handling - Penalties or discounts - Costs of on-site repairs
Quality level testing costs	
Personnel	*Material*
- Initial inspection of purchased semi-finished products - Maintenance of control and measuring equipment in optimal condition - Quality control at the production stage - Final acceptance procedure - Reliability testing	- Maintenance of apparatus and instrumentation
Energy	*(External) Testing*
- Energy consumption costs	- Insurance, attestation and certification costs
Prevention costs	
- Costs of the inspection department - Costs of construction and purchase of measuring equipment - Costs of quality training for personnel - Costs of testing the technical condition and maintenance of equipment	

Source: Kindlarski, 1991.

2.3.9 E. Kindlarski's model

The classification of structural models is enriched by the division of quality costs developed by E. Kindlarski (1991), who introduces quality-level testing costs, dividing them into four main categories: personnel, energy, material and research (Gawron-Zimon, 2012). The structure of these costs and their examples are presented in Table 2.11.

The solution proposed by E. Kindlarski may be an interesting alternative to traditional models of grouping quality costs and tying the organisation to the PAF model because the author rearranges the categories of costs and introduces a new category of quality-level testing costs.

2.3.10 M. Czajkowski's model

An innovative solution to the issue of a quality cost structure has been proposed by M. Czajkowski (2017) in his hybrid quality cost model which is a

combination of the strengths of the PAF model (used as a basis for identifying quality cost elements), the proposal of Ph.B. Crosby (particularly the costs of lost opportunities) and the process model (using it to illustrate a production process and identify activities that add value and those that do not, which will facilitate the understanding and analysis of quality cost elements). M. Czajkowski (2017) introduces the category of hidden costs that includes overtime, additional inventory-taking, downtime, premium transport costs, market losses and exceeded quality requirements. Administrative costs related to the maintenance of a quality management system and ISO accreditation are included in the group of assessment and internal failure costs. Calibration activities, on the other hand, should be classified similarly to control activities within appraisal costs. The quality costs of Czajkowski's hybrid model are summarised in Table 2.12.

Table 2.12 Cost categories in M. Czajkowski's model

Prevention costs	*Appraisal costs*	*Hidden costs*
- Quality control - Equipment - Quality planning - Supplier quality assurance - Training - Administration, audit, improvements	- Tests - Inspections - Inspection and testing materials - Product quality audits - Configuration for inspections - Review of data from tests and inspections - Performance testing - Appraisal of materials and spare parts - Administration, audit, improvements - Calibration and maintenance of production and testing equipment	- Overtime - Overheads - Additional inventory-taking - Downtime - Premium transport costs - Market losses - Exceeded quality requirements

Internal failure costs	*External failure costs*
- Scrapping - Rework - Analysis of defects - Reinspection - Scrapping and rework: supplier' failures - Authorisation for modifications - Return to older version - Administration, audit, improvements	- Complaints register - Product maintenance - Product returns or recalls - Returns of materials - Software - Warranty replacement - Loss of goodwill - Loss of reputation in the eyes of customers - Decline in sales - Decline in production capacity - Costs incurred by customers

Source: Czajkowski, 2017.

The authors note considerable similarities in the presented and discussed structural models of quality costs. The characteristic elements appearing in practically all of them are conformance and nonconformance costs. In some models, they constitute the costs of preventive measures, testing and inspections, as well as the costs of errors (PAF, A.V. Feigenbaum, ASQC, BS 6143, J. Bank, ISO 9004-1), whereas in other approaches, they are shown as costs of meeting or failing to meet requirements (BS 6143), quality losses (ISO 9004-1), costs of internal and external quality assurance (ISO 9004-3) or costs of low quality, costs of quality-level testing and prevention costs (E. Kindlarski). These elements have different scopes, although they most often concern production phases. An innovative solution is the hybrid model of quality costs developed by M. Czajkowski.

The conducted review of the literature on the subject allows one to notice that there are various typologies of quality costs; however, despite the differences in the nomenclature and the definitional scope, enterprises are interested in the reduction of their overall costs, which will be possible through the optimisation of quality costs (Molenda et al., 2016). The diversity of the structural models of quality costs gives managers the possibility to choose and implement appropriate modifications to the quality cost structure, adjusted to the needs of particular business activities (Szczepańska, 2017).

2.4 Activity-based quality cost models

Achieving an appropriate level of efficiency at the organisational, process and job position levels is possible through the use of quality cost models based on activities (Sadkowski, 2016). The most characteristic of these models are the process model, J.M. Juran's model, A.M. Schneiderman's model and the model proposed by Z. Zymonik.

2.4.1 The process model

The process model constitutes the foundation of activity-based quality cost models. It classifies quality costs as the costs of either conformance or nonconformance. This division results from the orientation of management in enterprises towards thinking based on processes. Processes are analysed in terms of their conformance or nonconformance with the assumption that both categories may be a source of savings (ISO 9004, 1996). Conformance costs are expenses incurred for the fulfilment of all determined and agreed requirements of the customer, with the process running smoothly without disruption. Emerging quality losses caused by irregularities in the process flow are classified as nonconformance costs. The process model of quality costs is gaining popularity, which results from the processual character of the ISO 9000:2000 standards (Balon, 2006). The main criterion for division – conformance or its lack – allows an easy and transparent way of classifying costs into one of the two groups. This model is presented in Table 2.13.

Table 2.13 The process model of quality costs

	Conformance costs	*Nonconformance costs*
PN-ISO 9004-1:1996	The cost of satisfying all established and implied needs of the customer, with the normal course of the process	Costs caused by the abnormal course of the process
BS 6143	The cost of delivering a product that conforms to the requirements of the process	The cost of lost time, materials and other resources associated with a given process

Source: U. Balon, *Przegląd wybranych modeli klasyfikacji kosztów jakości*, Problemy Jakości, nr 6/2006, p. 18.

2.4.2 J.M. Juran's model

The model proposed by J.M. Juran (1992) is a concept referring to broadly understood

basic and auxiliary processes. Design, manufacturing, documentation and customer service are universal and always consist of three elements:

1 Quality planning (identification of the customer; according to J.M. Juran, it is everyone who has contact with the process – both internal and external customers. The most important thing is the identification of customer needs, which is the basis for preparing quality requirements as well as defining quality objectives and measures necessary to achieve them).
2 Quality control (identifying and measuring the critical elements of the product and process and comparing them with the standards. If deviations occur, corrective and preventive measures must be taken. Quality control should take place at the lowest possible management level of the enterprise. It is necessary to undertake training in the methods of collecting data and solving quality problems).
3 Quality improvement (understanding the need to improve processes and developing appropriate action plans. Quality improvement is the responsibility of the team that should diagnose the problem, determine its causes and prepare countermeasures, as well as mechanisms to control the new process).

J.M. Juran's model of quality costs is based on the assumption that each process involves failures occurring in its course (failure costs). Such failures are integral elements of a process and can be divided into occasional and chronic (Juran, 1992). Undertaken testing and control measures give rise to appraisal costs, while prevention measures result in prevention costs. The cost structure is based on the PAF model. Quality is perceived in terms of product properties and features that are specified in technical documentation. In the 20th century, the measure of an enterprise's success was to manufacture a product that conformed to the established product documentation (Superville and Gupta, 2001). In his model of quality costs, J.M. Juran uses the concept of

an acceptable level of defectiveness. He is of the opinion that it is impossible to achieve 100% conformance with the requirements, thus the actual level of quality costs may be much higher than the optimal one, but still profitable for manufacturing enterprises (Superville and Gupta, 2001).

The process approach is a point of reference in the cost model developed by J.M. Juran. Although it uses the already known PAF model, its cost division principles set new standards in the perception of quality and its costs in business organisations. The social and economic conditions prevailing in the 1980s contributed to changes in approaches to quality. Enterprises shifted their focus to customers and their requirements relating to product quality and properties. As a result of these progressing changes, the quality cost model of J.M. Juran lost its usefulness. The new challenge was to develop a new quality cost structure.

2.4.3 A.M. Schneiderman's model

A.M. Schneiderman (1986) prepared and published a new activity-based quality cost model in which he divided quality costs into those resulting from the conformance or nonconformance with quality requirements. This model is based on the concept of zero defects that derives from the works by L. Tsu and Ph.B. Crosby and focuses on preventive measures and rejection of defectiveness. The optimal level of quality costs is achieved when a product or service is in full conformance with the customer's needs and expectations (www1). A.M. Schneiderman, similarly to J.M. Juran, strives to minimise the total cost of quality. This author also takes into consideration such variables as new technologies, customer focus and the strength of the organisation to manage its enterprise efficiently. Based on his analyses, he proposes a futuristic model of quality costs in which preventive measures definitely prevail. In this approach, quality becomes universal, and at some point, the problem of quality costs disappears (www1).

Emphasising the customer's quality requirements, A.M. Schneiderman's model of quality costs has been used by R.S. Kaplan (2001) to measure the efficiency of quality activities in the processes occurring in enterprises (Kaplan and Cooper, 2000). The economic efficiency of an enterprise must be considered on the basis of the following three parameters: effect, expenditure and time. Cost-benefit analysis is essential in any investment project (Wesołowski, 1975). R.S. Kaplan places most emphasis on the half-life metric, which can be used to measure cost, quality and time. The success of quality-oriented activities depends on the pace at which they proceed. It is necessary to measure the results of activities occurring at successive stages in order to determine, on the basis of the results obtained, whether the established objective will be achieved within the set time and whether a correct solution has been chosen (Kaplan, 1990).

2.4.4 Z. Zymonik's model

The author of another noteworthy activity-based quality cost model is Z. Zymonik (2003). Its basis is a matrix showing the flow of failures in a process and allowing the identification of quality costs in subsequent activities of

a process under analysis. The result of such a failure flow matrix is the author's original model of the costs and benefits of quality. The input of the model comprises additional expenditures aimed at preventing the occurrence of failures, as well as their earlier identification. Consequently, the output includes a reduced number of errors occurring and detected in activities. The added value for the enterprise results from the reduction of the loss of this value related to the waste of resources. The basis of Z. Zymonik's model is the cost accounting of ABC activities. Its graphic representation is shown in Figure 2.1.

When analysing the costs and benefits of quality in terms of the success of an enterprise, three levels of effectiveness proposed by G.A. Rummler and A.P. Brache (2000) should be taken into consideration: organisation, process and job position. Implemented improvements should contribute to a decrease in the number and magnitude of failures and subsequent losses, better detection of failures and reduction in the time and distance between the occurrence of a failure and its detection (Rummler and Brache, 2000). Quality-oriented measures are included in the set of activities supporting business management. The contribution of quality is one of many contributions that make up the success of a given enterprise. The business processes of key importance for the enterprise's strategy are not necessarily those related to quality improvement. Therefore, it is necessary to analyse the relationship between improved processes within the enterprise and its (financial and non-financial) results confirmed by customers – for example responsibility for product quality (Zymonik, 2003).

Activity-based quality costs contradict the TQM philosophy, according to which financial results will improve automatically when quality is improved. Without indicating the processes that are crucial for the enterprise's strategy, measuring achieved effects and analysing costs and benefits related to quality, it will be impossible to find an answer to the question: Is quality the cause of the enterprise's success? (Turney, 1992). For these reasons, it becomes very important to measure the efficiency of quality-oriented activities in the following areas: organisation, process and job position (Sedevich Fons, 2012). The quality cost model developed by Z. Zymonik uses the process approach and strategic scorecard to identify quality-related activities that generate quality costs. It is a relatively advanced solution that can be used in process-oriented organisations.

The activity-based quality cost models presented above were evolving in parallel with the progressing social, economic and technological development of the 20th century. The deepening relationship between quality and marketing and finance resulted in the development of the concept of consumer value, i.e. value related to the customer, which is a set of benefits enjoyed by the customer who has bought a product and includes its price, quality, convenience, on-time delivery, as well as pre- and after-sales services (Matwiejczuk, 2006).

The process approach finds more and more supporters; consequently, the importance of quality cost models using processes as a source of potential quality costs in enterprises is also growing.

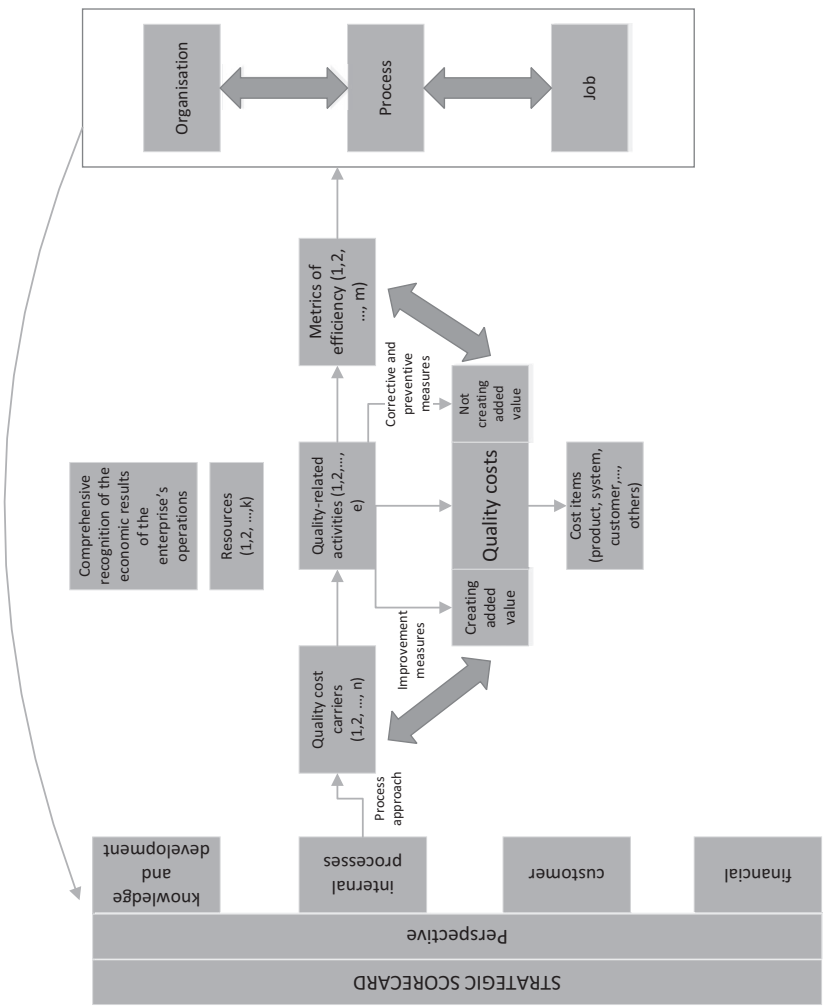

Figure 2.1 The quality cost model developed by Z. Zymonik
Source: Zymonik, 2003.

Summing up, the selection of an appropriate quality cost structure and its adjustment to the quality cost accounting system under implementation is the key task to be undertaken during the implementation procedure. Enterprises can use all the available quality cost models. The best solution seems to be the adoption of the most popular quality cost structure proposed in the PAF model.

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3 The specificity of the functioning of service enterprises and quality costs

3.1 The essence of services and service activity

The issue of services was already recognised at the end of the 19th century during the reorganisation of the Swiss economy. Hotels, restaurants, banks, hospitals, as well as enterprises providing transport and tourist services were incorporated into one sector. However, the attribute of services as an important part of the economy and a subject of research was established at the turn of the 1930s and 1940s (Ilnicki, 2009). On the other hand, the genesis of economic knowledge of services comes from the work by A. Smith (2013).

Currently, it is the service sector that creates the largest share of GDP and employs the largest percentage of the workforce. The progressing transformations of the employment structure reflect the continuous change towards a service-based economy (Osiadacz, 2012). In Poland, the share of services in the structure of the country's GDP increased from about 50% in 1990 to 67.7% in 2018 (www1), and more than a half of people in active employment (58.7%) (GUS, 2018a) already work in this sector. For comparison, at the end of 2017, the share of the service sector in the structure of the EU's GDP reached 73%, and the percentage of those employed in services was 74% of the active workforce (EU, 2018). Moreover, as much as 80% of the national income of highly developed economies comes from services. Based on the cited statistical data, it can be concluded that the service sector is one of the most dynamically developing parts of the economy (Osiadacz, 2012).

Numerous definitions of the term "services" have appeared and evolved over time in the literature on the subject. This evolution is the result of a diverse understanding of what constitutes a service. The authors have prepared an overview of the most important definitions of this concept. They are presented in Table 3.1. The collected definitions have been arranged in chronological order.

The conducted analysis of the literature including definitions of the concept of service shows a wealth of different definitions of this term developed by Polish and foreign authors who approached the subject from the perspective of such disciplines of social sciences as economics and finance, social and economic geography, spatial management, legal sciences, sociology, as well

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Table 3.1 An overview of the definitions of the concept of "service"

Author	*Year*	*Definition*
A.G.B. Fisher	1939	A good or service that is not included in the agricultural and industrial sectors
E. Taylor	1947	Human activity satisfying nonmaterial needs
W. KrzyŻanowski	1947	Expenditure of a certain amount of labour in order to produce a certain effect satisfying a need of the consumer
T. Kotarbiński	1955	An activity ancillary for someone other than the performer themselves, an activity satisfying someone's essential need, a more or less fleeting activity
American Marketing Association	1960	An activity, benefit or satisfaction offered for sale or provided in connection with the sale of other goods
J. Zagórski	1961	An activity serving the satisfaction of human needs that has no embodiment in new material goods
W. Regan	1963	An intangible good from which satisfaction can be derived directly or through the purchase of other goods and services
R. Judd	1964	A market transaction whose purpose is not the transfer of ownership of tangible goods
E. Lipiński	1965	Production of intrinsic values in use without any material form, serving to satisfy separate and intrinsic needs of higher types
F. Wiśniewski	1965	An activity producing values in use that serves to satisfy human needs directly or indirectly but does not reflect the production of new material goods
O. Lange	1967	An activity related to the satisfaction of human needs that does not serve the direct production of material goods
Cz. Niewadzi	1968	The provision of socially useful activities not directly related to the production of products
K. Polarczyk	1971	Productive work whose effect is a value in use or given to an object as a result of an action performed during work on the structure of such an object
R. Besson	1973	Any activity offered for sale to the consumer and providing them with satisfaction or benefit. The consumer does not want to or cannot perform such activities themselves
W. Stanton	1974	A separate activity that has no material effect, but provides the buyer with specific benefits that are not necessarily linked to the sale of products or other services
Z. Dmowski	1977	An activity to satisfy specific needs that, although not always embodied in material goods, is nevertheless an essential component of such goods
T. Hill	1977	An activity aimed at changing the state of a person or a tangible good as a result of the action of another economic entity provided that such a person has given their consent to such an activity

(Continued)

Author	*Year*	*Definition*
J.R. Lehtinen	1983	An activity or series of activities that brings satisfaction to the purchaser and occurs during interaction with a person or machine
O. Andersen	1983	A benefit without material effect, payable directly or indirectly, often involving technical and material elements
P. Kotler and P. Bloom	1984	An action or benefit without transfer of property rights offered by one party to an exchange to the other party. The benefit may or may not be related to the provision of a tangible product
A. Styś and J. Olearnik	1985	A benefit offered for sale, essentially nonmeasurable and subjectively assessed by the buyer
M. Daszkowska	1987	A useful intangible product generated as a result of human labour during the production process and by affecting the structure of a specific object to satisfy human needs
A Werwicki	1987	Any activity that does not produce a direct tangible effect
E. Gummesson	1987	Something that can be sold and bought but not dropped on your feet
C. Grönroos	1990	An activity or group of activities of a more or less intangible nature that usually occurs during interaction between the customer and the service provider's representative or the customer and the physical environment constituting the service provider's system. Such activities are meant to solve the customer's problems
K. Rogoziński	1993	Intentional performance of work undertaken at somebody's request and aimed at enriching the recipient's personal qualities or use values remaining at their disposal
P. Kotler	1994	Any intangible benefit that one party can offer to another and does not result in any transfer of ownership. Its production may or may not involve a tangible product
E. Nowosielska	1994	Service work (activity) regardless of its place in the classification of the national economy, i.e. a service classified in the production sectors of the economy (agriculture and forestry, industry and construction) as well as in the service branches (other than agriculture, industry or construction)
R. Maleri	1997	An intangible result of a combination of production factors
P. Petit	1997	A conscious action of a service provider that aims to transform an entity (a person or a good belonging to a person)
A. Payne	1997	An intangible product that affects the customer but does not result in a transfer of ownership
M. Daszkowska	1998	A useful tangible product that is the result of human labour and consists in exerting impact on the structure of a given object in order to satisfy needs
T. Sztucki	1998	Any intangible activity offered by one party to another that does not result in any ownership
G. Hufbauer and T. Warren	1999	An economic activity that increases the value of an economic entity or the goods belonging to it
L. Grabarski, I. Rutkowski, W. Wrzosek	2000	An activity serving the satisfaction of human needs, not finding any embodiment in new material goods

A. Hamrol and W. Mantura	2002	Any activity involving interaction with the customer or with personal or real property in the customer's possession
A. Czubała	2006	A specific type of activity that consists in the performance of work that does not lead to the creation of a new product
F. Kłosowski	2006	Any activity that has an institutional character, is directed towards an entity and does not result in a material product
J. Łańcucki	2006	Any manifestation of human economic activity that is intangible in nature and characterised by interactivity occurring between the service provider and the service recipient
S.E. Sampson	2010	A production process in which the customer provides one or more input components for the production unit
The Act of 4 March 2010 on the provision of services in the territory of the Republic of Poland	2010	A benefit provided by the service provider for their own account, usually for remuneration, in particular construction, commercial and professional services
E. Michalski	2012	A product with predominantly intangible components that require human effort and often the use of equipment and facilities
European Union – The Treaty on the Functioning of the European Union, Article 57	2012	It is an activity that is not the sale of goods and is normally provided for remuneration, to the extent that it is not governed by the provisions relating to free movement of goods, capital and persons; in particular, it is activities of an industrial character, commercial character, as well as activities of craftsmen and the professions
R. Kolman	2013	A useful human activity, work or process that does not produce a new tangible object but satisfies a specific need. It may make the object of activity more suitable or more efficient, or it may enable a change in the conditions of a person's conduct
J. Toruński	2013	An activity, benefit or satisfaction (contentment) offered for sale or related to the sale of products
W. Urban	2018	A process at the heart of which is a dynamic and unique interaction between the enterprise and the customer (treated as a co-performer). It does not produce a physical object as in the case of an industrial product that is manufactured and handed over to the consumer. It is accompanied by a degree of indeterminacy and uncertainty as to its performance
S.P. Mukherjee	2019	From the point of view of the results generated, it is an activity that takes place between the provider and the customer (consumer) and involves the provider's appropriate actions taken within the organisation to satisfy the customer's needs

Source: The authors' own work on the basis: Ilnicki, 2009; Osiadacz, 2012; Hawrysz, 2014; Lotko, 2018; Sadkowski, 2018.

as management and quality sciences. These definitions are characterised by varying degrees of generality.

Furthermore, a service is an activity that is intentional and process-oriented. The provision of a service is carried out by entities for which it is an occupational/professional activity. The purpose of providing a service is to satisfy the needs of the customer. The end result of the provided service is evaluated by consumers according to their own subjective criteria. There is a noticeable integral relationship between the service provider and the service recipient. Some definitions regard a service as a product that has a market value.

The current literature on the subject presents four basic approaches to defining services: negative, enumerative, constructive and illustrative (Panasiuk, 2005; Osiadacz, 2012).

Negative definitions describe what a service is not. One of the first definitions of this concept by A.G.B. Fisher (1939) was formulated precisely on the basis of negation, where it is such a good that does not belong to the agricultural or industrial sector. Another example illustrating this approach to defining is the concept created by O. Lange (1967), who is of the opinion that services are activities that do not serve directly the manufacture of tangible goods. Similarly, R. Judd's definition treats a service as a market transaction whose purpose is not to transfer ownership of material goods (Judd, 1964). R. Kolman (2013) describes a service as a useful human activity, work or process that does not result in a new material object, but satisfies a specific need. It may make the object of activity more suitable or more efficient, or it may enable a change in the conditions of a person's conduct. The other representatives of this approach include: A. Czubała (2012), Cz. Niewadzi (1968), W. Stanton (1974), F. Wiśniewski (1965) and the Treaty on the Functioning of the European Union (2012).

Enumerative definitions, on the other hand, list economic activities that make up the services sector. Such definitions have been formulated by the American Marketing Association (1960), C. Grönroos (1990), A. Payne (1997) and the Central Statistical Office (GUS, 2018b).

What appears in constructive definitions is elements that describe a service, its potential, process and result. In E. Michalski's view, it is a product containing intangible components requiring human effort and the use of equipment and facilities to perform it (Michalski, 2012). For W. Urban (2018), a service is a process whose essence is a dynamic and unique interaction between the organisation and the customer. The service recipient's experience related to the provided service, consisting of subsequent episodes mutually influencing each other, is also of a process nature. This researcher emphasises that every service is always characterised by indeterminacy (resulting from the frequent impossibility of fully determining the actual expectations of the customer) and uncertainty (because the customer's expectations and preferences are subject to dynamic changes during the service provision process) about its performance. The other representatives of constructive definitions are also R. Besson (1973), M. Daszkowska (1987), T. Hill (1977), T. Kotarbiński

(1955), W. Krzyżanowski (1947), J.R. Lehtinen (1983), K. Rogoziński (1993) and S.E. Sampson (2010).

The content of illustrative definitions includes examples. Such an approach is represented by E. Nowosielska (1974), who points out that a service may be classified as belonging to the production sectors of the economy (agriculture and forestry, industry and construction) or the service branches (other than agriculture, industry or construction). A service is also defined in this way by Polish legislation: "A benefit provided by the service provider for their own account, usually for remuneration, in particular construction, commercial and professional services" (The Act on the provision…, 2010).

In conclusion, it should be stated that the diversity of the definitions of the concept of "service" results from the great diversity of services themselves. The common element of the definitions is their authors' emphasis on the nonmaterial nature of a service and the fact that service activities do not involve production. Most definitions treat a service as a process, performance or activity that is aimed at satisfying people's needs. Each of them arranges this term in an understandable way and makes it possible to look at services from different perspectives.

The most important attribute characteristic of services is their intangible nature (Lotko, 2018). They are also described by means of such qualities as the simultaneity of production, distribution and consumption processes, heterogeneity, the impossibility of storing for future consumption and the impossibility of acquiring a property title (Gustafsson and Johnson, 2003; Yalley and Sekhon, 2014).

All the attributes mentioned above play an extremely important role in the process of understanding the essence of service activities. Intangibility emphasises that it is impossible for the buyer to evaluate a given service before purchasing it, and the provider is responsible for making it real. The simultaneity of the provision of the service by the service provider and its consumption by the customer affects the direct contact between the two interested parties (Boakye et al., 2016; Osarenkhoe and Byarugaba, 2016). Services are not of a uniform or standard character; their variety depends on the provider, time and place. It is also impossible for services to be kept for future use or to be resold and reused.

An extended definition of services is presented by J.M. Rathmell (1966). He indicates 13 elements that determine their uniqueness. These elements include: the monetary value of services (expressed in fees, commissions, deductions, percentages, shares, subsidies), the buyer of the service who is a consumer rather than a customer, the nature of services determining their diversity, the impossibility of storage for future use, the economic nature of services, diverse marketing systems, imprecise service standards, differences in pricing in the same service categories, difficulties in applying economic principles to services, the presence of a large number of different and interconnected benefits, limited concentration in services, marketing activities affecting recognisability in the service market and the approach to services as an activity rather than a state of possession.

What deserves attention in J.M. Rathmell's definition is the impossibility of storing services for future use. It is an important feature that distinguishes service activity from production activity (in which it is possible to produce goods and warehouse them thereafter). In a situation of increased demand, a service enterprise faces the dilemma of providing its services to a larger number of customers. The ability to provide a service is determined by access to appropriate personnel. The wide range of the characteristic features of services presented by J.M. Rathmell confirms that their provision is a distinctly different process from the production or sale of goods.

Discussing the characteristics of services and service activities, the authors often refer to impermanence. However, additional attributes can also be found. Among the main characteristics that distinguish services from products, W. Sasser (1976) mentions the former's direct nature, the high degree of interaction with the customer and the lack of transportability. The high degree of interaction between the service provider and the service user is worth emphasising. It is customers that generate demand and determine the provision of services for their benefit; they are also the source of uncertainty as to the timing of service performance or the quality and satisfaction of their needs. Consequently, the service provider is obliged to ensure the professionalism of their staff who will very often establish close or "personal" relations with their customers (Osiadacz, 2012).

Characteristic of service enterprises, a strong interaction between the producer and the consumer, affects the perception of quality. This perception depends on the so-called moment of credibility that occurs during the contact between the producer and the consumer. The credibility of the service provider is important because if skilfully presented, it may cause satisfaction or the opposite effect in the case of inadequate service. An example is a restaurant menu prepared in such a way as to stimulate a discussion between the customer and the waiter to create a good impression. If the waiter is too hasty in his conversation or does not answer the questions posed by the consumer, the latter will be disappointed (Drummond, 1998).

In summary, the essence of service activity is determined by its characteristic features. Its most important attributes are immateriality, impermanence, heterogeneity, inseparability of the process of production and consumption and the impossibility to acquire ownership of a service. Each characteristic has specific consequences for market activities. In the light of the presented definitions of the notion of service and its attributes, the authors attempt to define the essence of services and service activity. The crux of service activity is a process (action, activity) of an intangible, impermanent and heterogeneous character, being an integral relation between the service provider and the service recipient, which is aimed at satisfying human needs, and whose production and consumption occur at the same time and place. The final result of this process undergoes the consumer's subjective evaluation. The customer's satisfaction is a measure of the quality of the provided service.

3.2 Processes taking place in service activity

Processes constitute the basic architecture of services; they describe the method and sequence of actions of operating systems and specify how these systems within an organisation should work together to generate the promised value for customers (Wirtz, 2016). Poorly designed processes will result in dissatisfied and frustrated customers as they receive services of poor quality. Any service process can be considered in terms of the following three stages: preliminary processing, in-process activities and final activities (Wirtz, 2016). The preliminary processing stage concerns initial activities associated with a service. For example, in the case of a restaurant service, it is making a reservation, parking the car, taking a seat and looking at the menu. The realisation of the main objective of a service takes place during the stage of in-process activities, for example eating meals and drinking beverages in a restaurant. Final activities are related to actions necessary to complete a given service, for example receiving and paying the bill.

When identifying a service process, it is necessary to pay attention to the following elements: defining standards for each front-stage activity, major customer activities, physical and other evidence for front-stage activities, a line of interaction, front-stage activities in the form of contact between the personnel and the customer, a line of visibility, back-stage activities in the staff-customer relationship, support processes involving other employees and information technology (Wirtz, 2016). The front-stage is the part of the service delivery system that is visible to the customer, while the back-stage is invisible and consists of all the personnel as well as facilities, equipment and processes that support the personnel and processes in the front-stage part (Haksever and Render, 2018).

Service provision is a process that aims to create value for the customer in the form of a service that meets certain quantitative and qualitative parameters. There are many differences between service processes and organisational processes (Dobrowolska, 2017).

The course of a process is a form of transformation in which the (tangible, intangible) object of the process undergoes transformation aimed at creating value. It is important that the processes run smoothly, otherwise the objective, i.e. a service of a good quality, will not be achieved. The transformation process has been identified as a key element in the marketing triangle concept. It is perceived as both a change in the input resource data (Mills et al., 1983) and the way in which the customer receives the service (Rafiq and Ahmed, 1993). Furthermore, C. Grönroos (1998) defines it as a consumption process, while H. Corsten and R. Gössinger (2007) consider it as internal conversions, external conversions and customer-related production factors that are transformed into output products.

According to M. Hammer (1999), it is processes that are the most vital aspects of an organisation. The service provision process is primarily a set of

added values. It consists in defining these values in the individual phases of the process and directing the activities in such a way that the value for the customer is created optimally.

To sum up, a service enterprise is a platform where resources are gathered and integrated into conducted processes. Each entity has its own unique set of economic processes that create value for the customer (Zymonik, 2003). Only the identification and proper management of numerous related processes allows an organisation to function efficiently (Pacana and Stadnicka, 2017). The use of the process approach in the management of an entity operating in the service sector may give directly or indirectly many positive effects.

The process of service provision plays a key role in service organisations. In the literature on the subject, it has been divided into four specific processes: the process of planning and acquiring necessary resources, the process of developing human resource qualifications, the process of providing a service to the customer and the process of ensuring service quality. In each of the processes, errors and shortcomings may occur that will affect the consumer's subjective appraisal of the provided service (Gotsch et al., 2013).

The diversity of processes in service enterprises results from the profile of their activity. Its characteristic feature is a very wide range of all possible services provided on the market (Voss et al., 2016). The service sector includes, among others, tourism, hospitality, financial services, culture and arts, health care, education, charity, consulting and public services. This demonstrates its strong diversity. The service industries differ from one another with respect to the number of entities operating in them (Gilmore, 2006). The market position of an enterprise is influenced by the complexity and variety of processes that make up the services it provides (Czubała et al., 2012). Organisations may provide several related types of services, which is why an individualised approach to each process is so important.

The implemented processes should ensure the efficient operation of the enterprise. The necessary condition is employees' understanding of the role played by the processes and appropriate internal communication among the participants of the organisation (Kolman, 1992). One of the possible places for collecting and distributing information on the processes taking place in the organisation is the documentation of the quality management system (Skrzypek and Hofman, 2010).

A process map (Keller and Jacka, 1999; Skrzypek and Hofman, 2010) is a graphical representation of the way in which a process is carried out and individual activities are performed, as well as mutual relations among them. Enterprises usually construct process maps that describe the actual state. Process mapping allows the identification of key activities in a given process as well as unnecessary activities that do not provide added value; it also helps employees participating in the process to understand better the course of its execution. Figure 3.1 presents the authors' map of the service provision process.

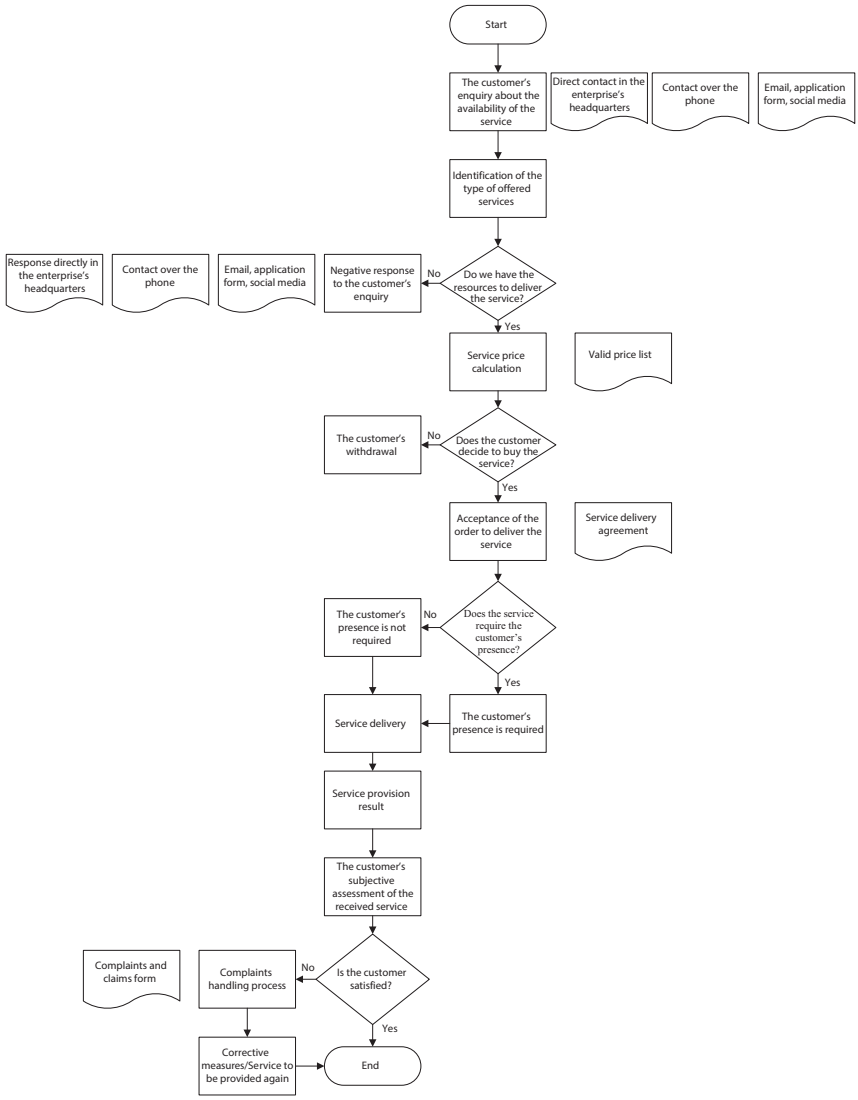

Figure 3.1 A map of the process of service provision
Source: The authors' own work.

The starting point of the service provision process is an enquiry from a potential customer to the service provider about the availability of a given service. The question may be presented during a face-to-face meeting or through a telephone conversation or using the Internet (email, a contact form available on the service provider's website, social media). In response, the service enterprise provides information on the available and offered services.

The service provider decides whether it has the appropriate resources to provide the service the customer is looking for. If not, a negative response should be communicated to the customer. If the organisation has adequate resources to provide the service, it calculates its price in accordance with the applicable price list and presents it to the interested party. After being informed about the price of the service, the customer decides whether to buy it or not. A positive answer entails the acceptance of an order for the provision of the service and the signing of a contract by both parties participating in the process.

In the next step, the service provider informs the customer whether their presence is required during the performance of the service. The service provision process ends with a particular result that is subject to the customer's subjective appraisal. If the recipient of the service is satisfied, this ends the whole process. The customer's dissatisfaction allows them to use the complaints and grievance procedure. After receiving a complaint/claim, the enterprise providing the service takes appropriate corrective measures or decides to provide the service again in order to correct the errors that may have occurred at the previous stage. The complaints handling procedure completes the whole process.

3.2.1 Selected divisions of service processes

The processes occurring in service activities can be divided into basic, auxiliary (support) and managerial (Zymonik, 2003). The characteristics of each of them are presented in Table 3.2.

Table 3.2 A classification of service processes

Process	*Description*
Basic	Directly generating added value Most easily perceived by the customer The customer's assessment of the quality and efficiency of the entire organisation on the basis of these processes They include: marketing activities, sales activities, designing new products and services, distribution
Auxiliary	Indirectly generating added value Their quality is hardly noticeable by the customer Little influence on the organisation's image They include: warehousing, quality control, personnel recruitment and assessment, financial and accounting activities
Managerial	Strategically influence the generation of added value Regulate basic and auxiliary processes Determine the mission, strategy and principles of the enterprise's operation Monitor the efficiency of processes

Source: The authors' own work on the basis Ossowski, 2012.

Basic processes are the most easily noticeable for the customer, and the assessment of the quality of the organisation and its services is based on them. They create added value in a direct way. The customer's awareness of the existence of auxiliary processes is rather low. Consequently, they have little influence on the perception of the enterprise, but are important because of their support for the basic activities. Process monitoring is the responsibility of managerial activities. They determine the content of the mission, strategy and operational principles of the organisation.

On the other hand, the process service provision comprises fast processes (running at a fast pace, partially or fully automated, for example taking cash from an ATM), routinised processes (more complex and less repetitive, based on developed patterns, for example a promotional offer of a bank account dedicated to a selected group of customers) and nonstandard processes (each time created from scratch, they apply an individual approach to a service, for example services provided by professionals) (Johnston and Clark, 2005; Urban, 2018).

An important division of processes in services resulting from the location of the visibility line is their classification as back office, front office and customer processes. Back office is processes that are invisible and inaccessible to customers; front office is visible to service recipients, who are not directly involved in them; and customer processes are those in which they directly participate (Roes and Dorr, 1997; Urban, 2018).

Processes in an organisation constitute a specific structure. They can also be divided from the point of view of satisfying the needs of the service recipient into processes that directly create value for the customer, those that create such value indirectly and those that do not create value for the customer (Grajewski, 2012).

Processes that create value in an indirect way should be the subject of outsourcing, i.e. subcontracting processes that do not create value directly and generate costs to other enterprises. Outsourcing these processes allows the enterprise to rationalise costs and focus on its core activity, i.e. the process of providing services, whereas processes that do not create value should be identified and rationalised (Downar, 2008a).

The broadest classification of processes included in the Process Classification Framework (PCF) (www2) is presented by the American Productivity Quality Center (APQC). This framework contains 13 process categories. A graphical illustration of this classification is presented in Table 3.3.

The categories of processes highlighted in the PCF and particularly relevant from the perspective of a service enterprise include vision and strategy development, service development and management, service marketing and sales, service delivery, customer service management and human capital management (Hiebeler, 1993).

The PCF is not limited to only these 13 categories, but is further divided as follows: process category – process group – processes – activities (actions). An example of a detailed breakdown of the fifth process category is shown in Table 3.4.

Table 3.3 A classification of processes according to the PCF

Category	*Process*
1.0	Development of vision and strategy
2.0	Development and management of services
3.0	Marketing and selling services
4.0	Procurement
5.0	Service delivery
6.0	Customer service management
7.0	Human capital development and management
8.0	Information technology management
9.0	Financial resources management
10.0	Asset acquisition, construction and management
11.0	Enterprise risk, compliance, improvement and resilience management
12.0	External relationship management
13.0	Business capability/capacity development and management

Source: The authors' own work on the basis of the APQC framework (www3).

Table 3.4 An example of the hierarchical structure of the PCF

Category	*Group*	*Process*	*Activity*	*Description*
5.0	Service delivery			
	5.1	Establishment of delivery management and service delivery strategy		
		5.1.1	Establishment of service delivery management	
			5.1.1.1	Configuration and maintenance of service management and delivery system
			5.1.1.2	Service delivery performance management
			5.1.1.3	Service provision development and direction management
			5.1.1.4	Requesting feedback from customers on their satisfaction with service provision
		5.1.2	Service delivery strategy development	
	5.2	Management of resources used in service provision		
	5.3	Provision of services to the customer		

Source: The author's own work on the basis of the APQC framework (www3).

The lowest level in the hierarchical structure of the model is activity. The number of possible activities within a given process category definitely exceeds the number of groups and processes. Analysing the possibility of the occurrence of quality costs in each potential activity, one can come to a conclusion that identifying all costs requires perfection, due attention and concentration. Adequate knowledge of the classification of quality costs in theory and in the practice of one's own enterprise is also necessary.

The Process Classification Framework presented by the APQC provides a general picture of the processes occurring in economic entities. Each enterprise may use it as a source of inspiration and create its own classification of processes adapted to the specificity and needs resulting from the profile of its activity.

On the basis of the above considerations, it should be stated that the processes occurring in service enterprises are definitely different from those typical of production organisations. The effect of a production process is a material good, while in the case of a service, it is an action, process or report that satisfies specific needs of the service recipient. A particularly significant disproportion concerns the customer's participation in the execution of the service process and absence from the production process. The uniqueness of service activity results also from the intensive interaction that takes place between the buyer and the seller, as well as the impossibility to store services.

3.3 Quality management in service enterprises

In this section, the knowledge of service quality management is presented in the following order: definitions of the term "service quality", quality improvement concepts, quality management systems, methods for measuring service quality and quality management tools.

3.3.1 An overview of the definitions of service quality

The starting point in considering quality management in service enterprises is to define the term "service quality". W.B. Martin (2006) defines service quality as "the ability to satisfy the needs and expectations of external and internal customers, taking into account technical and functional elements". In other words, it is simply the degree to which customers' needs and expectations have been fulfilled (Bugdol, 2008). J. Łańcucki (2010), on the other hand, is of the opinion that it is "the degree to which the totality of inherent properties of a service meets the customer's requirements". For S.P. Mukherjee (2019), it is the degree to which the service provided to the customer meets their requirements. Service quality can also be considered as a function of three factors: corporate image, technical quality and functional quality (Urbaniak, 2007); it means the provision of a service in accordance with or above the expectation of the service recipient (Michalski, 2012). C. Grönroos (1984) defines the term as a comparison between the service that is expected and the service that is perceived.

An important part of service provision systems is transcendent quality, understood as flawlessness and mastery of execution, as well as continuous improvement. Service quality perceived in this way requires qualified performers aware of the mission of the organisation providing services and its personnel (Rogoziński, 2012; Urban 2018).

Quality in services is also interpreted as the degree of achieving a benchmark. This is how quality is defined by the ISO 9001 standard. J.M. Juran (1992) defines it briefly: as freedom from defects. The uniqueness of each service causes difficulties in the formulation of patterns constituting a reference base when pursuing and assessing quality. The performance of a service by the service provider and its consumption by the service recipient take place at the same time, which is why it is so important to meet all requirements the first time. Poor service quality results in not only additional costs, but also the loss of customer loyalty (Urban, 2018).

Quality is also understood as the experience of customers who make a subjective evaluation of a received service in relation to their benefits, needs and preferences (Smith, 1993). According to C. Grönroos (1984), there are two parts that constitute service quality: technical quality (which is the result of the customer's contact with the organisation providing the service and which can be assessed fairly objectively, for example a meal on a plate ordered in a restaurant) and functional quality (i.e. the way the customer receives the technical result, whose assessment is very subjective).

Service quality can also consist of three other elements: material quality (the sum of the material elements that make up the service), interactional quality (the interaction that takes place between the customer and the organisation) and corporate quality (this is trust of the customer in the enterprise providing the service and its image) (Lehtinen and Lehtinen, 1991).

An adequately high quality of a service is a natural condition for the occurrence of customer satisfaction, but it should be remembered that the relationship between quality and satisfaction is not always simply linear (for example if the customer is in a very bad mood on a given day and uses a service of very high quality, the quality rating may be high, but the customer will not feel satisfied with the consumption of the received service) (Urban, 2018).

In his three-component model of service quality, W. Urban (2018) distinguishes the following components of quality: the quality of defined requirements (predetermined quality requirements), discovered quality (based on emerging requirements) and intuited quality (based on guesswork about customer expectations). All these components of service quality occur at different intensities during service delivery and affect the quality experienced by customers. It is only during the course of service delivery that the service provider can learn the criteria to be met by an ideal service (Urban, 2018).

Service quality is considered and discussed in many dimensions such as availability, timeliness, adequacy/completeness, compliance, reliability, safety and confidentiality (if required), flexibility, complaint resolution, credibility and reputation, qualifications, courtesy, communication, responsiveness and materiality. Some relate to technical and physical characteristics, others are of a functional nature or interact with each other, while still others overlap (Mukherjee, 2019).

The research conducted to determine the perception of quality by service enterprises clearly shows that quality is understood by these entities as their customers' satisfaction with received services (Urban, 2013).

In the authors' opinion, service quality is the actions taken by the employees of the service enterprise aimed at meeting the needs and expectations of the service recipient to the highest possible extent in the performance of a given service.

3.3.2 Selected concepts of quality improvement in service enterprises

Service enterprises provide services of different types, with different levels of sophistication. For the customer who experiences services, the most important thing is their quality. Therefore, service organisations look for ways to improve the quality of the services they offer. The literature on the subject presents a number of concepts relating to quality improvement. The most important of them include the following: Total Quality Management (TQM), Lean Management and Six Sigma.

The basis of TQM is the continuous improvement and development of the organisation in order to ensure its customers' full satisfaction and thus create an enterprise that is capable of achieving market success. The TQM concept is based on four pillars (Khan, 2003): total customer focus, involvement of all employees, continuous improvement and the application of a systematic approach to management. The key element of the TQM concept is ensuring customer satisfaction (Singh and Singh, 2014). Full satisfaction of the customer's requirements is only possible when the organisation fully understands the customer's needs and all employees are involved in the quality generation process. Used by entrepreneurs, TQM is to contribute to the achievement of required quality and the elimination of all possible errors and defects. The application of this concept involves making improvements at every level in the organisation (Radebaugh and Gray, 1997). It is necessary for each employee to be fully aware that in their area they bear full responsibility for quality and its improvement. Unfortunately, as S.P. Mukherjee (2019) notes, this concept does not allow service enterprises to eliminate their problems with quality quickly and efficiently. In TQM, only customers describe and assess the quality of services. The key element is the employees of service organisations who are responsible for how their customers experience quality (Hough, 2004). A lack of qualified personnel can contribute to more errors in the service delivery process and thus to the delivery of a service whose quality is lower than that expected by the customer. TQM is a concept of managing the whole organisation, as well as an organisational philosophy and culture consisting in taking deliberate quality assurance measures in all phases of the service process by all managers and employees (Fraś, 2013).

Lean Management is a management concept emphasising standards, which are the key to efficient and productive activities in an enterprise. Its essence is high quality of services and work, as well as efficient organisation and management. It gives a special role to the human factor. The process approach (Bitkowska, 2013) and reengineering (Fraś, 2013) are its most important foundations. Lean Management causes a change in the way both managers and employees think and act (Jakubiec, 2017). Failure to meet a standard results

in poor quality of work, which must be eliminated. Low quality costs very dearly, while excellent quality creates the lowest costs. Lean Management in service activity is referred to as Lean Service (Urban, 2018). The Lean concept is best described by the principles developed by J.P. Womack and D.T. Jones (2008): understanding the essence of value delivered to customers, determining the flow of the stream that creates value for customers, ensuring a smooth and quick flow of the value stream, embedding the "pull" principle in the value stream and improving continuously the flow of the value stream. Understanding the essence of value consists in discovering what creates value for the customer in a service. Intangible values such as respect, hospitality or empathy are more desirable to customers (Haeckel et al., 2003). According to service theories, value is located in the sphere of customer experience. A thorough understanding of the sequence of value-creating activities should be considered based on the assumption that the overwhelming majority of services take place with the active participation of the customer in the process of their performance. Eliminating activities that do not generate value for the customer is possible by mapping the value stream. An efficient, smooth and fast flow of the value stream can be achieved by eliminating activities that slow down value creation and cause disruptions. In turn, the "pull" principle manifests itself in making service provision capacity more flexible, i.e. seeking to adapt the service process quickly and easily to changes in demand. On the other hand, continuous improvement of the value stream requires a focus on service quality excellence, understood as a flawless service process and an above-average customer experience.

One of the most important ideas of the Lean Management concept is the elimination of waste, or muda. Muda is anything that does not create value for customers. The process of providing a service represents a great potential for improvement, as 80% of the time spent on it does not add value, thus it is muda (Sarkar, 2008). An important component of Lean is standardised work. In service activity, it manifests itself in the application of standards from the perspective of customer service and customer experience. The most common forms of standards in services include checklists, procedures, to-do, memos, blueprints and other maps, operations schedules and company standards manuals (Urban, 2018). The basic technique used by Lean is value stream mapping, which involves creating a diagram of the actual value flow. The prepared map allows one to identify the wastage of resources in the flow. The Lean concept provides an opportunity to introduce changes in service processes and achieve their considerable improvement at low costs and in a relatively short time.

The Six Sigma concept defines quality as the freedom of a service from defects and errors. Initiated by Motorola in the mid-1980s, Six Sigma emphasises the importance of processes in management. According to the global standard of deviation, no more than three defects per million opportunities can occur in a process. It focuses on analysing the most important processes from the point of view of customer needs. In service processes, Six Sigma allows

one to understand the occurrence of defects, develop improvements that will eliminate them and thus enhance the customer's perception of the service and satisfaction (Antony et al., 2007). The concept is a global quality standard for products, services and activity parameters, as well as a multi-step, cyclical process of improvement aimed at achieving a near-perfect standard (Grudowski and Wiśniewska, 2015).

The Six Sigma process consists of five stages (the DMAIC model) (Wheelen and Hunger, 2008): defining the process, measuring the process, analysing information about irregularities, improving the process and eliminating defects and controlling to protect against future errors. The most important benefits of using Six Sigma in service enterprises include increased customer satisfaction, reduced process errors, reduced variation in key processes, shorter process cycle time and thus faster service delivery, lower operating costs and increased market share (Antony et al., 2007). Six Sigma is also a way of properly allocating resources to the existing mechanisms. The application of this concept requires a radical reconstruction of the organisational structure and the knowledge of many statistical and analytical tools by managers, as well as the continuous involvement of senior management in the day-to-day activities of the organisation (Bogacz and Miga, 2013). T. Woodall (2001) regards it as the development of an impeccable foundation for the creation of subsequent perfect services that are in line with expectations.

Lean Six Sigma is a concept that integrates Six Sigma and Lean Management. It provides for delivering services of the highest quality to customers faster than the competitors. Lean Six Sigma also focuses on processes, but additionally exploits the fact that quality and speed of process execution are closely related (Corbett, 2011; Grudowski et al., 2015). The concept can be applied in service organisations, where it contributes to, among other things, cost reduction, shorter service delivery time and increased customer satisfaction (Pinjari et al., 2017).

Contemporary concepts of quality management assume that quality is the most important factor in the activities of service enterprises. Consequently, they should be organised in such a way as to meet the expectations of service recipients by providing services that fully satisfy them (Oakland, 1993).

3.3.3 Quality management systems

Efficient quality management involves not only extensive knowledge of business management but also high leadership and management skills of the management. Proper quality management in service enterprises requires the implementation of a quality management system that will define the structure of the organisation, quality activities, resources, responsibility for quality issues, authority to execute particular tasks and the ways in which information, documents and instructions flow. Such a system should be efficient, meet customer requirements, enable control of the entire quality activity and support the achievement of quality objectives (Fraś, 2010).

Service enterprises can use the following quality management systems: standardised management systems described in the PN-EN ISO 9000:2015-10, PN-EN ISO 9001:2015-10, PN-EN ISO 9004:2018 standards, as well as the quality management system authored by Ch.-Ch. Yang. Furthermore, there are many specific standards addressed to individual sectors. Sector-specific quality management systems include the following: the TL 9000 standard in the telecommunications sector, the AS 9100 series of standards in the aviation sector, the IATF 16949 standard (formerly ISO/TS 16949) in the automotive sector and the ISO 13485 standard in the medical sector (Jedynak, 2011).

Quality management systems are related to the model found in the ISO 9000 series of standards, especially ISO 9001, which contains the requirements to be fulfilled by quality management systems and provides the basis for independent assessment and certification (Grudowski, 2016). The PN-EN ISO 9000:2015-10 standard (2016) defines a management system as "a set of interrelated or interacting elements" and a quality management system as "a part of a management system concerning quality". It is useful in the design and implementation of a quality management system as it provides an interpretation of quality management concepts.

Documented fulfilment of the requirements contained in this standard is the basis for obtaining a quality management system certificate. The requirements presented in PN-EN ISO 9001:2015-10 provide for the adoption of a process approach (Fonseca, 2016) in the development, implementation and improvement of the effectiveness of the quality management system (www4; Psomas and Pantouvakis, 2015; Natarajan, 2017). In the process of improving the implemented system, it is recommended to follow the guidelines of the PN-EN ISO 9004:2018 standard (2018). It complements the requirements of ISO 9001 with the eight principles of quality management, financial assessment, self-assessment, continuous improvement process, as well as the necessity to take into account resources such as information, suppliers, partners, natural resources and finances.

An optimal quality management system consistent with ISO 9001 is one that constitutes an integral part of the enterprise bringing benefits manifested (Zivaljevic et al., 2017), among others, in the growing prestige of the enterprise on the local, national and international markets; the systemic management of resources, knowledge and customer service; the initiation of the continuous improvement of processes, as well as the guarantee of the smooth flow of information on planned activities and their performance (www5).

In summary, the application of this system is possible if the entire organisational structure is used and the necessary quality policy processes are implemented (Alper, 2017). Its purpose is to ensure that output (services or products) meets (technical, legal, consumer, internal) requirements and customer satisfaction is achieved (Zapata, 2009; Anttila and Jussila, 2017; Natarajan, 2017).

The large number of management systems makes it possible to integrate them into larger wholes. The majority of sectoral systems are based on quality management systems compliant with the requirements of EN ISO 9001:2015-10.

ISO standards are not the only element supporting the pursuit of quality used by enterprises in their management systems. Ch.-Ch. Yang has developed a model of a quality management system specifically dedicated to service enterprises. It is presented graphically in Figure 3.2.

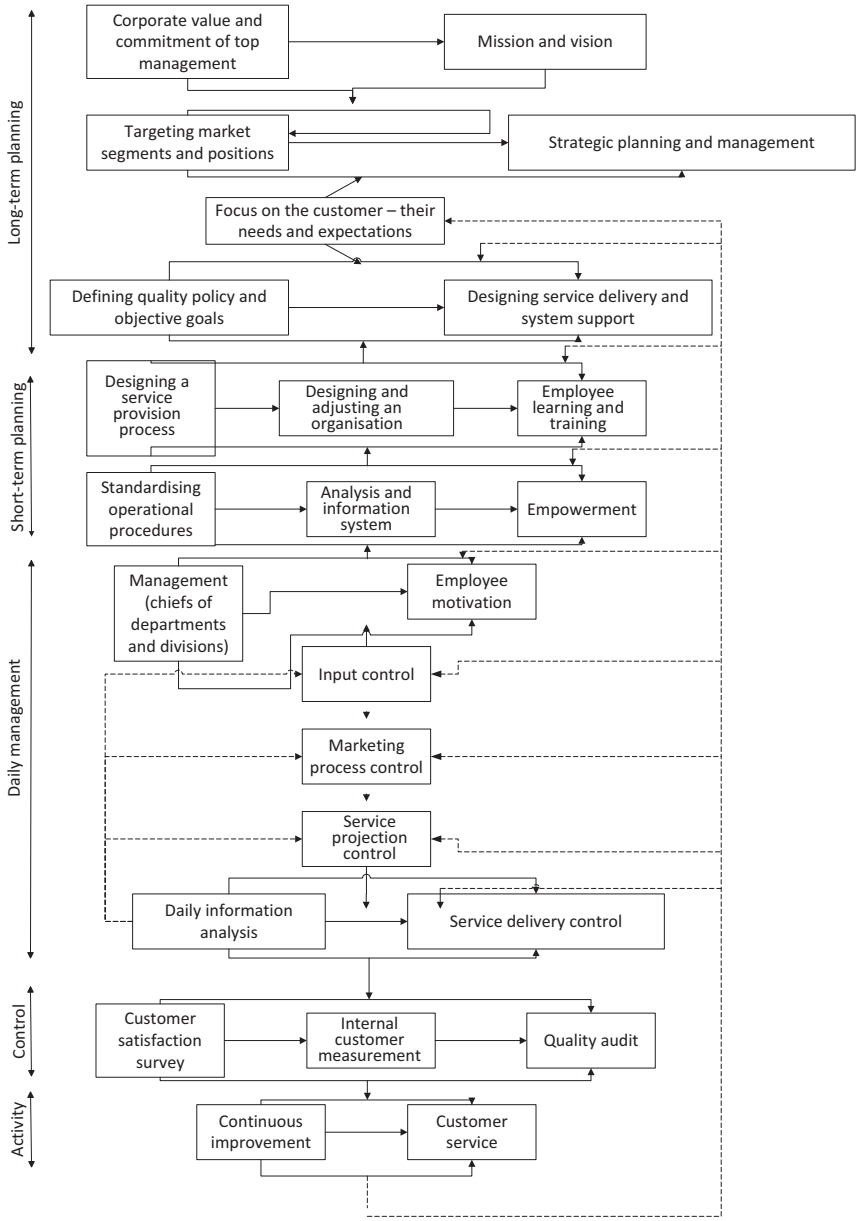

Figure 3.2 Ch.-Ch. Yang's quality management system for service enterprises
Source: Yang, 2006.

In this system, the service delivery process is divided into five stages: long-term planning, short-term planning, everyday management, control and action. Long-term planning includes such elements of the system as corporate values, mission and vision, market segment targeting and positioning, strategic planning and management, focus on customer needs and expectations, as well as quality policy development and service delivery design.

Short-term planning in this system is related to designing, organising and adjusting the service delivery process, employee learning and training, standardisation of operating procedures, an analysis and information system, as well as empowerment.

On the other hand, daily management concerns the management team, employee motivation, input control, marketing process control, service design control, daily information analysis and service delivery control.

Control is focused on customer satisfaction measurement, internal customer measurement and quality audit. The final step – action – comprises continuous improvement and customer service.

Both innovative and comprehensive, the quality management system for service enterprises proposed by Ch.-Ch. Yang (2006) includes the most important management tools. In comparison to management systems based on ISO standards, Ch.-Ch. Yang's model is distinguished by a new approach to service provision as a process taking place in five complex stages. It can be used successfully in all types of service enterprises and adapted to the individual needs of a given organisation. The common element of all presented quality management systems is focus on ensuring customer satisfaction as a result of providing services of the highest quality (Sadkowski, 2017a).

3.3.4 Service quality measuring methods

The challenge faced by service enterprises is the measurement of service quality. There are several methods used to measure it. Among the most popular are the following: SERVQUAL, mystery shopping, the critical incident method and external benchmarking. Customer satisfaction survey, focus group discussion, customer complaint analysis, random inspection, user group meeting, general industry forum, consumer value workshop and rating assessment are other methods of measuring quality (Mukherjee, 2019). They are collected and discussed in Table 3.5.

SERVQUAL (SERVice QUALity) is a popular method for examining the perceived quality of services. It is based on measuring the differences that arise between the level of the customer's satisfaction and how the customer perceives their satisfaction with the delivered service (Parasuraman et al, 2005; McCollin et al., 2011; Czubała et al., 2012). Its authors are V.A. Zeithaml, A. Parasuraman and L.L. Berry (1985), who have also developed a service quality model. They used the SERVQUAL method to examine quality in five different service sectors in the United States: reparation, warranty

Table 3.5 Selected methods for measuring service quality

Method	*Description*
SERVQUAL	It is used to measure service quality. It is based on estimating the difference between the customer's expectations and their perception of the provided service. The size of the difference indicates areas where improvement is needed. The assessment is based on a form with 22 items concerning the customer's expectations and perceptions, grouped into five dimensions of service quality. The rating scale for each item is from 1 to 7 (1 – disagree, 7 – fully agree).
Mystery shopping	A method for measuring mass services and services where direct contact with customers is necessary. Proper selection and excellent preparation of a person acting as a covert observer is necessary. The mystery shopper's observations may focus on various issues related to the process of service delivery and its various stages. The basis of the method is an observation scenario. The method serves to verify the functioning of the service provision system and its compliance with the implemented standards
Critical incident method	It consists in collecting, during an interview with customers, events occurring during service provision that have caused the greatest satisfaction or dissatisfaction. This method allows one to understand the state and dynamics of the experiences of customers receiving services. The collected critical events are valuable indications for service enterprises on what actions to take
External benchmarking	A process of comparing the practices, results, management systems, processes and services of the organisation with those of its direct competitors and industry leaders. It improves performance, increases productivity, optimises costs, raises the awareness of processes and changes employee behaviour
Customer satisfaction survey	A personal interview with or email questionnaire to be completed by customers of the organisation
Focus group discussion	The group must include service users, providers of these and other services, service design experts and representatives, as well as responses from regulators that can help to assess the advantages and disadvantages of a given service
Analysis of customer complaints	An examination of each complaint with respect to staff errors, physical deficiencies, defects in the materials used to deliver the service, as well as defects occurring in the delivery process
Random checks	Internal actions taken to detect and remove deviations
User group meeting	Direct feedback from customers on how they perceive the quality of a service and their suggestions for improvement
General industry forum	It can serve as an extension of benchmarking
Consumer value workshop	A short questionnaire to be completed by customers to identify their level of irritation (disappointment, annoyance, anger). This helps to identify deficiencies in the quality of a service
Rating	An assessment of service provision processes based on internal standards as well as conducted tests, checks and simulations

Source: The authors' own work.

and post-warranty services, banking, telecommunications, credit cards and brokerage firms (Lotko, 2018).

A SERVQUAL test is carried out in the form of a questionnaire prepared, depending on requirements, for internal or external customers of the enterprise. It consists of three stages – a survey of customer expectations, evaluation of service perception and determination of the importance of individual criteria. To assess expectations and service perception, SERVQUAL (Dotchin and Oakland, 1994; Samen et al., 2012) uses five predefined criteria that are also indicators reported as survey results. It is possible to carry out this measurement on a one-off or periodic basis – it all depends on the needs of a particular company. A periodic analysis can be used to determine whether the quality of service delivery has changed in the opinion of customers, especially if measures have been implemented between surveys to improve elements of the delivery process that have previously been rated negatively by those completing the questionnaire. An additional advantage arising from the systematic assessment of the perception of service quality is the ability to detect how customers' expectations of service quality change over time (Gupta et al., 2005; Lai et al., 2007).

SERVQUAL can be used successfully in both service and manufacturing companies that seek to improve the quality of their services or products and increase customer satisfaction.

The mystery shopping method is used to measure service quality with feedback. Pretending to be a customer, the auditor conducts an observation in which they follow a prepared research scheme and evaluate various aspects of the service under investigation (Wilson, 1998; Beck and Miao, 2003; Urban, 2018). This observation is hidden (the employee has to be convinced that a real customer is being served), controlled (conducted on the basis of a prepared scenario) and standardised (the observer focuses on specific aspects of the service) (Meder, 2005; Kowalik and Mazur, 2016). The basic types of mystery shopping include direct personal audit (a real visit of the auditor to the facility), direct business audit (a measurement carried out by an institutional customer), expert audit (carried out by a team of experts), telephone audit (aimed at assessing the work of the hotline), email and online audit (assessing the quality of electronic contact) and video audit (Kowalik and Mazur, 2016; www6). This method can bring many benefits to the service management process. The data collected from an audit are used to compare the course of service delivery and staff behaviour; they also allow managers to identify these areas of the service process that require improvement. The results of the application of this method can be used as one of the variables in determining staff bonuses (Urban, 2018).

Measuring service quality is also possible by using the critical incident method. It consists in collecting detailed descriptions of certain events from customers using services. These are events that cause a strong feeling of satisfaction or dissatisfaction. It is these types of incidents that determine customers' decisions on subsequent purchases of services (Urban, 2018).

Benchmarking is a method that consists in comparing the results, management systems, processes, services of a given organisation with those of its direct competitors and leaders in the industry under analysis. A thorough analysis of the processes executed in the enterprises that are leaders in their respective markets helps to discover those areas of the organisation that require improvement (Opolski et al., 2009).

To assess quality, enterprises should also use other measures, such as the number of complaints, customer loyalty, the duration of service delivery, as well as various economic indexes and ratios (e.g. revenues, costs, profits), which are in strong correlation with the quality of provided services.

A low number of complaints is indicative of services done right the first time. Customers' loyalty and attachment to the organisation are a confirmation of the quality of the services it provides (Rizka and Widji, 2013; Mirzapur et al., 2014).

Surveys and interviews conducted with users are a valuable source of information about the quality of services. Based on them, the service provider determines the degree of customers' satisfaction resulting from the services provided to them. In evaluating the results of such surveys, it is important to see each user and their responses in relation to their belonging to a particular category of users, personal experiences, as well as the cost of the service.

Methods for measuring service quality are characterised by a planned and iterative approach to quality management tasks. Several of them provide quantitative measures of quality. Each helps to identify and eliminate errors (deviations) emerging in processes, provided services and used solutions, as well as to initiate improvement actions. These methods are medium-term in nature and in most cases require teamwork.

3.3.5 Tools for service quality management

The ongoing decision-making, collection and processing of data related to service quality are possible with the help of quality management tools, which the authors have collected and compiled in Table 3.6.

The tools presented above are characterised by simplicity and short duration. They are used in a specific operational area and allow the acquisition of data of a quantitative and qualitative nature. They support managers and other employees in identifying relationships among elements of the management system, describing these relationships and estimating the probability of their occurrence. On the basis of quality management tools, it is possible to make strategic and operational decisions (Dudek and Byzdra, 2013).

The standard "PN-ISO 10014:2008 Quality management – Guidelines for achieving financial and economic benefits" presents methods and tools for quality management in the following management areas: finances, human resources, quality and production (Szczepańska, 2017). For the quality management area, these include audits, nonconformance monitoring, corrective measures, block diagrams and process mapping, management reviews, Plan-Do-Check-Act (PDCA), preventive measures, self-assessment,

Table 3.6 An overview of quality management tools

Function	*Tool*	*Description*
Data collection	Surveys	Used to obtain information. Assessment of phenomena based on a survey sample (e.g. a customer satisfaction survey on provided services). Survey results are subject to analysis
	Control sheet	It is used to collect data from measurements and observations. It supports their arrangement, as well as analysis of information about a product or process
	Shewhart control chart	It is used for statistical process control. It gives the possibility of assessing the stability of a process and the necessity of its adjustment
	Histogram	A bar or column diagram used for data visualisation. It enables analysis of the results of processes to improve them
Data analysis	Ishikawa diagram	By means of a "fishbone" pattern, it graphically depicts the relationship between factors exerting impact on a process and the effects of such impact. It supports problem solving
	Pareto-Lorenz diagram	It is used to group data and present their contribution to the total result. It shows the most important factors (e.g. the most frequent causes of complaints)
	Variable correlation graph	It enables the detection of relations between two sets of analysed data
	Block diagram	It graphically presents the activities that follow one another in a process. It shows the flow of information, materials and responsibilities
Problem analysis	ABC analysis	A tool for identifying and examining the main causes of specific effects in an enterprise
	"5xWhy?" analysis	A simple tool used to identify the root causes of problems
	"5W2H?" analysis	A tool used for an initial analysis and description of a problem. It allows the identification of who discovered the problem, what the problem is, when, where and how it was discovered and how much its occurrence cost
	Affinity diagram	It is used to organise and thematically segregate the causes of a problem under analysis
	Relationship diagram	It shows interrelationships within a set of factors that affect the issue under analysis. It is used when all causes seem plausible and it is not clear which one to start with first in order to reduce or eliminate a problem
Deciding on actions	Decision tree	A tool supporting decision-making. It is used when risks are present. It presents a decision-making problem and its possible solutions from which it is necessary to choose one
	Matrix diagram	It establishes relationships among the characteristic features of different analysed objects
	Matrix data analysis	It systematises the priorities determined in a matrix data diagram
Sequence of activities – resource planning	PDPC – Process Decision Programme Chart	It is used to analyse the degree of importance of individual tasks and priorities for their execution
	Arrow diagram	It allows one to plan in a graphic way the course of individual tasks in an implementation process

Source: The authors' own work on the basis: Stadnicka, 2019; Wiśniewska and Grudowski, 2014.

suggestion programme, supplier performance evaluation, ranking list and basic supply management. In financial management, the methods and tools comprise activity-based costing, activity-based management (ABM), cost avoidance, cost–benefit analysis, economic value added (EVA), life cycle costing (LCC), open-book management (OBM), payback period (PP) analysis, costs of prevention, evaluation and damage, as well as return on investment (ROI) analysis and risk analysis (PN-ISO 10014:2008, 2008).

The quality of performed services has an impact on the financial results of organisations. Entities that want to be successful on the market must take into account customer requirements, including those concerning quality. It is necessary to base quality intentions concerning services on economic balance (Zapata, 2009).

In conclusion, quality management in service enterprises is a particularly important element because only the provision of services guaranteeing a high level of customer satisfaction and loyalty will allow the organisation to maintain a strong competitive position.

The implementation of a quality management system promotes effective business management. The most important quality management systems include standardised systems described in ISO standards as well as the quality management system developed by Ch.-Ch. Yang. An attractive solution for service enterprises, it presents a service as a complex process consisting of five stages that link the activities necessary to deliver services of the highest quality. The effectiveness of this system depends on the efficiency of the activities carried out at each stage (Sadkowski, 2017).

In order to ensure full customer satisfaction, and thus the provision of top-quality services, it is necessary to properly identify the places where quality costs arise in order to optimise them.

3.4 The determinants of a quality cost structure in service enterprises

The issues concerning the factors determining costs incurred by business enterprises have been widely described in the literature on the subject (Dyhdalewicz, 2014). However, there are no indications concerning the factors affecting quality costs arising in service companies. The authors attempt to specify these determinants and divide them into internal factors (occurring within an organisation that affects its activity) and external factors (arising outside an organisation, constituting its environment). The internal factors are arranged in the following groups: structural, organisational and economic, resource-related and innovative. The structural factors resulting from the specificity of service activity include the type of provided services and their complexity, as well as the duration of their performance. Furthermore, an important factor in this group is also the scope of activities, which may change in the course of service provision. Among the organisational and economic determinants, it is possible to distinguish the range of the conducted activity, the location of the enterprise,

the adopted procedures of operation, the efficiency and effectiveness of executed processes, the applicable quality policy, the reliability of suppliers, the adopted marketing strategy, as well as the systems of information processing and transfer. Resources comprise human resources (their qualifications and commitment, quality awareness of the employees, as well as experience in the delivery of the offered services), material resources (their reliability and technological advancement) and financial resources (their availability and amount). The allocation and efficiency of the use of available resources (fixed assets, know-how, technologies, inventories, financial and human resources) are also important elements in this group of factors. On the other hand, the authors classify the scale of expenditures on research and development, the level of innovativeness and access to state-of-the-art solutions making it possible to provide a given service as determinants of innovation. The external factors affecting the structure of quality costs can be divided into: social- and market-related, legal and random. The social- and market-related determinants are the following: customers' preferences, current fashion and trends, subjective perception and evaluation of services by customers, the image of the company in the eyes of its customers and competitors, trends in complaints, as well as competitors operating on the service market. Among the legal factors, the authors enumerate Polish legal acts protecting consumers (e.g. the Consumer Rights Act, the Civil Code, the Banking Law), as well as accounting regulations (the Accounting Act). The group of random determinants includes extraordinary events that are related to the risk of conducting business activity and are difficult to predict (caused by natural factors, for example fire, flood, hurricane, gas explosion, as well as incidents and interruptions in the supply of energy, water and materials). The factors determining the structure of quality costs are summarised in Table 3.7.

The structure of quality costs is influenced by the type of services provided by the organisation. Each enterprise offers a variety of services of different levels of complexity, which manifests itself in the range of provided services as well as processes, techniques and activities used in their performance. Increasing the number of delivered services broadens the service provider's offer for customers, but also creates new processes and activities necessary to provide additional services. Service organisations can provide very simple services (for example a barber offers a haircut) as well as highly complex ones (for example a travel agency offers a package of services, where, for one price, the customer receives a flight/travel to a selected destination, accommodation, food, courier care, possibility of buying additional optional excursions or other attractions and a flight back). Increasing the diversity of a service offer intensifies the problem of controlling processes and activities, and also increases costs, including those related to quality. A service delivery lead time is also an important factor in the structure of quality costs. Its unplanned extension may cause delays, errors, downtime and dissatisfaction of customers, or even their complaints or resignations. Such a lead time is related to a range of activities, which may change during the course of service performance (for example the necessity to perform an additional repair

Table 3.7 The determinants of a quality cost structure in service enterprises

Internal factors			
Structural factors resulting from the specificity of services	*Organisational and economic*	*Resource-related*	*Innovative*
Type of provided services Complexity of provided services Duration of service delivery Flexible scope of activities	Range of conducted activities Location Operating procedures Effectiveness and efficiency of processes Quality policy Reliability of supplies Marketing strategy Information processing and transfer systems	Human resources Employee competencies Employee awareness of quality issues Experience in delivery of offered services	Scale of expenditures on research and development Access to state-of-the-art solutions for providing a given service Level of innovativeness of the company

External factors		
Social and market-related	*Legal*	*Random*
Customer preferences Prevailing fashion and trends Subjectivity of customers' perception and evaluation of services The company's image as perceived by customers Trends in complaints and claims competition The company's image as perceived by competitors	Consumer Rights Act Act on providing information about prices of goods and services Act on providing services by electronic means Act on tourist services Act on competition and consumer protection Act on accounting Civil Code Banking law Construction law Energy law	Random events caused by natural factors Accidents at the workplace, on the way to the customer, on the customer's premises Interruptions in supply of energy, water and materials

Source: The authors' own work.

resulting from an employee's error or a change in the customer's preferences with respect to the scope of the provided service).

The enterprise's choice of an appropriate location is crucial from the perspective of proper service delivery. Difficult access to the premises for customers, the premises in an unattractive location and interruptions in the supply of utilities will result in the perception of a given service from the angle of the resulting inconveniences. Consideration should also be given to

the size of the business and the volume of sales of the offered services, which may also result in changes to the quality cost structure. The adopted operating procedures and efficient implementation of processes should contribute to the provision of services of the highest quality. Failure to meet the conditions described in the procedures and ineffective actions will result in errors and irregularities. Therefore, another important thing is the supervision and measurement of processes in the organisation.

Its quality policy manifesting itself, for example, in the use of quality cost accounting, the preparation of reports and analyses on quality costs, allows managers to determine the actual structure of quality costs, identify the places of their occurrence and influence the implementation of required structural changes. On the other hand, the degree of connections with suppliers and customers can be used to establish or develop cooperation in the area of the implemented processes, which will have a positive impact on the quality of the provided services and the level of quality costs. It is similar in the case of information processing and transferring systems, whose efficient and effective functioning will ensure the organisation's access to key data about processes, activities and customers and will improve its cost position. Marketing activities undertaken by the organisation will help to attract new customers and maintain the interest of existing ones, as well as improve the image of the company in the face of a serious crisis with customers.

In the service sector, a very important role is played by employees, who – in the case of services requiring direct contact with the customer – should meet the requirements and standards set by the employer. Personnel with low qualifications, a lack of commitment to their work and a lack of awareness of the importance of quality will result in poor customer service, poor quality of services, which, in turn, will translate into costs associated with complaints or claims and the need to provide the service again. Similar effects will be brought about by inexperience in the delivery of the service by the organisation. Therefore, it is so important to undertake training activities as well as business and management improvement processes. The effect of experience allows organisations to achieve a strategic advantage in the market by predicting the level of costs and their effective reduction, as well as to forecast the amount of necessary resources. The possession of reliable tangible resources will ensure the provision of services to customers at an appropriate level. Malfunctioning and defective equipment will cause the occurrence of failure costs. The availability and amount of financial resources affect the level of development of the company and its ability to provide services. The lack of sufficient financial resources may result in a decrease in the quality of provided services and negative perceptions on the part of customers who, if unsatisfied, may file complaints and grievances. The allocation and efficiency of the use of available resources are another factor determining the quality cost structure in service enterprises. The provision of a service is not possible without the use of necessary resources. The efficient use of resources allows the enterprise to minimise the share of quality costs in its cost structure, whereas their bad allocation will cause an increase in these costs.

A decision on the scale of investment in research and development will result in changes in the quality cost structure. Continuous development and improvement of the service provision process will positively influence its quality, which will be reflected in lower error costs.

The external factors determining the structure of quality costs include customers' preferences, current fashion and trends, the subjectivity of the perception and evaluation of services by service recipients, trends in the submission of complaints and claims, i.e. the reasons directly related to the recipient of the service. The service enterprise has no influence on consumer' preferences and their assessment of service quality. A negative perception of the received service results in complaints, grievances and claims, which translates into failure costs. The structure of quality costs is also influenced by actions taken by competitors and their perception of the organisation under analysis. Legal regulations constitute a very important group of external determinants. Among such regulations, the authors distinguish Polish legal acts providing for the protection of consumers in the form of the consumer's right to withdraw from a purchase contract, the right to file a complaint under a general warranty or statutory warrant or the competent authorities' power to impose fines on enterprises involved in unfair competition. The most important legal acts include the following: the Act on consumer rights, the Act on providing information about prices of goods and services, the Act on competition and consumer protection, the Act on tourist services, the Civil Code, the Banking Law, the Construction Law, the Energy Law, as well as the Act on accounting, which regulates issues related to cost recognition and recording. The source of quality costs may also be random factors, such as extraordinary events caused by natural factors, accidents and interruptions in the supply of energy, water and materials to the enterprise.

The internal and external factors presented above have been used by the authors to prepare a scheme of the relationships occurring in the service enterprise that contribute to the emergence of quality costs within the scope of its processes. Its graphical representation is shown in Figure 3.3.

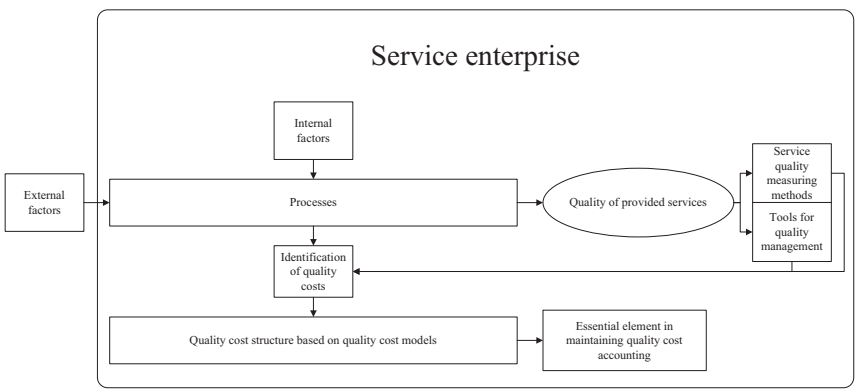

Figure 3.3 A scheme of the occurrence of quality costs in service enterprises
Source: The authors' own work.

The determinants shaping the quality cost structure of a service organisation have an impact on the processes that take place in it. Providing a service is a process consisting of properly selected subprocesses and activities. Each process in a service enterprise requires the identification of its owner and the person responsible for its course. It is also necessary to know the requirements and needs of external and internal customers, as well as to define the product and the process inputs and outputs. At each stage of process execution, errors and deviations may occur, which will affect the quality of the service provided to the consumer. Enterprises should carry out preventive and monitoring activities aimed at detecting and removing irregularities at an early stage of their occurrence. Thus, it can be concluded that all processes in a service organisation generate costs. Those concerning quality are particularly important from the point of view of the efficiency of management systems. Therefore, the determinants of the quality cost structure in services are the processes occurring in them (Sadkowski, 2017b).

The quality of a service is influenced by not only selected groups of features or factors, but also the entire course of the service delivery process (Bugdol, 2008). Service quality is measured using appropriate methods, and data collection and processing is possible through the use of quality management tools. The identification of deviations occurring in service processes allows one to indicate places where costs arise. The use of the process approach facilitates the perception of a service enterprise and the determination of its structure on the basis of a set of processes that have different scopes and levels of importance. It is also possible to deconstruct them, which facilitates accurate analysis and measurement of the effects of process execution.

The use of proven tools is a condition for the proper identification of processes, quality costs in places where they arise and the assessment of efficiency. Moreover, it gives the possibility to eliminate ineffective activities more efficiently (Downar, 2008a).

The processes taking place in service activity determine the structure of quality costs (Figure 3.4), which depends on the following (Downar, 2008b):

- the process structure (which consists of resources, activities, tasks and events remaining in mutual relationships),
- the degree of process detail (multi-level process hierarchies – outsourcing, a low degree of detail – e.g. a hairdressing service),
- the correctness of process definition (establishing an appropriate sequence of activities and determining what constitutes added value at each stage of the process),
- the identification of activities and determination of their degree of importance (focus on activities that significantly influence the final effect of the process),
- the competencies and qualifications of employees being a part of the individual stages of the process (for example an employee of a tax office will serve a customer better if they know applicable procedures and legal regulations),

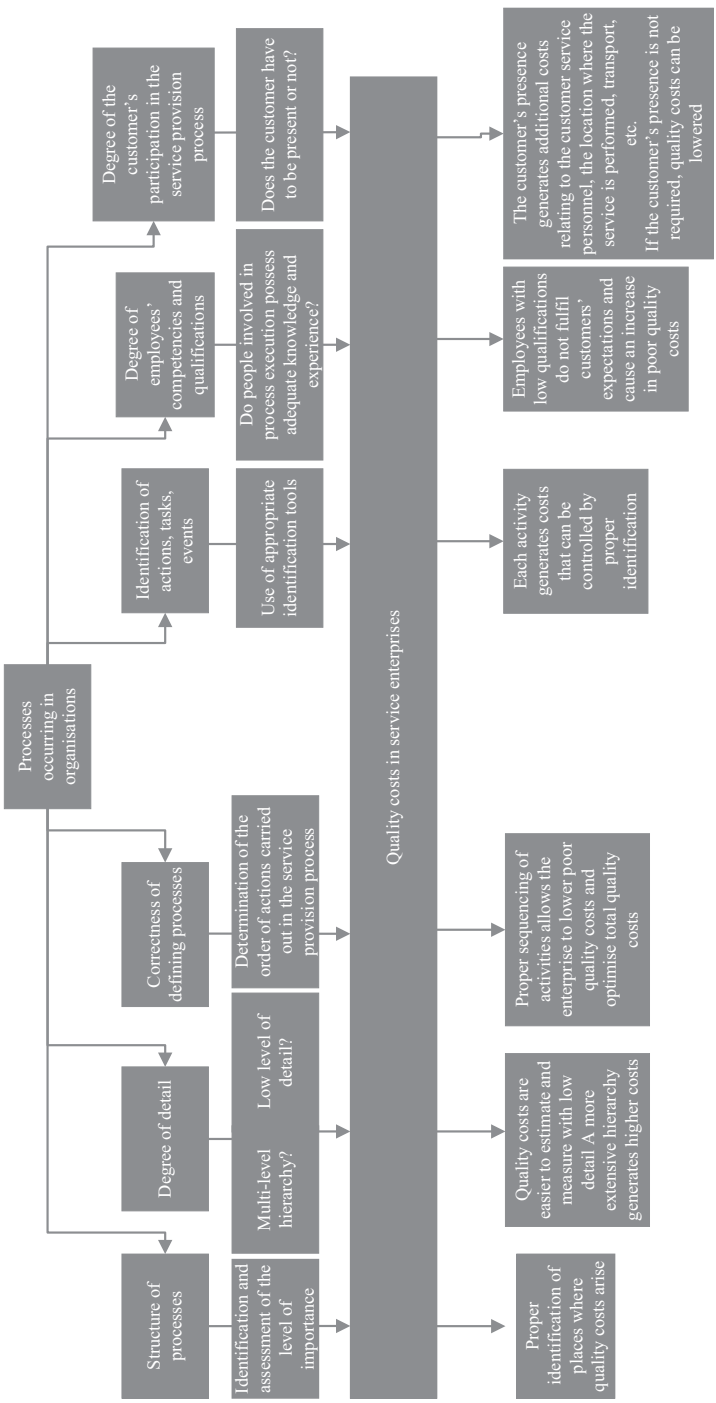

Figure 3.4 The processes that determine quality costs in service enterprises
Source: Sadkowski, 2017b.

- the degree of customer participation in the process of service provision (whether the physical presence of the customer in the place of service provision is required: for example a hotel, hospital, passenger transport – the need to maintain personnel, equipment, means of transport in a specific place and time; the presence of the customer is not required: for example laundry, car repair, waste disposal; services dependent on the collection, processing, analysis and transfer of information – financial, banking and legal services).

Service organisations have a strictly defined structure of processes that differ in the degree of detail and the scope of activities undertaken in their execution. The differentiation of processes in these enterprises results from the profiles of their activities. Since organisations may provide several types of services, an individualised approach to each process is necessary. Appropriate process identification makes it possible to identify quality costs occurring in them. An equally important factor influencing the size of these costs is the level of qualifications of the personnel, which also determines the consumer's perception of received services. The customer themselves and their presence as a participant in the process also determine the cost structure (Sadkowski, 2017b).

Identifying, controlling and analysing quality costs related to service provision in many cases is limited only to the monitoring of the costs of quality assessment and the classification of internal failures. It is necessary to conduct a comprehensive analysis of the costs incurred in the areas of process planning, organisation and supervision, as well as in the spheres of sales and supply (Ciechan-Kujawa, 2005).

Providing a service to the customer does not end the stage of incurring costs by the producer and the recipient. A poorly performed service may result in the loss of the customer's trust in the company. What arises in such circumstances is the costs of external nonconformance comprising such activities as the employment of persons in the complaints and claims department, the handling of claims and grievances or the performance of additional unplanned services. Information about the size of these costs allows the enterprise to determine the level and ratios of the quality of the offered services, as well as to determine the total quality costs incurred in the product life cycle (Ciechan-Kujawa, 2005).

Quality costs incurred by service organisations constitute synthetic information for the management about the degree of optimisation of activities and processes in the implemented quality management system (Lisiecka, 2013). They must also be a measure of the efficiency of activities in the process of generating added value at each of its stages (Zymonik, 2003).

Influencing the quality of the service at the stage of planning, preparation and organisation is much more economically efficient than at the stage of its performance or the customer's possible complaints after its performance. By incurring costs at the service design stage, and not at the moment of service provision or the subsequent stages, the enterprise can achieve the intended

level of quality at a much lower expense. The best results can be achieved when the enterprise takes into account the quality of the service already at the stage of identifying consumer needs. A thorough research in this phase is necessary to ensure high quality, the improvement of which is an important competitive requirement (Ciechan-Kujawa, 2005).

Service quality experts focus on reducing the costs of providing poor quality services. Such costs include expenditures on the provision of services and also the loss of customers (Lotko, 2018).

An important factor affecting the quality of services and the amount of quality costs is the image of the service provider. A positive one allows the company to make occasional mistakes, while a negative one contributes to the growth of low-quality costs.

Quality costs are the basis for creating ratios and indexes that diagnose weaknesses in an organisation, which can be found in different processes and departments. The quality of work and processes is strongly correlated with the economic result of the business entity, i.e. profitability and profit (Lisiecka, 2013).

Quality cost management should focus on minimising the level of such costs, optimising their structure, pursue an increase in the costs of good quality, a decrease in the costs of bad quality and a possibly minimal level of total quality costs. Such an approach results in a lower share of quality costs in the total cost of production, a reduction in the ratio of quality costs to sales revenues and a decrease in the ratio of quality costs to profit (Ciechan-Kujawa, 2005).

The complexity of provided services and the high degree of process differentiation cause the necessity to use such cost calculation systems that will function as important organisational management tools, as opposed to being an element of an accounting system used by the finance and accounting department (Zymonik, 2003).

To sum up, the costs of quality in service enterprises arise in the processes executed by these entities. The most important task is the proper identification of the place of their emergence. A skilful estimate of quality costs constitutes the basis for quality management in service organisations. The number, structure and degree of detail of processes in the enterprise providing services are determined by the profile of its activity (Sadkowski, 2017b). A very large number of all possible services on the market results in a significant diversity of processes and the necessity to adopt an individual approach to each process executed in the enterprise, because each process generates quality costs.

In order to establish a correct cost structure, it is necessary to analyse costs in the areas of not only process planning, organisation and supervision, but also service provision and subsequent phases.

Undertaking measures aimed at quality cost optimisation may turn out to be a decisive step leading to the economic growth of service enterprises (Chopra and Singh, 2015).

The essence of the service production process is customer satisfaction. However, many concepts are emerging that recommend paying more attention to the employee and their involvement in service delivery.

The economic reality of the 21st century requires companies to develop new concepts of management that would be particularly applicable to service enterprises, which are less than production organisations resistant to the contemporary phenomena in the world economy, such as globalisation. The common denominator of the new ideas is the customer and their needs. Furthermore, many organisations have to face the challenges of global cooperation in development, procurement, production and sales in order to resist increasing competitive pressures (Weckenmann et al., 2015).

In conclusion, the use of a process approach has become an essential means to ensure consumer satisfaction in the service sector. Process management requires the full involvement of all employees in the company. The overriding objective at each stage of process execution is to guarantee a service of the highest possible quality for the customer. Its fulfilment is only possible with the application of quality management.

The history of quality management shows a continuous development towards something greater than just a comprehensive and smooth achievement of quality for all provided products or services. The scale of quality issues is constantly expanding and it becomes necessary to look at the organisation as a comprehensive system to be managed and improved accordingly (Weckenmann et al., 2015).

A properly functioning quality management system allows resources to be used more efficiently and contributes to greater employee commitment, which increases customer satisfaction and decreases costs.

Ensuring full customer satisfaction, and thus, providing services of the highest quality is only possible when the company identifies the places where quality costs arise, calculates them at all stages of the service delivery process and uses quality costing as a basis for making economic decisions and more effective management.

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4 A quality cost accounting model dedicated to service enterprises

4.1 Assumptions adopted in the development of the model

The achievement of the established project objectives and the verification of the formulated research theses required the design of a quality cost accounting model addressed to service enterprises. In the approach adopted by the authors, such a model includes principles and rules, as well as resultant procedures that are used to process information on quality costs. The model of quality cost accounting consists of the following elements: a quality cost structure, a chart of accounts, a scheme of the accounting procedure, sources of information on quality costs, as well as quality cost analyses and reports.

Before commencing the empirical research, the authors made the following assumptions for the construction of the model: quality costs comprise all costs of actions performed in order to ensure an appropriate level of the quality of the offered services and the costs of measures taken in the case of not achieving the desired level of service quality (Nowak, 2014). Such costs should be recognised, measured, grouped, regularly recorded, analysed, interpreted and budgeted. The authors' original model of quality cost accounting is inspired by the models of quality costing proposed by M. Ciechan-Kujawa, K. Lisiecka, A. Kister, U. Sulowska-Banaś and T.M. Malik, R. Khalid, A. Zulqarnain and S.A. Iqbal, as well as the structural model of quality costs proposed by J. Bank and the process model. Each of these models has important elements (quality cost structure, quality cost accounting procedure, quality cost analysis, quality cost reports, analysis tools) that form the basis of quality cost accounting and should be properly applied in the preparation of the procedure for service enterprises. The authors are also inspired by the clear and easy-to-follow chart of accounts proposed by K. Trzpioła, apply the recommendations and guidelines of the accounting experts C. Warren, J.M. Reeve and J.E. Duchac concerning quality cost reporting and identify individual processes by means of the universal Process Classification Model. The elements used in the construction of the model are presented in Table 4.1.

Quality cost accounting should be conducted systematically on the basis of the cost accounting system existing in the enterprise. The quality

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Table 4.1 The sources used in the development of the authors' original model of quality cost accounting

Source	*Elements of the model*									
	Quality cost structure	*Chart of accounts*	*Recording of costs*	*Sources of information on quality costs*	*Quality cost accounting procedure*	*Division and identification of processes*	*Quality cost analysis*	*Quality cost reports*	*Pareto-Lorenz diagram used for data analysis*	*Ishikawa diagram used for identifying problem areas*
J. Bank's quality cost model	✓									
Process model of quality costs	✓									
K. Trzpioła		✓								
PN-ISO 9004-1	✓			✓						
Accounting Act		✓	✓							
M. Ciechan-Kujawa's QCA model				✓	✓		✓	✓	✓	
K. Lisiecka's QCA model					✓		✓	✓	✓	
A. Kister's QCA model				✓	✓		✓	✓	✓	

U. Sulowska-Banaś's QCA model	✓	✓		✓	✓	✓	
QCA model proposed by T.M. Malik, R. Khalid, A. Zulqarnain and S.A. Iqbal		✓		✓	✓	✓	✓
Process Classification Model			✓				
C. Warren, J.M. Reeve, J.E. Duchac				✓	✓	✓	

Source: The authors' own work.

cost system should be integrated with the accounting department. Most quality costs are hidden and invisible; therefore it is necessary to introduce new information carriers, documents and subaccounts in the accounting system. The source of information about their existence is the cost recording system and non-accounting materials. It is necessary to mark source documents as quality costs (QC) for recording purposes. The recording of quality costs should be conducted on a continuous basis (a constant and uniform cost recording method), which allows their comparison over time. These costs should be recorded in set 4 on the additionally created control account "quality costs" (account 406) within the applicable chart of accounts: depreciation (account 400), material and energy consumption (account 401), external services (account 402), taxes and charges (account 403), payroll (account 404), social insurance and other benefits (account 405), other costs by type (account 409) (Trzpioła, 2017). Appropriate level I analytics should be established for account 406: account 406-1 – costs of prevention, account 406-2 – costs of appraisal, account 406-3 – costs of internal failures, account 406-4 – costs of external failures and account 406-5 – other quality costs. The recording of quality costs in set 5 obliges the enterprise to create level I control accounts for the costs of core activity (account 510-x), departmental costs (account 520-x), auxiliary activity costs (account 530-x), sales costs (account 540-x) and overheads (account 550-x) (Trzpioła, 2017). Quality costs should be divided into conformance costs (prevention costs – account 5..-x-1 and appraisal costs – account 5..-x-2), nonconformance costs (internal failure costs – account 5..-x-3 and external failure costs – account 5..-x-4) (PN-ISO 9004-1, 1996) and other quality costs (account 5..-x-5). The detail of the division of quality costs results from the profile of the enterprise's activity, the type of services it provides and the processes occurring in it.

In the model proposed by the authors, processes are divided into core (operational), auxiliary and managerial (strategic) (Ossowski, 2012). It is also necessary to identify all activities, actions and processes taking place in the organisation, in other words to conduct a comprehensive analysis of the process value chain. Success in quality cost accounting depends on cooperation and good communication between the accounting department and the quality department.

4.2 The proposed structure of quality costs in service enterprises

Service companies have to deal with considerable difficulties related to the proper identification of quality costs and places where they arise. The structure of quality costs is determined by the processes taking place in individual entities. The complexity of processes occurring in a given enterprise depends on its size and the type of services it provides. Each process consists of events, actions and tasks that are performed by responsible employees, and the final

effect is the service provided to the customer. The quality cost structure proposed by the authors is based on a combination of the best practices used in two models: John Bank's structural model (1992) and the process model. The Process Classification Model can also be used as the foundation for building a quality cost structure based on the processes taking place in the enterprise and their division into core, auxiliary and managerial (Ossowski, 2012).

The adopted model development principles must be fulfilled; otherwise the structure of quality costs and their volume will be impossible to identify and estimate correctly. A scheme of the occurrence of quality costs in service companies is presented in Figure 4.1.

The processes taking place in the service enterprise begin with an input signal received from the customer who is interested in the service offered by the entity. The consumer has their own needs that can be satisfied by providing them with the selected service. Contact between the service recipient and the service provider initiates a series of activities, actions, tasks, events, i.e. an economic process whose final effect is the creation of value for the customer. Each process consists of a number of subprocesses. The most important groups of basic subprocesses comprise activities related to planning and design, procurement, service delivery, as well as sales and distribution (Sadkowski, 2017).

Each subprocess generates quality costs that are first divided into the costs of conformance, nonconformance and other quality costs. Conformance costs are further divided into the costs of prevention and appraisal, while nonconformance costs comprise the costs of internal failures and external failures. The key issue for the quality department is the appropriate identification of the places where quality costs arise, which later allows it to post them in the appropriate control and subsidiary accounts of costs divided by type or function (Sadkowski, 2017).

Quality costs are recorded in the accounts of set 4 (costs by type) and/or set 5 (costs by function). What this requires is the proper identification of core, auxiliary and managerial processes consisting of many subprocesses.

Enterprises keep records of costs, dividing them with respect to their types or types of conducted activities. The posting of costs in the accounts of set 4 allows the enterprise to collect all its costs arising in connection with the processes of procurement, production, sale of products or services and management. Using the accounts of set 4 is required for reporting purposes because costs divided by type are included in the comparative variant of the profit and loss account, notes and additional information, as well as the statistical report (Nowak, 2016).

Keeping the accounts of set 5 is recommended when the size and/or type of business requires the determination of the amount of costs and their structure with respect to the types of conducted business activity. The grouping of costs in this set of accounts and their accounting should take place in the entity that calculates product costs and is a party to long-term contracts with more than one customer (Trzpioła, 2017).

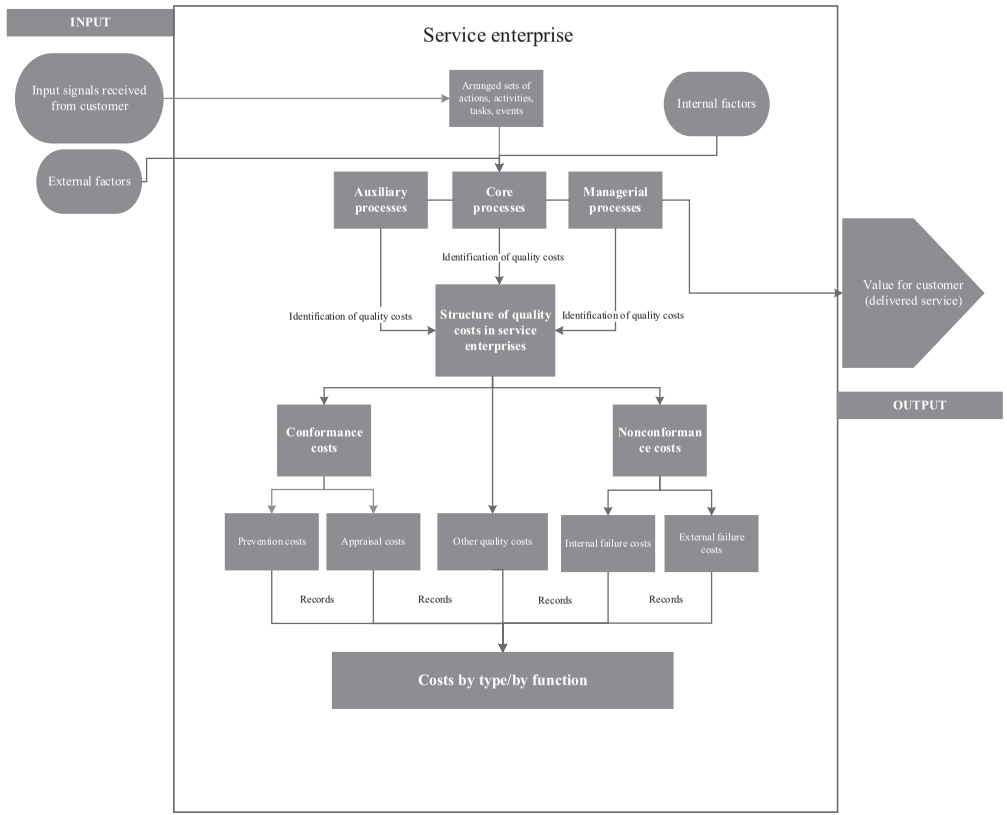

Figure 4.1 A scheme of the occurrence of quality costs in service enterprises
Source: The authors' own work.

The recording of costs in set 5 facilitates access to detailed information on the costs of manufacturing a product or providing a service and allows the enterprise to calculate its financial result with greater precision (Pałka, 2019).

The quality cost structure for service enterprises proposed by the authors is divided into four phases: planning, procurement, service delivery and sales (Tables 4.2–4.5).

Table 4.2 The quality cost structure for service enterprises – the planning phase

Quality costs	*Value*
Prevention costs	
Ensuring efficient organisation of the employees/team/department responsible for quality	
Training employees responsible for quality assurance	
Examining consumer preferences (on the whole market)	
Designing and developing the service delivery process as well as the planning, monitoring and supervising system	
Implementation costs connected with obtaining quality certificates (costs of consultations, preliminary audits, implementation and licences)	
Other	
Appraisal costs	
Consultations regarding the course of audits, internal expert opinions and quality audits	
Costs of maintaining quality certificates (annual fees and costs of annual audits)	
Costs of purchasing and maintaining equipment for measurement, inspection and testing	
Other	
Internal failure costs	
Repair of measuring and control equipment	
Other (e.g. repair of errors identified in process projection, use of external support)	
External failure costs	
Other (e.g. repair of errors resulting from inappropriate activities of an external consultant, additional costs of supervising the planning and design process)	
Other quality costs	
Total	

Source: The authors' own work.

Table 4.3 The quality cost structure for service enterprises – the procurement phase

Quality costs	*Value*
Prevention costs	
Ensuring efficient organisation of the employees/team/department responsible for procurement (e.g. recruitment process for those responsible for procurement)	
Training employees responsible for procurement	
Supplier analysis and selection	
Costs of supplier market monitoring, market assessments	
Other	
Appraisal costs	
Checks and inspections of deliveries	
Measurement and evaluation of critical parameters of the procurement process (suppliers, quality of supplies and monitoring system)	
Other	
Internal failure costs	
Additional deliveries to eliminate shortages	
Repair or replacement of supplies due to their insufficient quality	
Other (e.g. use of external consultants to rectify errors arising in the supplies quality monitoring systems, additional checks after correcting errors)	
External failure costs	
Repair costs of delivered services (additional supplies resulting from inadequate quality of provided services)	
Additional tests and checks following the correction of errors	
Unplanned downtime and time required for repair	
Other	
Other quality costs	
Total	

Source: The authors' own work.

Table 4.4 The quality cost structure for service enterprises – the service delivery phase

Quality costs	*Value*
Prevention costs	
Maintenance, inspections, repairs (e.g. of equipment, storage areas)	
Ensuring appropriate conditions for the provision of the service	
Training employees responsible for service delivery	
Other	
Appraisal costs	
Quality control of the service during its performance	
Appraisal of the conformance of the quality of the provided service with the applicable requirements	
Other	
Internal failure costs	
Elimination of failures arising during the course of service delivery	
Breakdowns and downtime	

(*Continued*)

Corrections and rework (e.g. replacing the subcontractor during the course of service delivery)	
Other (e.g. costs of scrapping equipment used to provide the service)	
External failure costs	
Correction of badly delivered services	
Repeat inspection of corrected services	
Repeat assembly at the customer's premises	
Correction of errors resulting from poor information on the service	
Other	
Other quality costs	
Total	

Source: The authors' own work.

Table 4.5 The quality cost structure for service enterprises – the sales phase

Quality costs	*Value*
Prevention costs	
Examining the preferences of existing and potential customers	
Ensuring efficient organisation of the employees/team/department responsible for sales and distribution (e.g. recruitment process for those responsible for sales and distribution)	
Training employees responsible for sales and distribution	
Ensuring appropriate conditions for the provision of the service	
Ensuring good quality of contacts with customers	
Other	
Appraisal costs	
Verification of consistency of the service sales documents with the customer's order	
Appraisal of the quality of promotional activities	
Checks and inspections of the employees/team/department responsible for sales and marketing as well as appraisal of the quality of their work	
Quality checks after the service has been performed	
Other	
Internal failure costs	
Correction of quality failures in the organisation of the employees/team/department responsible for sales and marketing	
Additional checks after correction of errors	
Other (e.g. correction of errors resulting from inadequate quality of promotional campaigns)	
External failure costs	
The handling of returns, complaints and claims	
Costs of non-performed services (e.g. contractual penalties)	
Costs of the repeat delivery of the service	
Other	
Other quality costs	
Total	

Source: The authors' own work.

Table 4.6 The structure of quality costs in service enterprises based on cost functions

Quality costs	*510 Costs of core activity*	*520 Departmental costs*	*530 Costs of auxiliary activity*	*540 Costs of sales*	*550 Overheads*	*Total*
Prevention costs						
Appraisal costs						
Internal failure costs						
External failure costs						
Other quality costs						
Total						

Source: The authors' own work.

The quality costs presented in Tables 4.2–4.5 can occur in any service enterprise. The column "quality costs" corresponds to quality costs divided into conformance costs, nonconformance costs and other quality costs with the elements specified for each category. Their amount will depend on estimates to be made using the quality cost estimation form.

The recording of costs relating to quality may be conducted on the basis of either their types or functions. The structure of quality costs in a service enterprise developed by the authors on the basis of cost functions is presented in Table 4.6.

Quality costs are entered in the particular columns as costs of core activity, departmental costs, costs of auxiliary activity, costs of sales and overheads. The rows correspond to particular quality costs arising at each stage of the economic process. The cost categories and items in the quality cost structure are the same as those in the case of costs arranged by type (Tables 4.2–4.5).

On the basis of quality costs posted in the enterprise's accounting system in the accounts of sets 4 and/or 5, it becomes possible to prepare a process matrix of quality costs for the purposes of quality analyses. The proposed matrix is shown in Table 4.7.

The columns of the proposed matrix include the processes occurring in the enterprise: core (operational) processes, managerial (strategic) processes and auxiliary processes. The auxiliary processes include human resources management, financial management, technical infrastructure management, change management and improvement. The management processes are made up of strategy and information management as well as process efficiency

Table 4.7 The process matrix of quality costs

Quality costs	*Core (operational) processes*	*Managerial (strategic) processes*	*Auxiliary processes*	*Total*	*Vertical analysis of quality costs*
Prevention costs					
Appraisal costs					
Internal failure costs					
External failure costs					
Other quality costs					
Total					
Vertical analysis of processes generating quality costs					

Source: The authors' own work.

monitoring. The rows of the matrix contain quality costs divided into prevention costs, appraisal costs, external failure costs and internal failure costs, as well as other quality costs.

The use of the process matrix in the calculation of quality costs will help managers to identify the enterprise's processes incurring the most quality costs and determine the percentage share of individual processes in the quality cost structure. In addition, it will be a source of information for the enterprise about the areas that are the most responsible for the costs of internal and external failures, as well as those that account for the largest share in the prevention of deficiencies and failures.

The knowledge of where failure costs occur in individual subprocesses will allow more efficient management, optimisation of incurred costs and elimination of failures emerging in processes.

An additional advantage of this matrix is also the identification of subprocesses with the highest share of failure prevention costs. The efficiency of prevention and assessment activities will be the greater, the more accurately and precisely the causes of failures are identified.

The proposed process matrix may be a management support tool providing complete and reliable information on the amount of quality costs arising in the core, auxiliary and managerial processes of the enterprise. In order to use it, it is necessary to maintain records of quality costs in the accounting system of the enterprise, using the accounts of sets 4 and 5.

In the structures of quality costs arranged by either type or function, it is necessary to include the period for which the desired values will be calculated. The authors recommend preparing monthly quality reports, and subsequently half-yearly and yearly reports. They will constitute excellent material for analyses to be conducted by the quality department. Quality cost

reports should include not only the costs of the current period but also their amounts for the previous periods, which will allow for their comparison over time and determining the dynamics of their changes. For the purposes of controlling, it is also important to compare the quality costs of the current period with those forecast in the budget for a given period (Sadkowski, 2017).

Among the elements making up the operating budget (Warren et al., 2018), the authors have noticed the lack of an item concerning quality costs incurred at all stages of the process of service provision or product manufacture. The preparation of a quality cost budget can have a positive impact on the whole process of planning, managing and identifying quality risks. An efficient tool should ensure the discipline of quality costs in all executed processes, as well as improve the detection of internal and external failures, and ultimately their prevention and avoidance.

The main requirements for the preparation of a process budget for quality costs are the posting of quality costs in the accounts of sets 4 and/or 5 and the use of a process matrix for quality costs.

A quality cost budget should be prepared on the basis of the already available historical data on quality costs (if the enterprise has already kept records of quality costs in the accounts of sets 4 and/or 5, the information on the amount of the incurred costs is made available by the accounting department) or from scratch (if the enterprise has not recorded its quality costs yet). The authors' proposition for such a budget is shown in Table 4.8.

The quality cost budget consists of the forecast amounts of prevention costs, appraisal costs, external failure costs and internal failure costs, which are entered in the rows of the budget matrix. The columns of the matrix contain the core, auxiliary and managerial processes executed in the course of service delivery.

The best solution is to prepare partial budgets of quality costs for each process separately, which gives the possibility to control the amount of costs incurred in connection with the service being performed. The total sum of forecast quality costs (QC) is calculated in the last column of the proposed matrix. The budget structure is largely determined by the nature of the enterprise's activity. The authors propose preparing a budget forecast of quality costs on a monthly, quarterly, half-yearly or yearly basis. The time horizon is determined by the management of the enterprise.

The preparation of a quality cost budget requires the proper identification of all processes executed by the organisation and their division into subprocesses and activities. Only such an approach can provide sources of information on quality costs.

The introduction of quality costs to the cost structure in a service enterprise requires taking appropriate measures. Each measure must be thought out and implemented according to applicable recommendations. Thanks to this, the system of quality cost accounting will function efficiently. All actions required for its implementation are collected and presented in Figure 4.2.

Table 4.8 A process budget of quality costs

#	*Process budget of quality costs for service process no. 1 in the period …*	*Core processes in service no. 1*	*Managerial processes in service no. 1*	*Auxiliary processes in service no. 1*	*Total for service no. 1*	
1	Forecast prevention costs					
2	Forecast appraisal costs					
3	Forecast internal failure costs					
4	Forecast external failure costs					
5	Forecast other quality costs					
6	**Total**					
	Process budget of quality costs for service process no. 2 in the period …	*Core processes in service no. 2*	*Managerial processes in service no. 2*	*Auxiliary processes in service no. 2*	*Total for service no. 2*	*Total quality costs for services nos. 1 and 2*
8	Forecast prevention costs					
9	Forecast appraisal costs					
10	Forecast internal failure costs					
11	Forecast external failure costs					
12	Forecast other quality costs					
13	**Total**					
	Process budget of quality costs for service process no. n in the period …	*Core processes in service no. n*	*Managerial processes in service no. n*	*Auxiliary processes in service no. n*	*Total for service no. n*	*Total quality costs for services nos. 1, 2 and n*
15	Forecast prevention costs					
16	Forecast appraisal costs					
17	Forecast internal failure costs					
18	Forecast external failure costs					
19	Forecast other quality costs					
20	**Total**					

Source: The authors' own work.

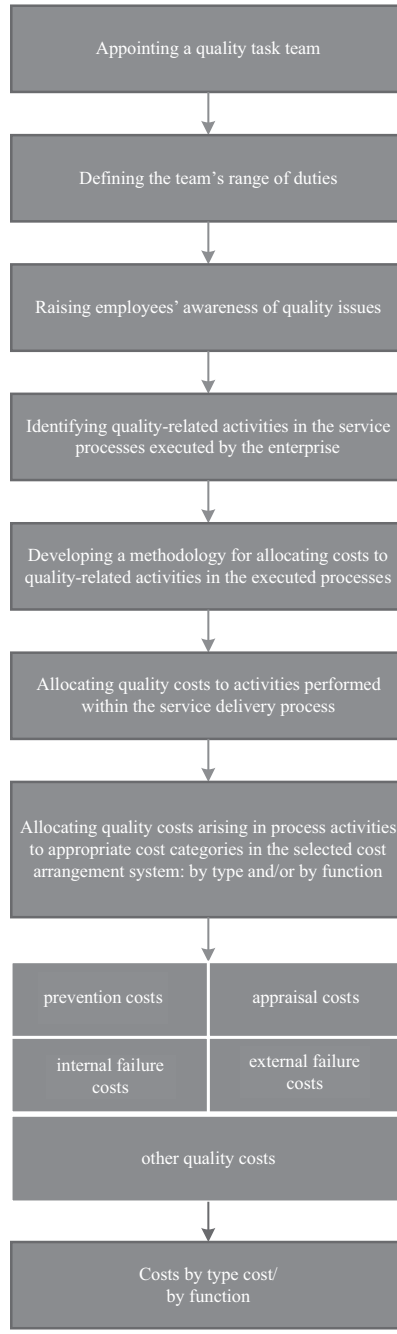

Figure 4.2 A model of implementing quality cost accounting in enterprise services
Source: The authors' own work.

The first step is to appoint a quality task team whose members should be the persons responsible in the enterprise for quality assurance, service process management and accounting.

The next step involves defining the scope of work and responsibilities of the appointed team. Its duties include calculating and estimating the level of quality costs, as well as analysing the possibility of their reduction to a level satisfactory for the management.

The quality team is also responsible for organising meetings and quality seminars for employees in order to make all those employed in the company aware of the existence and function of quality costs at each stage of the process of service delivery.

A very important task is an in-depth analysis of all service processes executed in the enterprise, with their breakdown into sequences of activities and the identification of those that are related to quality.

In the next step, the appointed team prepares a methodology according to which costs will be allocated to quality activities. The developed methodology is used in the next activity and allows for linking quality activities to corresponding costs.

The last activity of the task team consists in the allocation of the identified quality costs to appropriate cost categories in a selected cost classification system: one based on cost types or functions.

A model of implementing quality costs into cost structures in a service enterprise prepared and implemented according to the methodology described above generates a number of benefits, including the following (Sadkowski, 2017):

- marking off quality and emphasising the importance of quality problems in the enterprise,
- creating a dedicated quality team to be a guarantor of the high quality of delivered services,
- increasing employees' awareness of the issues related to quality,
- ensuring the proper identification of activities generating quality costs in the processes executed by the enterprise,
- obtaining knowledge about the places where quality costs arise and the processes that generate the most of them,
- providing error-free estimates of the amount of quality costs,
- ensuring the possibility of efficiently controlling quality costs, thanks to necessary and complete information on costs.

The structure of quality costs for service enterprises proposed by the authors is closely connected with the processes taking place in service enterprises. The basis of the whole system is the division of quality costs into two categories: conformance costs and nonconformance costs. Within conformance costs, it is possible to distinguish costs related to prevention and appraisal. Nonconformance costs include the costs of failures. Each process execution phase generates costs, including those related to quality. A skilful identification of

the activities taking place within the process is the basis for the proper determination of the places where quality costs arise and for the estimation of their volume (Sadkowski, 2017).

Enterprises may use generic cost systems in which costs are divided by type or calculating cost systems where costs are recognised according to the place where they arise. In the constructed structure of quality costs based on the processes occurring in service organisations, the authors have prepared two variants of quality cost calculation depending on the system applied in a particular enterprise.

For a complete picture of quality costs generated by service enterprises in their core, auxiliary and management processes, it is proposed that a process matrix of quality costs be used.

When preparing a quality cost structure, it is important to take into account the time period concerned. Quality cost accounting based on such a quality cost model can be an effective tool used in service enterprises.

4.3 The proposed procedure for quality cost accounting in service enterprises

Developing procedure RKJ/1/2019 "Quality cost accounting in a service enterprise" included in the appendix (Appendix 1), the authors used the assumptions collected and presented in Section 4.1, as well as the proposed quality cost structure discussed in Section 4.2. The procedure contains guidelines concerning the activities necessary for the implementation of a quality cost accounting system, as well as the identification, classification, recording and analysis of quality costs. The objectives of the prepared model of quality cost accounting include capturing, measuring, grouping, processing, presenting, interpreting and analysing, as well as budgeting and controlling quality costs. The proposed model of quality cost accounting establishes the following:

1. A mechanism for identifying and classifying quality costs in a service enterprise.
2. A method of recording quality costs.
3. A mode and manner of reporting data on quality costs.
4. Methods and tools used to analyse quality costs and prepare quality reports.
5. A mode and manner of budgeting quality costs.
6. Rules of determining quality costs.
7. Employees/teams/departments responsible for the implementation of the individual stages of a quality cost accounting system together with a detailed description of their authority.

In the developed model, quality costs are defined as all the costs of measures implemented in order to ensure an appropriate level of quality of offered services and the costs of actions taken in the case of not achieving the desired

level of service quality. The authors have used their division into conformance costs (prevention and appraisal costs), nonconformance costs (costs of internal failures and costs of external failures) and other quality costs. Defining the concept of quality costs, particular groups of quality costs, quality cost analysis and quality cost accounting in the procedure allows employees to clearly identify the components of the whole system, increases their awareness in the execution of the tasks allocated to them and also has a positive impact on the reliability of their analyses and the effectiveness of their actions.

An appropriate identification and classification of quality costs and their ongoing recording in the accounting system of the service organisation allows to determine the following areas of analysis:

- a structure of quality costs on a monthly/quarterly/annual basis,
- a percentage share of particular groups of quality costs in total quality costs,
- dynamics of changes occurring in the shaping of particular groups of quality costs within (monthly/quarterly/annual/multiannual) periods under analysis,
- relations between the groups of quality costs,
- identification of processes/activities that generate the highest quality costs,
- comparative analysis of the actually incurred quality costs with the forecast values,
- a share of quality costs in total costs, as well as costs of operating activities,
- a share of quality costs in sales revenues and net profit of the enterprise under examination,
- an assessment of the efficiency of the organisation's management systems,
- an assessment of the effectiveness of the implemented measures aimed at quality costs optimisation.

The sources of information on quality costs are accounting documents (confirming the occurrence of a quality cost) as well as other internal documents and calculations (for example failure forms and reports, complaint registers, materials from audits, data from computer systems, reports from sales and customer service departments). The proposed model of quality cost accounting takes into account both costs actually incurred and reflected in accounting documents and costs estimated on the basis of documents and internal calculations in quality cost calculation forms.

The proposed quality cost accounting procedure includes the following stages: the construction of a quality cost accounting (QCA) system and its implementation, the preparation of a process budget of quality costs, the collection of data on quality costs occurring in the implemented processes, the measurement and recording of quality costs arising in all phases of the service delivery process in the balance sheet and off-balance sheet accounts, the analysis of changes in quality costs, the optimisation of bad quality costs, the preparation

of reports on quality costs, as well as guidelines and recommendations concerning the optimisation of quality costs generated by the particular processes.

The first stage is connected with undertaking preparatory work for the introduction of a quality cost accounting model in the enterprise. The decision on its implementation should be approved on the basis of information on the impact of this type of accounting on the improvement of the efficiency of management systems. The responsibility for this lies with the management of the enterprise, who must formulate initial principles for the implementation of the model in line with the organisation's quality policy. It is very important at this stage to ensure that employees will become familiar with issues related to quality, quality costs and their impact on the enterprise's financial results.

The introduced quality cost accounting system requires strict control to be exercised by a specially established quality task team (which should include persons responsible in the enterprise for quality and accounting, as well as having good knowledge of the implemented processes) subordinate to the appointed quality manager, who, in turn, will report to the management of the enterprise.

In the next stage, the quality task team develops the foundations for the functioning of the system. First, it is necessary to determine the purpose, scope and structure of quality costs, the method of their recording and the employees responsible for this. The team also decides on how to collect, organise and disseminate information on quality costs, as well as how to conduct analyses and draw conclusions from them. It also establishes which activities in the service delivery processes generate quality costs. Subsequently, it extracts the elements of quality costs from the executed processes (on the basis of the quality cost estimation form) and forwards gathered information to the accounting department. Emphasis should be put on good communication between the quality team and the accounting department. Data on quality costs received by the accounting department need to be posted in the appropriate accounts. Before quality costs start to be recorded, the accounting department is obliged to build a new chart of accounts or expand the existing one by adding quality cost accounts to account sets 4 and 5. The authors of the model under discussion recommend the creation of control accounts of quality costs for all accounts of costs arranged by either type or function (if applicable in a given enterprise), which will facilitate their recording in the financial-accounting programme and the preparation of the statements of recorded quality costs account balances for the quality team. The final decisions related to the recording of quality costs are taken by the management of the enterprise, which approves or rejects the guidelines formulated by the accounting department. Organised in cooperation between the quality team and the accounting department, the quality cost accounting system is introduced in the enterprise on the basis of an internal regulation concerning the application of quality cost accounting. From that moment on, each identified quality cost is recorded in the organisation's accounting system.

The enterprise applying quality costing should also focus on activities related to the budgeting of quality costs. The preparation of a quality cost budget based on the processes executed in the enterprise is the responsibility of the quality team. Such a budget is also an important element in the analyses of activities generating the highest volumes of quality costs. Getting to know this cost structure will allow for making decisions that optimise quality costs on the basis of the actual and forecast data that will be collected and reviewed. The prepared budget constitutes a point of reference for the actually incurred quality costs.

Maintaining an efficient quality cost accounting system requires the commitment of all employees responsible for identifying quality costs at their respective positions and marking them with the QC symbol. In the absence of a document confirming the occurrence of a quality cost, it is necessary for the responsible employee to prepare a quality costing form according to the template included in procedure RKJ/1/2019. The identified and labelled documents and quality costing forms are forwarded to the quality team, which verifies their correctness and assigns them to the appropriate quality cost groups and service delivery process phases. Monthly statements of classified quality costs are delivered to the accounting department, which is responsible for their posting in the organisation's accounting system. The systematically maintained records of quality costs allow for the preparation of periodic reports on their structure, size and places of their occurrence. On the basis of the received monthly balances of the quality cost accounts, the quality team carries out an analysis of quality costs, including a vertical analysis, a horizontal analysis and a ratio analysis. Its objective is to provide information on changes in these costs with respect to the predetermined criteria. The ratio analysis comprises the following calculations performed on a quarterly or annual basis: the ratio of quality costs to total costs, the ratio of conformance costs to quality costs, the ratio of nonconformance costs to quality costs, the ratio of prevention costs to quality costs, the ratio of appraisal costs to quality costs, the ratio of failure costs to quality costs, the ratio of other quality costs to total quality costs, the ratio of the number of nonconformances to quality costs, the ratio of quality costs to sales revenues, the ratio of quality costs to net profit, the ratio of quality costs to operating costs and the ratio of nonconformance costs to net profit. The calculated quality cost ratios allow the management to determine the relationships occurring among the individual groups of quality costs, as well as the impact of quality costs on the organisation's financial results, as well as profit and loss account. The quality cost analysis focuses on the following: determining the causes and places of the emergence of quality costs, comparing changes in the quality cost structure and the rate of such changes taking place in particular periods, indicating the relations occurring among the quality cost categories, comparing the actual quality costs to those planned in the budget, reviewing internal and external nonconformances, as well as assessing the efficiency of the management system and the effectiveness of the introduced improvements. The quality cost budget prepared at the earlier stage constitutes the basis for conducting an analysis of the deviations of these costs. For the assessment of the efficiency of the

enterprise's management system, the authors recommend using all elements of the cost analysis. The condition for a reliably conducted analysis of quality costs and the preparation of a reliable report on quality costs is an efficiently organised system of circulation of documents among the responsible employees, quality team, accounting department and quality manager. All obtained information on quality costs should be stored from the beginning of the functioning of the quality cost accounting system in the organisation. Correct identification of data on quality costs allows for drawing appropriate conclusions and providing reliable recommendations for optimising quality costs in the processes executed by the service enterprise.

Prepared by the quality team and approved by the quality manager, quality cost reports should comprise quarterly and yearly periods. Each report should contain the following elements: a vertical and horizontal analysis of quality costs with a commentary, a ratio analysis of quality costs with an interpretation, a process matrix, a quality cost budget with an analysis of deviations, an appraisal of the efficiency of management systems and the effectiveness of introduced corrective measures, as well as proposals for measures aimed at optimising quality costs in service delivery processes. Quarterly reports make it possible to notice positive and negative trends in the quality costs of the recent months and thus make it possible for the management to take quickly corrective measures for the following quarters. Annual reports on quality costs show data in a broader time horizon and provide information on whether the improvements implemented in the successive quarters have had any real effect in the form of improved results. Reports are presented by the quality manager during management meetings specially convened for this purpose.

The final stage in the quality cost accounting procedure is the use of the results included in quality cost analyses and reports by the management of the enterprise when evaluating the efficiency of the quality management system and its improvements. Recommendations for corrective/preventive/optimising measures may, but do not have to, be implemented in the organisation. The final decision on their application lies with the management of the enterprise.

Table 4.9 presents the authors' proposed quality cost accounting procedure in the form of a Bernatene-Grün diagram.

Maintained in accordance with the guidelines discussed above, a quality cost accounting system for service organisations is an effective tool for dealing with the issues of quality costs, identifying the places of their occurrence and recording them. It also allows for the more efficient recognition and addressing of problems with quality arising at the particular stages of the service delivery process. Furthermore, it influences the efficiency of the enterprise's management system and employees' awareness of quality issues, simultaneously allowing the enterprise to optimise its costs and improve its net financial result (Jedynak and Sadkowski, 2017).

The whole procedure of quality cost accounting and the structure of quality costs dedicated to service organisations is unique due to the type of

Table 4.9 The modified Bernatene-Grün diagram illustrating the quality cost accounting procedure for service enterprises

Subject matter of the procedure						Documents																	
Management	Quality manager	Quality team	Accounting department	Employees	List of activities:	Preliminary assumptions for the implementation of quality cost accounting	Quality policy	Training schedule	Appointment of a quality task team	Procedure RKJ/1/2019 Quality cost accounting in a service enterprise	Process documents	Quality cost accounts in sets 4 and 5	Regulation concerning the use of quality cost accounting and the recording of quality costs	Process matrix of quality costs	Process budget of quality costs	Documents relating to quality costs marked with the QC symbol	Quality cost calculation form	Classification of quality costs in the core processes of the service enterprise	Monthly statement of balances in quality cost accounts	Quality cost ratios	Analysis of deviations in quality costs	Quality cost report	Recommendations for corrective measures
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
X	X				1. Preparations for implementation of quality cost accounting	□	□	□															
X	X				2. Establishment of the quality task team				□														
		X	X		3. Laying foundations for the functioning of a quality cost accounting system					□													
		X			4. Identification of activities that generate quality costs						□												
			X		5. Creation of a chart of accounts including quality costs							□											
X			X		6. Final determination of the registrable elements of quality costs								□										
X					7. Implementation of the regulation concerning the application of quality cost accounting								□										
		X			8. Preparation of a quality cost process budget									□	□								
		X		X	9. Identification of quality costs at particular positions and submission of documents to the quality team											□	□						
		X			10. Registration of quality costs in the quality cost accounting system											□	□						
		X	X		11. Preparation of a classification of quality costs in the core processes of the service enterprise and its submission to the accounting department													□					
			X		12. Systematic recording of quality costs in the existing financial and accounting software							□						□					
		X	X		13. Preparation of a monthly statement of quality cost account balances and its submission to the quality team														□				
		X			14. Quality cost analysis									□	□				□	□	□		
		X			15. Preparation of a quality cost report																	□	
	X				16. Approval of the quality cost report and preparation of recommendations for corrective measures																	□	□
X	X				17. Presentation of the quality cost report and recommendations for corrective measures																	□	□
X					18. Implementation of conclusions drawn from the quality cost report and recommendations for corrective measures																	□	□
				X	19. Corrective measures																		□
X	X				20. Assessment of the effectiveness of the taken corrective measures																	□	□

activity conducted by this group of enterprises. Service delivery is a complex process consisting of a number of structured actions, activities and tasks whose performance based on predetermined quality requirements is to result in the customer's full satisfaction. The customer's perception of their own satisfaction with the received service is a subjective concept.

Each action taken in the service delivery process generates visible and hidden quality costs whose identification is crucial in an efficient quality costing system. In order to optimise costs connected with quality, it is necessary to calculate them appropriately and post them in the enterprise's accounting system, which allows for the preparation of appropriate analyses and reports for the management. Decisions made by the management will be effective only if the management follows recommendations and conclusions formulated on the basis of correctly diagnosed causes of unfavourable changes.

In order to verify the proposed structure of quality costs and the quality cost accounting procedure dedicated to service enterprises, the authors conduct empirical research in selected organisations. Its principles and execution are described in detail in the next chapter.

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5 Empirical research methodology

5.1 Procedure and methods of empirical research

The research conducted by the authors allows for the exploration of the issues of quality costs and quality cost accounting in service enterprises, as well as the verification of the use of the model of quality cost accounting developed by the authors in the assessment of the efficiency of management systems in selected service enterprises.

The authors attained the objectives of the empirical research work by exemplifying the application of the proposed quality cost accounting model in a selected service organisation. The triangulation procedure of research techniques (documentation content analysis, observations, interviews and quantitative data analysis) played a fundamental role in the conducted research (Stańczyk, 2016; Gibson, 2017; Turner et al., 2017; Harrison et al., 2020). The following research methods were used to analyse quantitative data: multidimensional comparative analysis, ratio analysis and simulation (for forecasting quality cost budgets). The analysis of quantitative data was carried out using Microsoft Excel. To facilitate the assimilation of the presented results, the authors also used graphical forms of data presentation such as tables and figures. The research is complemented by the determination of conditions in which it is possible to apply this model in improving the efficiency of management systems in service enterprises. Having collected and analysed the necessary data, the authors intended to provide answers to the following questions:

- What are the possibilities and directions of using the model in assessing the efficiency of management systems in service enterprises?
- What are the limitations of using the model in evaluating the efficiency of management systems in service enterprises?

The research procedure was divided into four main stages: stage I – preliminary research, stage II – core research, stage III – post-research material analysis and preparation of research results and stage IV – data synthesis and formulation of conclusions. A scheme of the research procedure is presented in Figure 5.1.

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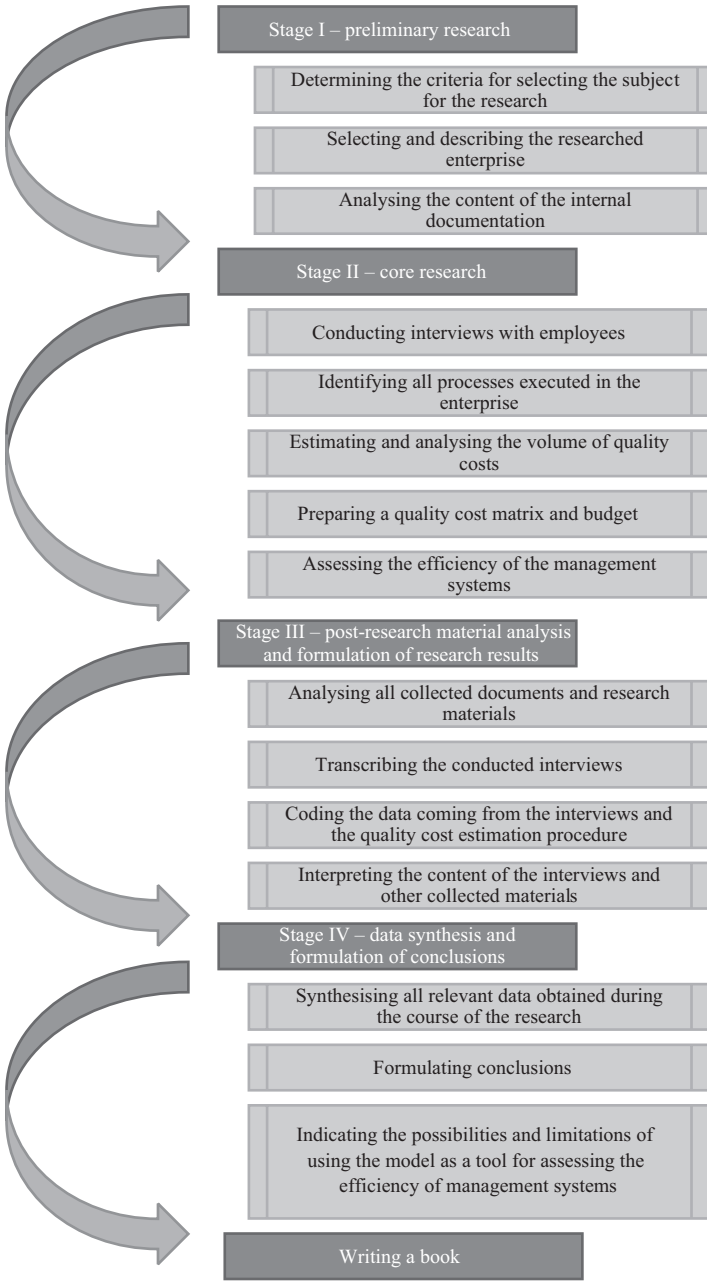

Figure 5.1 The research procedure
Source: The authors' own work.

The first stage included the following activities: determination of the criteria for selecting the subject for the research, selection and description of the researched enterprise and its management systems, analysis of the content of the internal documentation of the service organisation participating in the research. The research problem of the publication determined the way of selecting the subject for the research. It was decided that the criteria important for the selection of the enterprise would be the possession of a Quality Management System (QMS) and ISO certificates, as well as the use of a full accounting system. The most important selection criterion was considered to be the possession of an implemented QMS and ISO certificates. In the authors' view, the possession of such a system indicates that the enterprise has at its disposal data appropriate for estimating quality costs. The second most important criterion was the use of a full accounting system by the entity participating in the study because this would make it possible to obtain statements of account balances and all entries in bookkeeping accounts, as well as information on documents recorded in accounting systems. After selecting a potential entity meeting the specified criteria, obtaining its consent for participation in the research and access to the data included in its internal sources, the process of collecting the necessary documents began. The following documents were used in the analysis of the content of the internal documentation of service providers: annual reports, articles of association, documentation of the Integrated Management System (IMS), annual reports of the officer responsible for the IMS on the functioning of this system, documents defining employees' scopes of duties, as well as data published on corporate websites.

The second stage of the research was divided into the following activities: conducting interviews with respondents, i.e. employees of the selected service enterprise, estimating the volume of quality costs and analysing quality costs, preparing a quality cost matrix and budget, as well as evaluating the efficiency of the management systems. The objectives of the interviews comprised checking the enterprise's knowledge of and commitment to quality cost accounting and employees' knowledge of the issues of quality costs and the implemented processes, as well as establishing the enterprise's openness to new solutions in quality cost management and readiness to take the risk relating to their implementation. An employee interview questionnaire prepared by the authors for the purposes of the research is included in Appendix 2. The interview was divided into the following blocks of questions:

Block I – General questions about the enterprise's activities

Block II – Quality costs

Block III – Quality cost accounting

In block I, the authors attempted to establish the following: the way of developing the company chart of accounts, the system/s of cost recording, the main objectives of business activity, the level of employees' knowledge of the

processes executed by them and the frequency (if any) of training in the field of quality. Block II contains questions about the existence of the issue of quality costs, conducted quality improvement activities, the records of quality costs in the accounting system, the sources of information on these costs, as well as the management's knowledge of occurrence of quality costs in the processes executed in the enterprise. Based on the questions from block III, the authors wanted to obtain information concerning the enterprise's quality cost accounting system and its procedure, the most important objectives of the system, the impact of quality cost analysis on improving the efficiency of the management systems, the preparation of quality cost matrices, budgets and reports, as well as the QMS and the impact of quality cost accounting on the efficiency of this system. The full interview questionnaire constitutes an appendix to this book.

The basis for estimating the amount of quality costs in the enterprise was the identification of all processes executed in it. At this stage of the research, a repeat analysis of the content of the internal documentation was conducted (the documentation of the Integrated Management System, the annual reports of the IMS officer) in order to become familiar with the map of the enterprise's processes. On this basis, the authors prepared a quality cost estimation form whose general template can be found in this book in Appendix Z1A/ RKJ/1/2019 to procedure RKJ/1/2019 "Quality cost accounting in a service enterprise". During the subsequent visit to the enterprise, the authors handed over the form to an employee of the relevant organisational unit dealing with cost accounting and consulted them about estimating quality costs. The completed form constituted a database for conducting a quality cost analysis consisting of a vertical analysis (of the quality cost structure), an analysis of the Pareto-Lorenz diagram, a ratio analysis, as well as for creating a matrix and budget of quality costs and an assessment of the efficiency of the management systems in the enterprise participating in the research on the basis of the prepared quality cost accounting system.

In the third stage of the research, a comprehensive analysis of the collected materials was carried out and an attempt was made to formulate research results. The subsequent structured activities included analysing all collected research materials, transcribing the conducted interviews, coding the data coming from the interviews and the quality cost estimation procedure, as well as interpreting the content of the interviews and other collected materials. The comprehensive analysis comprised the results obtained from the estimation of the volume of quality costs (based on the vertical analysis, the Pareto-Lorenz diagram analysis, the ratio analysis), the prepared matrix and budget of quality costs and the appraisal of the efficiency of the management systems carried out on the basis of Appendix Z7/RKJ/1/2019 to procedure RKJ/1/2019. The researcher also transcribed the interviews conducted with the management of the controlling departments and the officers responsible for the respective management systems. The next activity was to code the

data acquired during the interviews, i.e. to transfer them from the interview forms into a predetermined system of letter and number symbols. The coding key was prepared based on the method of creating a general scheme of codes (Czernek, 2016). Each answer was assigned a corresponding numerical value. The coded answers provided by the enterprise's employees were entered into an answer sheet, which was used to interpret the results of the interviews. The coding of the estimated quality costs consisted in transferring the collected data to the quality cost structure in the proposed quality costing model. All collected research material was subject to interpretation. In order to increase the level of interpretation, the obtained results were consulted with the representatives of the enterprise.

The final stage of the empirical research consisted in data synthesis aimed at drawing conclusions. The steps taken were based on linking together all relevant data obtained during the course of the research. The authors formulated the conclusions with the intention of using them in a subsequent report on quality costs for the needs of the enterprise under study. This was possible by comparing the developed quality costing model and the obtained empirical results. The authors validated this model in the selected service enterprise as a tool to assess the efficiency of its management systems.

5.2 A description of the enterprise under study[1]

The research was carried out in a service company selected on the basis of the adopted sampling criteria. This section presents a description of the enterprise under study.

It is a limited liability company, which has operated under its current legal form since 2012. As at 31 December 2018, the company employed 134 persons, including 95 white-collar workers and 39 blue-collar workers.

Its core activity is the execution of plumbing, heating, gas and air-conditioning installations. Other activities include the provision of services in the field of metal structure erection; installation, repair and maintenance of measuring, inspection, testing, navigational instruments and appliances, machinery and electrical equipment; demolition works, earthworks, as well as construction works associated with building construction, civil engineering structure construction, specialised construction works, plastering, painting, glazing, road transport of goods; as well as rental and lease of construction machinery and equipment.

Described in its internal documents, the organisational structure of the enterprise is both functional and formal. The main body authorised to direct its activities is the management board, which consists of one president and three vice presidents. Each of the vice presidents reports to the president and supervises different departments of the company. One of the vice presidents oversees the Road Networks and Works Execution Department (II), another is responsible for the Road Networks and Works Execution

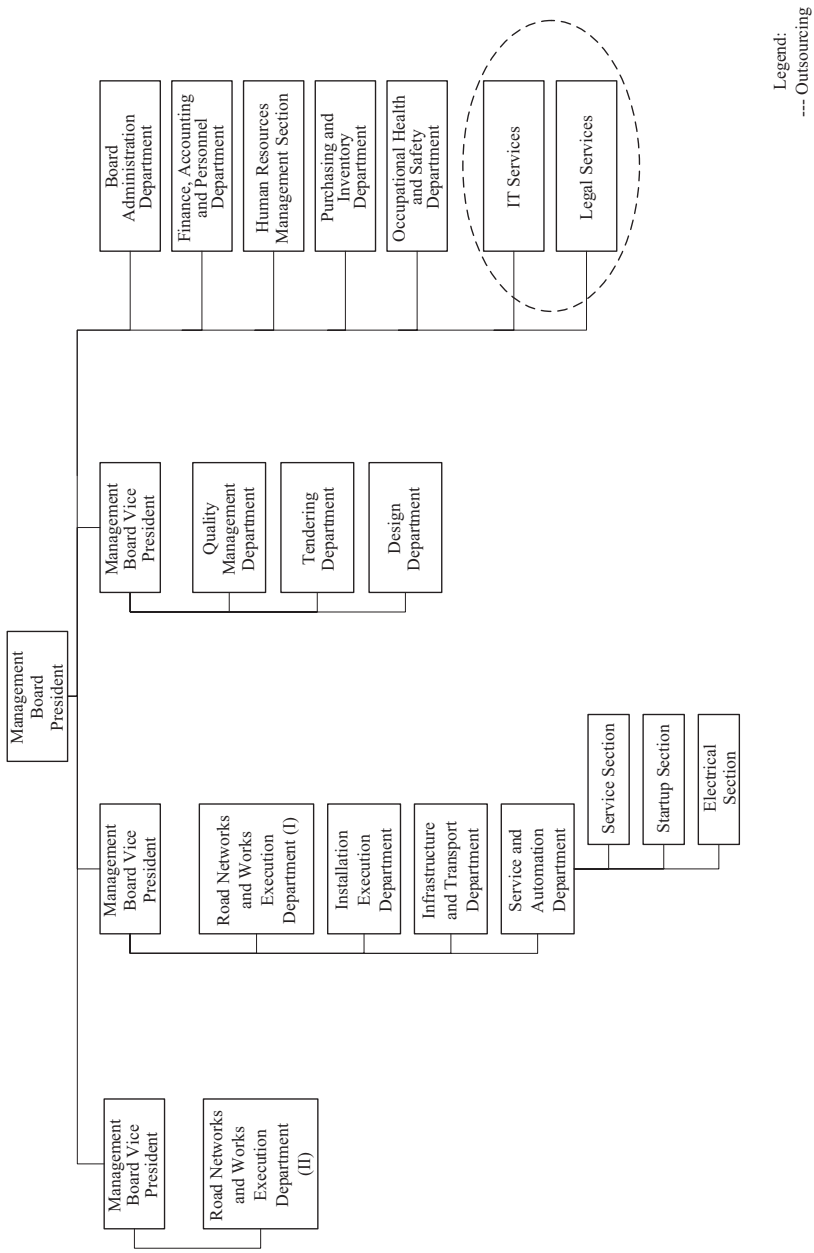

Figure 5.2 The organisational chart of the enterprise participating in the research
Source: The authors' own work on the basis of the enterprise's internal document entitled *Quality Book PN-EN ISO 9001:2015*

Department (I), the Installation Execution Department, the Infrastructure and Transport Department, the Service and Automation Department, and the third vice president controls the Quality Management Department, the Tendering Department and the Design Department. The president of the management board supervises directly the following organisational units: the Board Administration Department, the Finance, Accounting and Personnel Department, the Human Resources Management Section, the Purchasing and Inventory Department, the Occupational Health and Safety Department. The president is also responsible for the outsourcing of IT and legal services. The structure of the enterprise is simple and clear, which allows for the quick processing of various matters within the organisation and their proper control by appropriately authorised units. The enterprise's organisational chart is shown in Figure 5.2.

5.3 A description of the management systems of the service enterprise under examination[2]

The theoretical aspects of management systems have already been discussed in Section 3.3. Below the authors present a description of the management systems used in the enterprise under study.

The company has a QMS compliant with the requirements of the PN-EN ISO 9001:2015 standard. It was implemented at the end of 2016. It allows the company to satisfy its customers' needs for the timely fulfilment of orders for high-quality products and services. This system consists of 11 processes and is implemented throughout the organisation in the areas of design, completion of deliveries, assembly and erection, commissioning and servicing of building installations, water supply and sewage systems, as well as the performance of earthworks and road surfacing works.

The position of the QMS officer is not included in the organisational chart (Figure 5.2). It is located in the Quality Management Department, which is controlled by one of the vice presidents of the Management Board. According to the internal documentation, the QMS officer reports directly to the president of the Management Board. The duties of the QMS officer include the following: performing all work related to the implementation and maintenance of the QMS based on the ISO 9001 standard, cooperating with all organisational units with regard to the implementation of the QMS, initiating and coordinating the work of the ISO 9001 implementation team, planning and carrying out training relating to the QMS, monitoring the functioning of the QMS and determining potential for improvement, planning and implementing corrective measures, maintaining and updating the documentation of the QMS, with the exception of records created at the points of process execution in a given organisational unit, receiving and analysing requests for changes to the internal QMS documentation in the

company, planning internal and external audits in cooperation with entities participating in audits, appointing audit teams to conduct internal audits and supplier audits, conducting internal audits in the company and supplier audits, conducting periodical appraisals of the work of the company's internal auditors, preparing and collecting data for management reviews and drawing up periodical reports for the management board on the functioning of the QMS in the company. Furthermore, the scope of activities and duties of the QMS officer also includes other tasks assigned by the direct superior, in accordance with the qualifications possessed by the employee, as well as in accordance with the applicable legal regulations and basic moral and ethical standards.

In the enterprise, the following groups of processes can be distinguished: core processes, design, purchasing and inventory, quality management, human resources management, infrastructure and transport. The core processes include tendering, contract performance and service. The group of the quality management processes comprises management reviews, internal audits, corrective and preventive measures, as well as supervision of documents and records. The remaining process groups do not have separate target processes other than those indicated in the particular groups. The enterprise has an extensive process map that allocates input and output elements to each process. Such an arrangement of processes allows for an easy identification of the requirements necessary for the execution of a given process, as well as received output data. A map of the processes executed in the enterprise is presented in Figure 5.3.

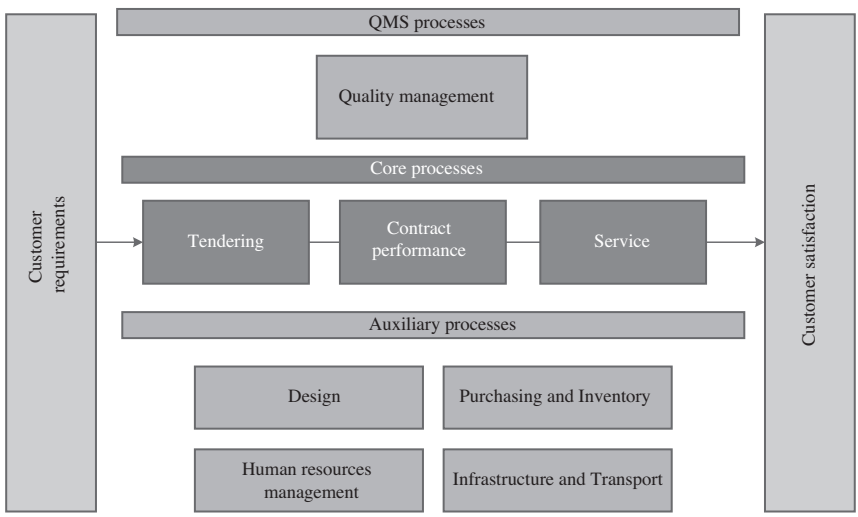

Figure 5.3 A map of the enterprise's processes
Source: The authors' own work on the basis of the enterprise's internal document entitled *Quality Book PN-EN ISO 9001:2015.*

In order to fulfil orders that meet the requirements of customers, the enterprise implemented a process management system comprising the following steps: identifying the processes taking place in the organisation, determining the interdependencies and impacts of these processes, determining the principles of monitoring and measuring indexes for assessing the functioning of the processes, ensuring the availability of resources and information on the course of the processes, defining activities that ensure the achievement of planned objectives and continuous improvement, taking into account risks and opportunities, as well as allocating duties and powers related to individual processes. A list of the enterprise's processes and their owners is included in Table 5.1.

The enterprise's most important processes are its core processes, i.e. tendering, contract performance and service. The auxiliary processes include design, purchasing, human resources management, as well as infrastructure and transport. The group of quality management processes (management review, internal audits, corrective and preventive measures and supervision of documents and records) constitute the strategic processes of the organisation under analysis. The structure of responsibilities presented in Table 5.1 shows that several processes have more than one owner (contract execution, service, purchasing, infrastructure and transport). The QMS officer, directors responsible for installations, road networks and works, contract managers, service and automation manager are responsible for more than one process. The majority of the quality management processes (internal audits, corrective and preventive measures, supervision of documents and records) are ceded to the QMS officer; only management reviews are excluded from their scope of responsibility as they are supervised by the president of the Management Board. There is a strong relationship between the contract performance process and purchasing, hence the owners of both processes are the directors responsible for installations, network and road works, as well as contract managers. The division of responsibility for individual processes has been clearly defined in the enterprise's QMS.

All identified processes have been formalised by means of process sheets containing requirements relating to the monitoring and measuring of the established metrics. Each process has a measurable objective linked to a metric; some of the processes have 2–3 metrics. The 11 processes executed in the enterprise have been allocated 19 metrics. Ongoing monitoring of the processes by their owners makes it possible to obtain information on the degree of compliance with the requirements for the established metrics of the functioning of the processes, which undergo periodic analysis and appraisal. On the other hand, compliance with the requirements of the provided services is monitored by employees responsible for contract performance by means of metrics and analyses whose results are entered in acceptance reports. Besides measurable objectives, the enterprise also establishes quality objectives that are defined at the beginning of each calendar year and whose number varies from year to year. These objectives include the company's strategic objectives and

Table 5.1 The processes executed in enterprise participating in the research

Group	*Process name*	*Responsibility structure*	*Formalisation*
Core processes	Tendering	Head of Tendering Department	Process sheets, objectives and metrics. All identified processes have process sheets, each process has a goal associated with a metric (some processes have 2–3 metrics). The processes are described and illustrated in the form of process diagrams in the Quality Management System.
	Contract performance	Director for Installations Director for Road Networks and Works Contract manager Service and Automation Department Manager	
	Service	Service and Automation Department Manager Service Section Manager	
Design	Design	Design Department Manager	
Purchasing and Inventory	Purchasing	Director for Installations Director for Road Networks and Works Contract manager Purchasing and Inventory Department Manager	
Quality management	Management review	Management Board President	
	Internal audits Corrective and preventive measures Supervision over documents and records	QMS Officer	
Human Resources Management, Infrastructure and Transport	Human resources management	Personnel and Payroll Specialist	
	Infrastructure and Transport	Infrastructure and Transport Department Manager Contract manager	

Source: The authors' own work on the basis of the enterprise's internal document entitled *Quality Book PN-EN ISO 9001:2015*.

objectives divided into areas. The company is not always able to achieve its objectives and their pursuit undergoes appraisal at yearly management reviews.

Assessments of the functioning and analyses of the efficiency of the QMS are carried out during internal audits and after their completion by the QMS officer on the basis of information provided within the scope of audits. An assessment of the efficiency of the entire QMS is carried out during a management review.

In the enterprise under study, the QMS is adequately documented in both the Quality Book and the Quality Procedures. The QMS documentation is made available to all interested organisational units in electronic format via the internal computer network. The originals of approved documents in hard copies are stored in the Quality Management Department.

The QMS of the enterprise has been developed in a very detailed manner; each of its elements has been described and precisely explained. The supervision and coordination of the entire system is in the hands of the QMS officer, who has considerable knowledge and experience, which is essential for a person performing such a function. A system based on reliable documentation and information for employees should ensure the delivery of high-quality services and the fulfilment of customers' expectations.

Notes

1 This section was developed on the basis of the enterprise's internal documents such as financial statements, annual reports, sustainability reports, company statutes and articles of association, compliance policies, codes of ethics and publicly available information materials. In selected descriptions, the company information contained in the National Court Register of Companies was also used. The enterprise did not agree to have its business name published in this work.
2 This section was developed on the basis of the surveyed enterprise's internal documents such as quality policies, quality books, process maps, job descriptions, management reviews and others.

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Enterprise's internal documents such as financial statements, annual reports, sustainability reports, company statutes and articles of association, compliance policies, codes of ethics, quality policies, quality books, process maps, job descriptions, management reviews and others and publicly available information materials. In selected descriptions, the company information contained in the National Court Register of Companies was also used.

6 Verification of the quality cost accounting model in the assessment of the efficiency of the management systems in the selected service enterprise

6.1 The results of applying the model in the service enterprise under examination

This chapter presents the results of the research conducted in the selected service enterprise. The presentation's layout is compatible with the adopted empirical research procedure.

In the first step, a detailed analysis of the interviews with the enterprise's employees is conducted. The answers provided by the respondents are interpreted also by means of a coding table which characterised the enterprise based on the result obtained from the whole interview.

The next step is the presentation of the data entered in the quality cost estimation form together with subjective observations related to the course of preparations, as well as the presentation of the prepared quality cost model.

The presentation constituting the third stage comprises the results of the quality cost analysis in the form of a process matrix, a Pareto-Lorenz diagram, a forecast quality cost budget and quality cost ratios.

Finally, the authors attempt to critically evaluate the efficiency of the enterprise's management systems based on the obtained research results.

For the purposes of the research, in June 2020 the authors conducted an interview with the enterprise's financial director. An analysis of the director's answers to the questions asked in the course of the interview is presented below. The questions are compiled in Appendix 2.

The first two questions from block I (questions 1 and 2) concerned the process of developing the company's chart of accounts and its cost recording system. The respondent indicated that the chart of accounts had been adopted unchanged in the form of available templates and cost records were kept in a mixed system. Questions 3 and 4 aimed to obtain information on the enterprise's both main objective and short-term objective. The interviewee stated that the main realistically achievable objective was cost optimisation, while, in the ideological sphere, the company considered the provision of top-quality services to customers and ensuring their satisfaction as the primary objective. On the other hand, the organisation's short-term goal was profit maximisation. Asking question 5, the authors wanted to find out

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whether the enterprise's employees had sufficient enough knowledge of the processes for which they were responsible. In the financial director's opinion, all employees have sufficient knowledge of such processes, but it requires regular updating and appropriate training. Questions 6 and 7 addressed the issue of quality training and its frequency. The respondent confirmed that quality training courses were conducted periodically, once every five years.

In the first two questions of block II (questions 8 and 9), the respondent was asked to assess whether his organisation addressed quality cost issues and whether it took measures to improve quality. He stated that such issues were not dealt within the normal course of work, but they could be linked especially to one of the main processes, namely service. Furthermore, the company undertakes quality improvement measures (based on weekly coordination meetings where actions are identified to minimise and eliminate nonconformances and their effects, as well as to prevent their occurrence). Question 10 was of a filtering nature and concerned the issue of recording quality costs. The interviewee answered that such records were not kept. Consequently, questions 11 and 12 were omitted and the next question asked was question 13, which attempted to obtain information on the readiness of the Accounting Department to implement changes, including a quality cost recording system. The respondent stated that the Accounting Department was fully open and ready to adjust its bookkeeping system for the recording of quality costs. Questions 14 and 15 were to give answers about the centre responsible for the identification of quality costs, as well as about the possibilities of obtaining information on the size of these costs. In the respondent's opinion, both the project managers and the company management should be responsible for the identification of quality costs (costs of construction projects under implementation and overheads, respectively). Obtaining information on the size of quality costs will be possible especially on the basis of data from the Service and Automation Department (costs of service and warranty repairs). Questions 16 and 17 attempted to establish the sources of information on the enterprise's quality costs and whether the management had sufficient knowledge of quality costs generated by its processes. The respondent indicated that accounting documents and bookkeeping accounts were the main sources of information on quality costs, and also stated that the managers did not have sufficient knowledge of quality costs arising in the processes executed by the company.

The first question of block III (question 18) was a filtering question and concerned the issue of maintaining a quality cost accounting system in the organisation. Since the answer was negative – the company does not have such a system – questions 19 and 20 were skipped. Answering question 21 concerning the goals of quality costing, the interviewee said that, in his opinion, these were both cost optimisation and improving the efficiency of the company's management systems. Asking questions 22 and 23, the interviewer attempted to establish the impact of quality cost analysis on improving the efficiency of management systems and the existence of a relationship between

increasing expenditure on preventing poor quality and decreasing the costs of failures. The respondent stated that cost analysis had an impact on improving the efficiency of management systems and that he perceived a relationship between higher expenditure on preventing poor service quality and lower failure costs. Questions 24–26 were to identify the issue of optimising quality costs by managing service quality processes and whether the organisation prepared quality cost matrices and budgets, as well as quality cost reports. The respondent was aware of the impact of process management on quality cost optimisation. He also emphasised that his organisation did not prepare quality cost matrices, budgets or reports. Question 27 was omitted due to the negative answer to question 26 concerning the preparation of quality cost reports. The last two questions in block III and the entire interview (questions 28 and 29) were aimed at obtaining information on whether the enterprise had a comprehensive quality management system and learning the interviewer's opinion on the impact of quality costing on the efficiency of management systems. He confirmed that the enterprise had such a comprehensive system, which functioned satisfactorily but required further improvement in order to fully ensure the possibility of achieving the objectives included in the company's quality policy. Referring to question 29, the respondent indicated quality costing as one of the elements influencing the effectiveness of management systems.

The conducted interview allowed the authors to achieve the established objectives. The authors verified the enterprise's employees' level of knowledge of, and involvement in, quality cost accounting. The employees are rarely trained in the issues of quality (once every five years), and their knowledge of such issues requires improvement. The enterprise does not use a cost accounting system, but expresses full readiness and openness to new solutions in this regard. The issue of quality and process costs is well known. The organisation indicates that it is possible to identify and estimate the level of these costs, and it has a significant potential for implementing a quality cost accounting system.

The next step in the analysis of the research results is the presentation of the estimated quality cost form (Table 6.1), which was developed in cooperation with the enterprise's financial director and the Quality Management Department. The reporting period adopted for the purpose of identifying quality costs was 2019. The source documents used to calculate the amount of quality costs were the following:

- the general ledger,
- the payroll records,
- invoices (relating, among others, to the ISO management system certification audit, waste disposal, other services provided by external parties),
- the training plan,
- agreements entered into with customers, subcontractors, suppliers,
- the tendering and technical documentation,

Table 6.1 The enterprise's quality cost estimation for the year 2019

Name of process	*Name of cost*	*Type of cost*	*Amount of cost in 2019 [PLN]*	*Source document*	*Additional information*	*Name of quality cost*
Quality management	Costs of quality management system certification	Certification audit	15,430.00	General ledger	–	Appraisal costs
	Costs of internal audits	Salaries	9,322.40		Costs of two days' work of department managers responsible for preparing data for an audit; nine audits, one auditor	Appraisal costs
	Costs of the quality management department	Salaries	60,400.00		One employee	Prevention costs
Human resources management	Costs of employee training	OHS, subject-specific training	5,400.00	General ledger	Eight employees	Prevention costs
	Employee development costs	Employee benefits	11,880.00		Costs of English language courses	Prevention costs
	Costs of disciplinary dismissals and severance pay	Retirement severance pay	5,850.00		–	Other quality costs
	Other	Medical examinations	9,966.00		–	Prevention costs
Infrastructure and transport	Costs of vehicle, machinery and equipment technical inspections and tests	Maintenance, testing, insurance, GPS service	59,474.00	General ledger	–	Prevention costs

	Costs of repairs of vehicles, machines and equipment	All repair costs, cost of parts and garage employee salaries	242,038.00		Minor in-house repairs, major outsourced repairs	Internal failure costs
	Costs of waste	Costs of waste disposal	10,695.00		–	Internal failure costs
	IT system costs	All costs relating to IT infrastructure	97,971.00		–	Prevention costs
	Maintenance costs of head office, buildings and project execution facilities	All office and base maintenance costs, including energy costs, property tax, etc.	553,816.00		–	Prevention costs
	Costs of security	Outsourced services	148,920.00		–	Prevention costs
Tendering	Costs of ensuring and verifying the correctness of tenders/contracts/ technical documentation/ orders	–	187,640.00	General ledger	–	Prevention + appraisal costs
	Costs of repeated negotiations with customers	Salaries	120,000.00		Part of personnel costs of the Management Board, which is responsible for final price negotiations	Internal failure costs
Contract performance	Costs of verifying compliance with the work schedule	–	3,753.80	General ledger	–	Appraisal costs
	Costs of purchase of measurement tools	–	4,284.00		–	Appraisal costs

(Continued)

Name of process	*Name of cost*	*Type of cost*	*Amount of cost in 2019 [PLN]*	*Source document*	*Additional information*	*Name of quality cost*
	Costs of preparing as-built documentation	–	123,940.00		–	appraisal costs
	Costs of ensuring appropriate conditions for contract performance	Costs of backup facilities	141,696.00		–	prevention costs
	Costs of assessing conformance of the quality of delivered services (performed contract) with applicable requirements	Costs of the site manager's work	593,052.00		–	appraisal costs
Service	Costs of inspections of installations	–	24,339.70	General ledger	Varying number of inspections depending on construction projects, e.g. 45 inspections in 2019	Prevention costs
	Service costs	–	67,610.27		–	External failure costs
	Warranty repair costs	–	322,625.00		–	External failure costs
	Costs of complaints handling	–	19,484.40		–	External failure costs
	Costs of verifying efficiency of installations	–	197,422.00		Start-ups	Appraisal costs
	Costs of checks and calibration of instruments	–	4,098.00		–	Appraisal costs
	Costs of measurements after repairs/service	–	69,097.70		–	external failure costs

Purchasing and inventory	Costs of monitoring the supplier/subcontractor market	Salaries	57,600.00	General ledger	Part of the department manager's salary	prevention costs
	Costs of delivery inspections	Salaries	65,720.00		Salaries of one purchasing department employee and contract managers	Appraisal costs
	Costs of measurement and evaluation of suppliers/ subcontractors	Salaries	4,328.67		Working day of key employees responsible for cooperation with suppliers and subcontractors	Appraisal costs
	Costs of additional deliveries to eliminate deficiencies	–	9,568.00		Cost of monitoring inventory levels and processing orders	Internal failure costs
	Costs of additional tests and checks	Costs of stocktaking	423.90		–	Internal failure costs
Design	Costs of preparing a design (drawing + description)	Salaries	165,000.00	General ledger	Two employees working throughout the year	Prevention costs
	Costs of verifying correctness of design	Salaries	30,000.00		Salary of the department manager	Appraisal costs

Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

(Continued)

- projects (drawings and descriptions),
- the register of complaints,
- the register of service requests and conducted tests/measurements,
- warranty cards,
- technical and testing reports,
- installation inspection reports,
- equipment inspection and calibration reports,
- stocktaking reports,
- order lists,
- occupational medicine documents.

The developed quality cost estimation form constituted the basis for the allocation of the identified quality costs to the particular quality cost categories of the proposed quality cost accounting model. The result of this allocation was schemes of the quality cost structure, which are presented in Tables 6.2–6.5.

Collected and presented in Tables 6.2–6.5, all quality costs of the enterprise under discussion were used to prepare a list of these costs in the successive phases of process implementation (Table 6.6) and a pie chart (Figure 6.1).

The analysis of the amounts of quality costs and their allocation to the individual process phases allows for the drawing of the following conclusions. The service delivery phase is responsible for generating the most quality costs (43.25%). Almost a quarter of all quality costs in the analysed organisation arise in either the sales phase (23.49%) or the procurement (23.05%) phase. The planning phase accounts for 10.21% of quality costs. The costs of internal failures appear in all process phases, with the exception of the sales phase, while the costs of external failures arise only in the sales phase. The remaining quality costs occur only in the planning phase. The largest group of quality costs is the costs of prevention. Identifying the processes generating the most quality costs required the use of the previously presented output data in the form of a spreadsheet (Table 6.1) and the tables of quality cost structures (Tables 6.2–6.5). Based on the collected information, a process matrix of quality costs was created (Table 6.7).

From the analysis of the quality cost matrix, it can be concluded that the level of these costs in the organisation for the year covered by the research, i.e. 2019, amounted to almost PLN 3.443 million. 41.54% is the costs of prevention (PLN 1.430 million), 33.26% the costs of evaluation (PLN 1.145 million), 13.91% the costs of external failures (almost PLN 479,000), 11.12% the costs of internal failures (almost PLN 383,000) and the remaining quality costs only 0.17% (PLN 5,850).

The analysis of the matrix also allows for the conclusion that the most quality costs are incurred by the core processes (54.58%) and auxiliary processes (42.95%). The highest costs in the core processes arise in connection with contract performance (nearly PLN 867,000) and service (nearly PLN 705,000) activities. As regards the auxiliary processes, the source of quality costs is the process of infrastructure and transport (almost PLN 1.113 million).

Table 6.2 The researched enterprise's quality costs structure – the planning phase

Category of quality costs from the model	*Category of quality costs from the enterprise*	*Value [PLN]*
Prevention costs		*74,686.00*
Ensuring efficient organisation of the employees/team/department responsible for quality	Costs of the quality management department	60,400.00
Training employees responsible for quality assurance	– Costs of employee training – Employee development costs	4,320.00
Examining consumer preferences (on the whole market)	–	–
Designing and developing the service delivery process as well as the planning, monitoring and supervising system	–	–
Implementation costs connected with obtaining quality certificates (costs of consultations, preliminary audits, implementation and licences)	–	–
Other	Costs of medical examinations	9,966.00
Appraisal costs		*29,036.40*
Consultations regarding the course of audits, internal expert opinions and quality audits	–	–
Costs of maintaining quality certificates (annual fees and costs of annual audits)	– Costs of quality management system certification – Costs of internal audits	24,752.40
Costs of purchasing and maintaining equipment for measurement, inspection and testing	Costs of purchase of measurement tools	4,284.00
Other	–	–
Internal failure costs		*242,038.00*
Repair of measuring and control equipment	Costs of repairs of vehicles, machines and equipment	242,038.00
Other (e.g. repair of errors identified in process projection, use of external support)	–	–
External failure costs		*0.00*
Other (e.g. repair of errors resulting from inappropriate activities of an external consultant, additional costs of supervising the planning and design process)	–	–
Other quality costs		*5,850.00*
Other	Costs of disciplinary dismissals and severance pay	5,850.00
Total		**351,610.40**

Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

Table 6.3 The researched enterprise's quality costs structure – the procurement phase

Category of quality costs from the model	*Category of quality costs from the enterprise*	*Value [PLN]*
Prevention costs		*713,707.00*
Ensuring efficient organisation of the employees/team/department responsible for procurement (e.g. recruitment process for those responsible for procurement)	– IT system costs – Maintenance costs of head office, buildings and project execution facilities	651,787.00
Training employees responsible for procurement	– Costs of employee training – Employee development costs	4,320.00
Supplier analysis and selection	–	–
Costs of supplier market monitoring, market assessments	Costs of monitoring the supplier/subcontractor market	57,600.00
Other	–	–
Appraisal costs		*70,048.67*
Checks and inspections of deliveries	Costs of delivery inspections	65,720.00
Measurement and evaluation of critical parameters of the procurement process (suppliers, quality of supplies and monitoring system)	Costs of measurement and evaluation of suppliers/ subcontractors	4,328.67
Other	–	–
Internal failure costs		*9,991.90*
Additional deliveries to eliminate shortages	Costs of additional deliveries to eliminate deficiencies	9,568.00
Repair or replacement of supplies due to their insufficient quality	–	–
Other (e.g. use of external consultants to rectify errors arising in the supplies quality monitoring systems, additional checks after correcting errors)	Costs of stocktaking	423.90
External failure costs		*0.00*
Repair costs of delivered services (additional supplies resulting from inadequate quality of provided services)	–	–
Additional tests and checks following the correction of errors	–	–
Unplanned downtime and time required for repair	–	–
Other	–	–
Other quality costs		*0.00*
Total		**793,747.57**

Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

Table 6.4 The researched enterprise's quality costs structure – the service delivery phase

Category of quality costs from the model	*Category of quality costs from the enterprise*	*Value [PLN]*
Prevention costs		*637,569.70*
Maintenance, inspections, repairs (e.g. of equipment, storage areas)	– Costs of vehicle, machinery and equipment technical inspections and tests – Costs of security – Costs of inspections of installations	232,733.70
Ensuring appropriate conditions for the provision of the service	– Costs of project preparation – Costs of ensuring the correctness of tenders/contracts/technical documentation/orders – Costs of backup facilities	400,516.00
Training employees responsible for service delivery	– Costs of employee training – Employee development costs	4,320.00
Other	–	–
Appraisal costs		*720,625.80*
Quality control of the service during its performance	– Costs of verifying correctness of design – Costs of verifying compliance with the work schedule	33,753.80
Appraisal of the conformance of the quality of the provided service with the applicable requirements	– Costs of verifying the correctness of tenders/contracts/technical documentation/orders – Costs of the site manager's work	686,872.00
Other	–	–
Internal failure costs		*130,695.00*
Elimination of failures arising during the course of service delivery	–	–
Breakdowns and downtime	–	–
Corrections and rework (e.g. replacing the subcontractor during the course of service delivery)	Costs of repeated negotiations with customers	120,000.00
Other (e.g. costs of scrapping equipment used to provide the service)	Costs of waste disposal	10,695.00
External failure costs		*0.00*
Correction of badly delivered services	–	–
Repeat inspection of corrected services	–	–
Repeat assembly at the customer's premises	–	–
Correction of errors resulting from poor information on the service	–	–
Other	–	–
Other quality costs		*0.00*
Total		**1,488,890.50**

Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

Table 6.5 The researched enterprise's quality costs structure – the sales phase

Category of quality costs from the model	*Category of quality costs from the enterprise*	*Value [PLN]*
Prevention costs		*4,320.00*
Examining the preferences of existing and potential customers	–	–
Ensuring efficient organisation of the employees/team/department responsible for sales and distribution (e.g. recruitment process for those responsible for sales and distribution)	–	–
Training employees responsible for sales and distribution	– Costs of employee training – Employee development costs	4,320.00
Ensuring appropriate conditions for the provision of the service	–	–
Ensuring good quality of contacts with customers	–	–
Other	–	–
Appraisal costs		*325,460.00*
Verification of consistency of the service sales documents with the customer's order	–	–
Appraisal of the quality of promotional activities	–	–
Checks and inspections of the employees/team/department responsible for sales and marketing as well as appraisal of the quality of their work	–	–
Quality checks after the service has been performed	– Costs of verifying efficiency of installations – Costs of checks and calibration of instruments	201,520.00
Other	Costs of preparing as-built documentation	123,940.00
Internal failure costs		*0.00*
Correction of quality failures in the organisation of the employees/team/department responsible for sales and marketing	–	–
Additional checks after correction of errors	–	–
Other (e.g. correction of errors resulting from inadequate quality of promotional campaigns)	–	–
External failure costs		*478,817.37*
Handling of returns, complaints and claims	Costs of warranty repairs	19,484.40

Costs of non-performed services (e.g. contractual penalties)	–	–
Costs of the repeat delivery of the service	– Service costs – Warranty repair costs	390,235.27
Other	Costs of measurements after repairs/service	69,097.70
Other quality costs	–	–
Total		**808,597.37**

Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

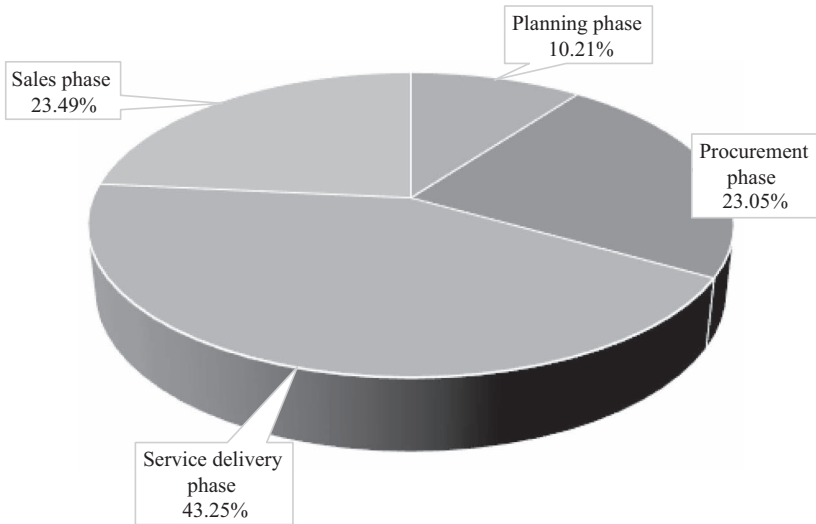

Figure 6.1 The share of quality costs in the enterprise's individual process phases
Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

The organisation's managerial processes, i.e. the group of quality management processes, account for 2.47% of all quality costs (PLN 85,000). In conclusion, it should be noted that the most important processes in the enterprise under study are contract performance, service, as well as infrastructure and transport. Their costs constitute approximately 78% of all quality costs.

All quality costs identified in the enterprise are collected and arranged in appropriate categories in Table 6.8.

Such a structure of quality costs in the organisation is determined by its processes that serve to achieve the main objective, which is the provision of plumbing, heating, gas and air conditioning installation services, as well as construction services that ensure customer satisfaction.

Table 6.6 Amounts of quality costs in the researched enterprise

	Prevention costs	*Appraisal costs*	*Internal failure costs*	*External failure costs*	*Other quality costs*	*Total [PLN]*	*% share*
Planning phase	74,686.00	29,036.40	242,038.00	0.00	5,850.00	351,610.40	10.21
Procurement phase	713,707.00	70,048.67	9,991.90	0.00	0.00	793,747.57	23.05
Service delivery phase	637,569.70	720,625.80	130,695.00	0.00	0.00	1,488,890.50	43.25
Sales phase	4,320.00	325,460.00	0.00	478817.37	0.00	808,597.37	23.49
Total	1,430,282.70	1,145,170.86	382,724.90	478817.37	5,850.00	3,442,845.84	100.00

Source: The author's own work on the basis of the internal documents of the enterprise under analysis.

Table 6.7 The researched enterprise's quality cost process matrix

Quality costs	*Core (operational) processes*	*Managerial (strategic) processes*	*Auxiliary processes*	*Total [PLN]*	*Share of the particular quality cost categories in the quality cost structure [%]*
Prevention costs	259,855.70	60,400.00	1,110,027.00	1,430,282.70	41.54
Appraisal costs	1,020,369.80	24,752.40	100,048.67	1,145,170.86	33.26
Internal failure costs	120,000.00	–	262,724.90	382,724.90	11.12
External failure costs	478,817.37	–	–	478,817.37	13.91
Other quality costs	–	–	5,850.00	5,850.00	0.17
Total	1,879,042.87	85,152.40	1,478,650.57	3,442,845.84	100.00
Share of the particular processes in the structure of quality costs [%]	54.58	2.47	42.95	100.00	

Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

Table 6.8 The typology of the enterprise's quality costs

Conformance costs	
Prevention costs	*Appraisal costs*
– Costs of the quality management department – Costs of employee training and development – Costs of medical examinations – IT system costs – Maintenance costs of head office, buildings and project execution facilities – Costs of monitoring supplier and subcontractor markets – Costs of vehicle, machinery and equipment technical inspections and tests – Costs of security – Costs of inspections of installations – Costs of project preparation – Costs of ensuring the correctness of tenders, contracts, technical documentation, orders – Costs of backup facilities	– Costs of quality management system certification – Costs of internal audits – Costs of purchase of measurement tools – Costs of delivery inspections – Costs of measurement and evaluation of suppliers and subcontractors – Costs of verifying correctness of design – Costs of verifying compliance with the work schedule – Costs of verifying the correctness of tenders, contracts, technical documentation, orders – Costs of the site manager's work – Costs of verifying efficiency of installations – Costs of checks and calibration of instruments – Costs of preparing as-built documentation
Nonconformance costs	
Internal failure costs	*External failure costs*
– Costs of repairs of vehicles, machines and equipment – Costs of additional deliveries to eliminate deficiencies – Costs of stocktaking – Costs of repeated negotiations with customers – Costs of waste disposal	– Costs of warranty repairs – Service costs – Warranty repair costs – Costs of measurements after repairs and service
Other quality costs	
Costs of disciplinary dismissals and severance pay	

Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

The next stage in the presentation of research results is a review of the largest group of quality costs and irregularities in the form of a Pareto-Lorenz diagram. Due to the fact that prevention costs constitute the largest share (41.54%) in all processes, they required a separate analysis. Its results are presented in Figure 6.2.

The most important conclusions drawn from the analysis of the prevention cost diagram include the dominant share of the premises and buildings

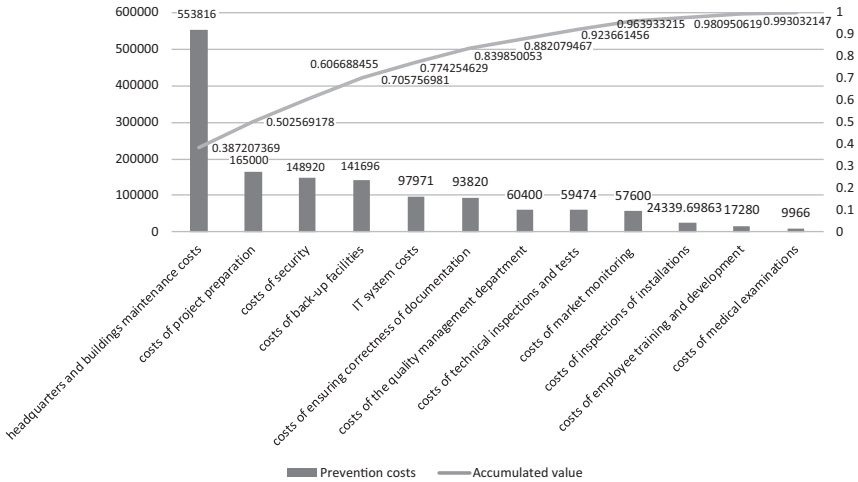

Figure 6.2 A Pareto-Lorenz diagram of the enterprise's prevention costs
Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

maintenance costs (almost 39%), which together with project preparation costs, security costs, backup facility costs, IT system costs and costs of ensuring documentation correctness constitute 83.99% of all prevention costs. The costs of the quality management department, technical inspections and tests, as well as the costs of market monitoring, together with the previously mentioned items, make up 96.39% of prevention costs. The remaining cost items (installation inspections, employee training and development, medical examinations) do not have a significant impact on the entire structure of these costs.

An analysis of irregularities occurring in the enterprise was also carried out in the form of a Pareto-Lorenz diagram. The diagram with the obtained results is presented in Figure 6.3.

The enterprise registered 94 service requests during the analysed period (2019), which gives an average of 0.26 requests per day. The most problems concerned ventilation systems (38), road works (13), water and sewage installations (12), as well as fire protection systems (9). Together they account for 76.6% of all diagnosed notifications. The remaining items do not have a significant impact on the overall structure of irregularities. It is important to emphasise that the number of complaints in 2019 demonstrates the low failure rate and high quality of the services provided by the enterprise.

The quality costs estimated in the process matrix, as well as the financial data from the company's annual report for 2019, allowed for the performance of a subsequent research stage, i.e. a ratio analysis of quality costs. The calculated values of the ratios are collected in Table 6.9.

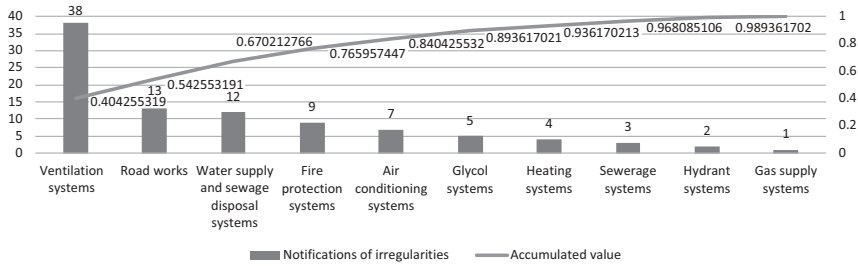

Figure 6.3 A Pareto-Lorenz diagram of the enterprise's irregularities
Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

Table 6.9 A ratio analysis of the enterprise's quality costs

Ratio	*Value of ratio (%)*
Quality costs to total costs	4.35
Conformance costs to quality costs	74.81
Nonconformance costs to quality costs	25.02
Prevention costs to quality costs	41.54
Appraisal costs to quality costs	33.26
Internal failure costs to quality costs	11.12
External failure costs to quality costs	13.91
Other quality costs to total quality costs	0.17
Number of nonconformances to quality costs	0.0027
Quality costs to sales revenues	4.48
Quality costs to net profit	−178.00
Nonconformance costs to net profit	−44.54
Quality costs to operating costs	4.40

Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

The most important conclusions drawn from the ratio analysis are the following:

- a very low share (4.35%) of quality costs in the total costs of the researched organisation, as well as in operating costs (4.40%), which may result from the wide range of subcontracting within its processes,
- a 74.81% share of conformance costs in quality costs means that great importance is attached to actions aimed at preventing the occurrence of irregularities,
- nonconformance costs constitute ¼ of all quality costs, which indicates a large number of errors in the executed processes,
- the costs of external failures (13.91%) are larger than the costs of internal failures (11.12%),

- other quality costs (0.17%) are of marginal significance in the quality cost structure,
- the costs of quality equal 4.48% of the enterprise's revenue from sales and do not have a significant impact on its financial results,
- the negative values of the ratios of quality costs to net profit (−178%) and nonconformance costs to net profit result from the company's net loss for the year under examination and mean that there is no relation between these elements,
- the ratio of the number of nonconformances to incurred quality costs is very low (0.0027%), which may indicate that the actual service requests have a very small impact on total quality costs.

Summing up the ratio analysis, it should be emphasised that the organisation has a very low share of quality costs in total costs incurred in the period under examination. This may result from the large number of operations outsourced to subcontractors, to whom a large portion of responsibility for quality is transferred, which is evidenced by the high level of external services in the enterprise's total costs. The structure of quality costs reflected in the aforementioned ratios confirms the management team's commitment to activities aimed at preventing the occurrence of irregularities. A 25% share of failure costs should be a warning signal for the enterprise. It will be necessary to take measures to optimise these costs. Processes in enterprise under analysis are executed in a way that allows the control of their quality and efficiency. The diagnosed significant share of the costs of irregularities may generate additional costs, which in consequence will influence the organisation's bottom line and image.

On the basis of the calculated values of quality costs and assuming a 5% increase in costs, a forecast quality cost budget was prepared for the year 2020 (Table 6.10). According to this forecast, in 2020 quality costs would amount to PLN 3,614,988.

Table 6.10 A process budget of quality costs enterprise for the year 2020

#	*Forecast quality costs*	*Core processes*	*Managerial processes*	*Auxiliary processes*	*Total [PLN]*
1	Forecast prevention costs	272,848	63,420	1,165,528	1,501,797
2	Forecast appraisal costs	1,071,388	25,990	105,051	1,202,429
3	Forecast internal failure costs	126,000	—	275,861	401,861
4	Forecast external failure costs	502,758	—	—	502,758
5	Forecast other quality costs	—	—	6,143	6,143
6	**Total**	1,972,995	89,410	1,552,583	3,614,988

Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

The quality cost budget may be an additional tool for controlling these costs in longer periods of time. By analysing the deviations of actual quality costs from their planned values, it is possible to verify the forecasts of their occurrence and to include drawn conclusions in subsequent quality cost reports. Using this management accounting tool skilfully will optimise a considerable part of nonconformance costs in the enterprise under analysis and positively influence their structure.

The final stage of the presentation of the research results is an evaluation of the efficiency of the enterprise's management systems prepared on the basis of the used and analysed elements of the quality cost accounting system. In order to achieve the set objective, it was necessary to collect and organise all results obtained from the conducted empirical research. The overall results of the evaluation are presented in Table 6.11.

The analysis of all areas of quality cost accounting presented in the table of results allows for the conclusion that the management system of the enterprise under examination functions efficiently. It is confirmed by the results of the conducted analysis of quality costs. In the structure of quality costs, those concerning conformance dominate over the costs of nonconformance and other quality costs. Quality costs arise mainly in the enterprise's core processes such as contract performance and service, as well as auxiliary processes, particularly infrastructure and transport. The conducted ratio analysis reveals a high share of prevention and appraisal costs in quality costs. It is necessary to pay special attention to the level of external and internal failure costs, which constitute ¼ of all costs related to quality. Their potential increase in the following years will show the enterprise's worsening efficiency. What surprises is the very low ratios of quality costs to total costs and quality costs to operating costs, which may indicate that a large part of the processes is outsourced (subcontracted) or the enterprise does not attach particular importance to the issue of quality. The analysis of prevention costs allowed the authors to identify the most important costs in this group, which are closely related to the execution of the core processes of the organisation under analysis.

The efficiency of the management system is at a satisfactory level. This is confirmed by the information obtained during the course of a management review and concerning positive audit results, a satisfactory level of process metrics and the degree of their execution, as well as achieved quality objectives. The perception of the efficiency of the quality management system is also influenced by the results of the customer satisfaction survey, which are acceptable, indicating that the requirements of service recipients are met. The enterprise considers references received after completed contracts as an additional indicator of the degree of customer satisfaction. Such references were successfully obtained from several customers. As a result of conducted audits and management reviews, the enterprise identified two nonconformances and 15 observations. The results obtained for the quality management system are good, but – as emphasised by the organisation itself – the system still requires improvement in order to fully ensure the possibility of fulfilling the principles adopted in the quality policy.

Table 6.11 The results of the evaluation of the efficiency of the enterprise's management systems carried out with the use of quality costing

Evaluation area	*Model element*	*Obtained results*	*Conclusions*	*Assessed efficiency of the management systems*
Quality cost accounting	Quality cost structure	Prevention costs 41.54%, assessment costs 33.26%, internal failure costs 11.12%, external failure costs 13.91%, other quality costs 0.17%	In the structure of quality costs, conformance costs prevail, which is a very favourable and desirable phenomenon. Constituting 25% of all costs, nonconformance costs should draw the attention of the company and contribute to undertaking measures aimed at their optimisation.	High level
	Share of quality costs in individual process phases	Service delivery phase 43.25%, procurement phase 23.05%, sales phase 23.49%, planning phase 10.21%	The main source of quality costs is the service delivery phase. Almost half of all quality costs arise in the phases of procurement and sales. The remaining quality costs are of marginal significance and appear only in the planning phase.	Medium level
	Process matrix	Quality costs in: core processes (54.58%), auxiliary processes (42.95%) and managerial processes (2.47%)	More than half of all quality costs arise in the core processes (54.58%), and these are mainly the processes of contract performance and service. Almost 43% of quality costs are generated by the auxiliary processes (especially infrastructure and transport), and only 2.47% of these costs arise in the managerial processes	Medium level

(*Continued*)

Evaluation area	*Model element*	*Obtained results*	*Conclusions*	*Assessed efficiency of the management systems*
	Pareto-Lorenz diagram of prevention costs	Prevention costs consist of the following: costs of maintenance of the headquarters and buildings (almost PLN 554,000), project preparation costs (PLN 165,000), security costs (PLN 149,000), backup facility costs (PLN 142,000), IT system costs (PLN 98,000), costs of ensuring correctness of documentation (PLN 94,000), costs of the quality management department (PLN 60,400), costs of inspections and technical tests (PLN 59,474), costs of market monitoring (PLN 57,600), costs of installation inspections (PLN 24,400), costs of employee training and development (PLN 17,280) and costs of medical examinations (PLN 10,000).	The biggest impact on the amount of prevention costs is exerted by the costs of maintenance of the premises and buildings (38.72%). Together with the project preparation costs, security costs, backup facility costs, IT system costs and costs of ensuring documentation correctness, they constitute 83.99% of quality costs. These costs ensure the execution of the organisation's key processes and the provision of service of the highest quality. The high share of prevention costs in the most important processes is a desirable phenomenon.	High level

Pareto-Lorenz diagram of irregularities	Number of irregularities: ventilation 38, road works 13, water and sewage installation 12, fire protection installation 9, air conditioning 7, glycol installation 5, heating 4, sewerage 3, hydrant installation 2, gas installation 1. On average 0.26 requests per day	The majority of irregularities concerned ventilation, road works, as well as water and sewage installations. The low total number of complaints proves the high quality of delivered services	High level
Quality cost ratios	Quality costs to total costs = 4.35%	A very low ratio of the enterprise's quality costs to total costs	Very low level
	Conformance costs to quality costs = 74.81%	A high share of conformance costs in quality costs is a positive phenomenon	High level
	Nonconformance costs to quality costs = 25.02%	A 25% share of nonconformance in quality costs proves numerous irregularities occurring in the processes	High level
	Prevention costs to quality costs = 41.54%	A high level of prevention costs confirms that the enterprise conducts a large number of prevention activities, which results in a low level of failure costs	Medium level
	Appraisal costs to quality costs = 33.26%	A high share of appraisal costs confirms the enterprise's involvement in control activities, which is a positive phenomenon	Low level
	Internal failure costs to quality costs = 11.12%	A more than 11% share of costs of internal errors in quality costs confirms the occurrence of irregularities in the enterprise's processes	Very high level

(*Continued*)

Evaluation area	*Model element*	*Obtained results*	*Conclusions*	*Assessed efficiency of the management systems*
		External failure costs to quality costs = 13.91%	A 13.91% share of external failure costs in quality costs confirms the occurrence of numerous irregularities after a service has been provided to the customer	Very high level
		Other quality costs to total quality costs = 0.71%	A marginal significance of the share of other quality costs in total quality costs	Very high level
		Number of nonconformances to quality costs = 0.0027%	A very low ratio of the number of nonconformances to total quality costs is a desirable phenomenon	Very high level
		Quality costs to sales revenues = 4.48%	Quality costs do not have a significant impact on sales revenues	Very high level
		Quality costs to net profit = –178.00%	The negative value of the ratio results from the enterprise's net loss for the period; there is no relation between quality costs and net profit	Very low level
		Nonconformance costs to net profit = –44.54%	A negative value of the ratio results from the enterprise's net loss; the generated loss does not secure the costs resulting from irregularities	Very low level
		Quality costs to operating costs = 4.40%	A very low share of quality costs in operating costs indicates that they are not important in the enterprise's operating activities	Very low level

Source: The authors' own work on the basis of the internal documents of the enterprise under analysis.

To sum up, the quality cost accounting system and the results of its implementation may support the appraisal of the efficiency of the researched enterprise's management system, indicating the most costly processes and identifying the level of incurred quality costs. Using all information provided by the quality costing system, it is possible to undertake cost (especially the costs of internal and external failures) and process (in particular: infrastructure and transport, contract implementation, service) optimisation measures that may contribute to improving the efficiency of the organisation's management system.

6.2 The possibilities and directions of using the model in assessing the efficiency of management systems in the selected service enterprise

As part of the empirical research, a testing session of the developed quality cost accounting model was conducted. An analysis of the use of the individual elements of the model in the researched enterprise is presented in Table 6.12.

The elements of the tested model that were applied in the examined enterprise are the following: a procedure of quality cost accounting, a division of processes and their identification, sources of information on quality costs, a quality cost estimation form, a structure and typology of quality costs, a quality cost analysis, a process matrix and a process budget of quality costs, a

Table 6.12 An analysis of the use of the elements of the tested model of quality cost accounting in the enterprise under analysis

Model element	*Enterprise under analysis*
Quality cost accounting procedure	✓
Division and identification of processes	✓
Sources of information on quality costs	✓
Quality cost estimation form	✓
Quality cost accounts in sets 4 and 5	✗
Recording of quality costs in the accounting system	✗
Quality cost structure	✓
Typology of identified quality costs	✓
Analysis of quality costs	✓
Process matrix of quality costs	✓
Process budget of quality costs	✗
Analysis of quality cost deviations in the process budget	✓
Pareto-Lorenz diagram used in data analysis	✓
Ishikawa diagram used for identifying problem areas	✗
Ratio analysis of quality costs	✓
Quality cost report	✓
Assessment of management system efficiency	✓

Source: The authors' own work.

Pareto-Lorenz diagram, a ratio analysis of quality costs, a report on quality costs and an assessment of management system efficiency.

The presented model of quality cost accounting allowed the enterprise to formulate general statements concerning its quality costs, identify and estimate the size of the largest possible number of potential quality costs, indicate the processes and process phases where the most quality costs are incurred, precisely identify the elements forming the largest group of quality costs and the causes of irregularities, conduct a multidimensional analysis of quality costs and an assessment of the impact of quality costs on the efficiency of its entire management system.

The developed model of quality cost accounting is dedicated to service enterprises, which have not had a specialist and universal quality costing and whose importance in the economy should not be underestimated. It provides guidelines on how to implement a quality cost accounting system and how to conduct it effectively in organisations that have implemented a quality management system and use a full bookkeeping system. The purpose of maintaining a quality cost accounting system is to obtain economic information on quality costs incurred in the processes executed by a given enterprise. The undertaken research confirms that the use of quality cost accounting in service organisations makes sense and brings benefits in the form of identifying the level of quality costs, information on the structure of these costs and its analysis, indicating the processes and process phases generating the most quality costs and requiring optimisation measures, identifying the largest group of quality costs and the reasons for occurring irregularities, forecasting a quality cost budget, reporting on quality costs and supporting the assessment of the efficiency of management systems.

Quality costs are a difficult and troublesome subject because in the typical arrangements of costs for financial accounting purposes presented in the profit and loss account, they are not recognised or estimated. Therefore, their identification provides additional financial information that can be used in organisational performance management and decision-making.

An analysis of a quality cost structure may provide answers to the following questions: Which of the costs incurred by the organisation are quality costs? Is the structure dominated by conformance costs, nonconformance costs or maybe other quality costs? Is the level of nonconformance costs not too high? Are prevention costs and appraisal costs at an appropriate level?

Quality costs are "hidden" in the processes implemented by service enterprises, so the use of quality costing allows them to obtain information on the amount of quality costs incurred in the particular core, auxiliary and managerial processes, as well as in the individual process phases. Identifying the processes generating the most quality costs is an additional benefit that can be used during management reviews as a supplement to, and a support for, an assessment of the efficiency of management systems. Any additional knowledge about the level of costs, places where they arise and occurring

errors allows for a more efficient management of costs and processes, and may also affect the more effective management of the entire enterprise.

A ratio analysis of quality costs makes it possible to check relationships among individual groups of these costs, as well as their influence on the most important elements of the profit and loss account, i.e. generated revenues, incurred costs and net profit. Conclusions from this analysis will constitute a valuable complement to a report on quality costs that, in its entirety, can be an important document supporting and extending a management review prepared by the quality management system officer.

An analysis of the largest group of quality costs and causes of irregularities indicates the sources of major cost items and the areas of nonconformances that require measures aimed at improving the efficiency of their management.

An additional plane of application of this model is using the proposed quality cost accounting system in the preparation of a quality cost budget. Drawing up such a budget and analysing deviations of quality costs may improve the efficiency of their control in the long-term perspective.

The authors noted that the catalyst for the selected enterprise to participate in the research project had been its willingness to learn about the new management tool, as well as to identify quality costs and estimate their amount, which could indicate that this type of cost accounting is awaited in service enterprises. The employees of the organisation under analysis were aware of the existence of costs related to the quality of their services in the processes executed by their enterprise, but they had not made attempts to record them. Proposals for supplementary training on the implementation and operation of a quality cost accounting system met with great interest, which may indicate the demand for such services. External expert consultancy may be an additional source of information that will allow managers to effectively use this tool supporting the assessment of the effectiveness of management systems in service enterprises.

The proposed quality costing model has a chance of success, as it allows for the identification and estimation of quality costs using existing human resources after their appropriate training. The application of this model also has a positive impact on the creation of an atmosphere of cooperation among departments, teams and employees working on the implementation of its subsequent stages. Involving employees in such an implementation project will contribute to raising their awareness of quality issues, as well as improving the entire organisation.

Potential benefits also include the systematisation of the management of quality processes and costs, and thus the formation of a proactive approach to the organisation's overall efficiency and the management of the quality of services provided by it. Identifying as many quality-related costs as possible will allow ineffective activities to be managed more efficiently.

The authors recommend integrating this model with other quality tools used in an enterprise, its bookkeeping system, management reviews and related reports, as well as internal and external audits. The results of analyses

and conclusions included in a report on quality costs constitute an input for further analyses.

The presented benefits of using a quality cost accounting system in a service company demonstrate the advisability of conducting further research on this model. It is a starting point for conducting a broader discourse, both academic and practical.

6.3 Limitations of the use of the model in assessing the efficiency of the management systems in the selected service enterprise

Conducting the research on the proposed model of quality costing in the selected service enterprise, the authors encountered some problems that resulted from the organisation's policies and its specificity. An important determinant of the success of applying this model is an organisation's maturity that manifests itself in effectively implemented quality management systems, a full bookkeeping system, employees' awareness of quality-related costs, as well as openness to cooperation with research institutes and providing them with necessary data (including sensitive ones). An analysis of the internal documents of the enterprise participating in the research (such as its quality policy, quality book, process map, articles of association, annual reports, job descriptions, management review reports and others) allowed the authors to conclude that service organisations execute very diverse and specific processes whose understanding is crucial for the identification of quality costs. Not having full information about such processes and nonconformances occurring in them results in problems with estimating these costs.

Another limitation is the lack of adequate legal regulations obliging enterprises to use quality costing systems. As such systems are implemented on a voluntary basis, the majority of enterprises do not attempt to keep records of their quality costs. Consequently, quality costs are not recorded in any way on separate accounts in the accounting systems of service organisations. Attempts to add quality cost accounts to charts of accounts meet with great resistance on the part of accounting departments, for which this is an unnecessary activity. Such opposition is the result of insufficient substantive preparation of the employees of service organisations in the field of quality cost accounting. The lack of specialist training courses results in employees' low awareness of quality costs and influences the biased thinking that their identification and estimation require a continuously large amount of time, which results in their unwillingness to participate in attempts to locate them in particular processes executed by their organisations. As a consequence, estimates of quality costs may be very much inaccurate. A similar effect will arise as a result of the top management's unwillingness to disclose sensitive data for the purpose of carrying out reliable research, or when access to such data is selective and aimed at projecting possibly the most favourable image of the enterprise. The reluctance of managers to take proactive implementation

measures is the result of their low awareness of quality costs incurred by their organisations. Ignoring this problem means depriving the enterprise of the possibility to obtain more exhaustive information on its financial position, and thus to manage it more efficiently.

Another problem is assigning the same quality cost items to different groups of processes or process phases. It is the result of a considerable process and service diversity of the surveyed organisations. Classifying the same costs in different groups of processes or process phases makes it difficult to compare the shares of quality costs in particular groups among the enterprises under analysis.

Another limitation is related to establishing the most reliable budget assumptions and factors (inflation, interest rates, taxes, etc.) having a real impact on quality costs in a simulation of a budget of these costs for the next period. A failure to take into account all essential variables will result in an unreliable quality cost budget. The incremental budgeting method applied in the research is justified only for such economic quantities whose level obtained in the past can be considered reasonable. The lack of full information about actually incurred quality costs will make it impossible to prepare a reliable budget of these costs.

Carrying out the analysis of quality cost deviations was impossible because the researched enterprise had never prepared a process budget of quality costs before, so it did not have any data on forecast quality costs that could be compared with factual data. If an enterprise does not implement a quality cost accounting system and does not use it on a continuous basis, it will not be able to analyse deviations of quality costs.

An important problem during the empirical research was also the establishment of a reliable scale for the assessment of the efficiency of the enterprise's management system based on the results of the conducted analyses. For each evaluated element of the quality cost accounting system, the authors adopted metrics that, in their opinion, had the greatest influence on the items under analysis. In the case of such elements as a structure of quality costs, a share of quality costs in individual process phases and a process matrix or Pareto-Lorenz diagrams of prevention costs and failure costs, it was possible to indicate several metrics (e.g. in the quality cost structure: nonconformance costs and other quality costs). However, these would be quantities causing the same effect on the scale of assessing the efficiency of management systems, so they would duplicate the adopted assessment.

There were also some problems of minor importance, for example:

- adopting a too subjective approach to the identification of quality costs,
- assigning an estimated quality cost to the proper category,
- indicating incorrectly the true level of irregularities,
- interpreting some results obtained in the ratio analysis of quality costs,
- integrating the results of quality cost analyses with the management review reports.

The organisational limitations of using the presented quality cost accounting system in service enterprises include high labour intensity and long periods of time necessary for its implementation, however, its subsequent systematic operation does not require such significant expenditure of labour and time.

In conclusion, the analysed service enterprise has a sufficient basis (a full bookkeeping system, a certified ISO quality management system) for the introduction of the proposed model of quality cost accounting. However, its personnel do not have sufficient knowledge of how to implement this model, estimate, classify and analyse quality costs, as well as to use them to assess the efficiency of management systems. This model can be successfully implemented provided that professional consultants are involved.

Bibliography

Enterprise's internal documents such as financial statements, annual reports, sustainability reports, company statutes and articles of association, compliance policies, codes of ethics, quality policies, quality books, process maps, job descriptions, management reviews and others and publicly available information materials. In selected descriptions, the company information contained in the National Court Register of Companies was also used.

Conclusions

The subject matter of the research presented in this book was the use of the authors' original model of quality cost accounting as a tool for assessing the efficiency of management systems in service enterprises. The authors used the following research methods in the theoretical layer: a review of scientific literature on quality management, management in services, performance and accounting management, an analysis of the content of quality management standards dedicated to service organisations and a critical analysis of the existing models of quality costing. On the other hand, the following research methods were applied in the empirical layer: a reconstruction of quality costing models, an analysis of the content of the documentation of the researched service enterprise, interviews with the employees of the selected organisation, a case study aimed at verifying the possibility of using the developed model of quality costing to assess the efficiency of the management systems of the selected company.

In Chapter 1, the authors state that quality costs do not have one precise definition. They are incurred by enterprises at all stages of production or service delivery processes. The tool used for their efficient management and optimisation is quality cost accounting, considered to be the most important element of a quality management system in an enterprise. The evolution in the development of this type of accounting resulted in a redefinition of its tasks, which include the calculation, recording and analysis of quality costs, as well as the identification of the places in which they arise. On the basis of the literature on the subject, the authors mention a number of views on, and approaches to, classifying quality costs (e.g. American, European and Asian concepts; international and national standards; the philosophy of Total Quality Management). The growing interest in quality has caused the development of such quality cost categories as prevention costs, appraisal costs, internal failure costs and external failure costs. Quality costs are considered to be a metrics of the efficiency of management systems operated by an enterprise.

Chapter 2 describes the existing models of quality cost accounting and their applications. On the basis of the conducted research, the authors find that a model of quality cost accounting consists of such elements as a structure

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of quality costs, a chart of accounts, a scheme of the accounting procedure together with a list of persons responsible for it, sources of information on quality costs, as well as the proposed improvements. The authors indicate that the majority of the models have been developed for manufacturing companies, whereas there is no quality cost accounting model designed for service companies. Numerous models confirm the interest of researchers in the issue of quality cost accounting. This type of accounting is used to identify, measure, record, control, optimise and manage quality costs, as well as to assess the efficiency of management systems. An important element of any quality cost accounting system is a quality cost structure. The conducted review of the literature on the subject of quality costing models allows for the conclusion that there are different typologies of quality costs (structural quality cost models and activity-based quality cost models), and the choice and adjustment of an appropriate quality cost structure to the selected quality cost accounting system is the key task during the implementation procedure.

Chapter 3 discusses the specific character of service activity, the processes occurring in it, and also systematises the knowledge of quality management in service organisations. On the basis of the undertaken research, the authors conclude that the essence of service activity is an intangible, impermanent and heterogeneous process that is aimed at satisfying human needs, and whose production and consumption take place at the same time and place. Furthermore, the authors conclude that the processes occurring in service enterprises are definitely different from those typical of production organisations, as their effect is an activity, process or report, as well as the occurrence of intensive interaction between the buyer and the seller. A particularly important element in service enterprises is quality management, which manifests itself in the concepts of quality improvement, quality management systems, service quality measurement methods and quality management tools. The identified determinants of a quality cost structure include internal (structural, organisational and economic, resource-related and innovative) factors and external (social and market-related, legal and random) factors.

The work on the preparation of a quality cost accounting model is described in Chapter 4. The authors follow the formal model designing rules and first present premises adopted in the development of the model along with used sources. The next step is a presentation of the proposed structure of quality costs for service enterprises, the related process matrix and process budget, as well as the proposed procedure for quality cost accounting. This part of the book is complemented by the annex including procedure RKJ/1/2019 "Quality cost accounting in a service enterprise". Among other elements, the procedure contains relevant terminology, the scopes of responsibility of individual employees, teams and departments, detailed procedures and used tools. The result of the actions undertaken by the authors is a model of quality cost accounting whose advantage is that it can be applied in any type of service enterprises.

In Chapter 5, the authors present the course of the conducted empirical research, indicate the criteria for selecting an enterprise as a research subject, i.e. the possession of a quality management system and ISO certificates, as well as the use of a full bookkeeping system, and describe the chosen organisation.

The results of the empirical research are presented in Chapter 6. The character of the research is both exemplificative and diagnostic. On the one hand, the research results relate to the application of the developed quality costing model as a tool for assessing the effectiveness of management systems in service enterprises; on the other hand, they allow the verification of the correctness of the model and the advantages of its application. The results obtained in this part of the research confirm the coexistence of the projective and diagnostic functions in management sciences. The scientific cognitive and utilitarian goals were also achieved through the application of scientific consultancy and the triangulation procedure of research techniques (organisational documentation content analysis, observations, interviews and quantitative data analysis).

The basic cognitive conclusion resulting from the empirical part of the conducted research is the statement that the use of the proposed model of quality costing allows for evaluating and improving the efficiency of management systems in service enterprises. Such a procedure perfectly matches the philosophy of the process approach in quality management. On the basis of the conducted research, the authors also show that the application of the quality costing model allows service enterprises to identify their quality costs and processes generating most of them, i.e. such areas that require optimisation and improvement measures. According to one of the diagnoses reached in the course of the empirical research, there is a large cognitive gap in the substantive knowledge of quality costs and quality cost accounting among the employees of the enterprise participating in the research. The actions taken by the personnel were very often intuitive and inconsistent with the principles of efficient cost management and organisational management. These findings form the basis for determining the scope of training for employees, particularly those working in the accounting, controlling and quality departments. The diagnostic part of the empirical research is complemented by the indication of possibilities and directions, as well as limitations related to the application of the model to assess the effectiveness of the management systems of the enterprise.

The theoretical implications formulated by the authors in connection with the conducted research are the following:

1 There are many definitions of quality costs, but there is no universal one.
2 Quality costs are the most important element of quality cost accounting, which is a tool for their efficient management.
3 Most quality costs in enterprises are hidden costs, difficult to measure.

4 Quality costs are a metric of the efficiency of the management system.
5 A model of quality cost accounting consists of the following elements: a quality cost structure, a chart of accounts, a scheme of the accounting procedure together with a list of employees responsible for it, sources of information on quality costs, as well as quality cost analyses and reports.
6 The literature on the subject is dominated by quality cost accounting models developed for enterprises in the industrial sector. However, there is no universal model of quality cost accounting for service and commercial enterprises.
7 The existing models of quality cost accounting are most often used by organisations to identify, measure, record, analyse and optimise quality costs. Furthermore, they are used to measure and assess the efficiency of quality management systems and improve the quality of offered products/services. They are also a source of information used in implementing organisational policies.
8 The most popular quality cost structure is the PAF model, which includes prevention costs, appraisal costs and failure costs.
9 The essence of service activity is determined by its characteristic features, i.e. immateriality, impermanence, heterogeneity, inseparability of the process of production and consumption, as well as the impossibility to acquire ownership of a service.
10 The very wide variety of services available on the market results in a great diversity of processes carried out in service enterprises.
11 Quality is understood by service enterprises as the customer's satisfaction with the service.
12 Service quality management comprises quality improvement concepts, quality management systems, service quality measurement methods and quality management tools.
13 The processes occurring in service activities determine the quality cost structure.
14 The determinants of the quality cost structure are factors occurring within the organisation and external factors arising outside the organisation.
15 The provision of services of the highest quality is only possible when the enterprise identifies the places where quality costs arise, calculates them at all stages of the service delivery process and uses quality costing as a basis for making economic decisions and providing more effective management.
16 The authors' original model of quality cost accounting is inspired by the models of quality costing proposed by M. Ciechan-Kujawa, K. Lisiecka, A. Kister, U. Sulowska-Banaś and T.M. Malik, R. Khalid, A. Zulqarnain and S.A. Iqbal, as well as the structural model of quality costs proposed by J. Bank and the process model.

In the course of his empirical research, the authors also formulated the following applicative implications:

1. A full and comprehensive bookkeeping system, a quality management system and ISO certificates are necessary for the implementation of the proposed quality costing model.
2. Applying the proposed quality cost accounting model brings benefits in the form of identifying the level of quality costs, information on the structure of these costs and its analysis, indicating the processes and process phases generating the most quality costs and requiring optimisation measures, identifying the largest group of quality costs reasons for occurring irregularities, forecasting a quality cost budget, reporting on quality costs and assessing the efficiency of management systems.
3. The employees of the service enterprise participating in the research are aware of the existence of costs related to the quality of provided services in the processes they execute.
4. There is a need for supplementary training on the implementation and maintenance of quality cost accounting systems in enterprises interested in the implementation of the presented model.
5. The application of this model positively influences the creation of an atmosphere of cooperation among departments, teams and employees working on the implementation of its subsequent stages.
6. In the analysed enterprise, conformance costs definitely dominate, while the costs of nonconformances and failures constitute small parts of the quality cost structure.
7. The enterprise's core processes and the service delivery phase generate the most quality costs.
8. The enterprise operates an efficient management system, which is confirmed by the assessment results presented in Chapter 6.
9. Quality costing is a tool supporting and complementing the assessment of the efficiency of management systems.
10. Integrating the quality cost accounting model with other quality tools, the bookkeeping system, management reviews and related reports, as well as internal and external audits will improve the overall management of the service organisation.
11. Not having full information on processes and nonconformances occurring in them results in problems with estimating quality costs.
12. The lack of appropriate legal regulations obliging enterprises to maintain quality cost accounting system is not favourable for the implementation of this tool in service enterprises.
13. The implementation of this model involves considerable expenditure of time and labour.
14. The discussed model can be successfully implemented provided that professional consultants are involved.

The authors would like to emphasise that the presented research results are not definitive or conclusive. This is due to the fact that the verification of the functioning of the model was carried out in one selected service company, which does not constitute sufficient ground for formulating far-reaching generalisations. The research presented here should be continued. In the authors' opinion, important future research issues include the following: support for the popularisation of this model of quality cost accounting in service enterprises, the development and implementation of a dedicated IT programme identifying quality costs, the range and quality of consulting services in the field of quality cost accounting implementation and maintenance, as well as barriers to the implementation of quality cost accounting in service enterprises of the SME sector.

Appendix 1
Annex

Procedure
no. RKJ/1/2019
Quality cost accounting
in a service enterprise
Edition no. 1
Process owner: Quality manager
Prepared by: Wojciech Sadkowski

A.1 Objective of the procedure

The objective of the procedure is to develop information on the costs of quality occurring in service enterprises, the methods of quality cost optimisation and the assessment of the efficiency of management systems operated in a particular enterprise.

A.2 Subject matter

The subject matter of the procedure is the determination of the rules governing such actions as capturing, measuring, grouping, processing, presenting, interpreting and analysing, as well as budgeting and controlling quality costs. In addition, the procedure indicates those responsible for carrying out individual tasks.

A.3 Terminology

Quality costs – All costs of measures implemented in order to ensure an appropriate level of quality of offered services as well as the costs of actions taken in the event of failure to achieve the desired service quality level.
Prevention costs – Costs incurred to ensure conditions for the fulfilment of requirements applicable to the provision of services.

Appraisal costs – Costs incurred to ascertain whether the requirements applicable to the provision of services are being met.

Internal failure costs – Costs arising when the results of work deviate from the adopted quality standards and a failure is detected before the service is provided to the customer.

External failure costs – Costs of irregularities detected after the service has been provided to the customer.

Other quality costs – Quality costs that cannot be allocated to any of the basic groups of quality costs (prevention, appraisal or failure costs).

Quality cost analysis – An analysis of the structure of and changes taking place in quality costs, as well as a ratio analysis of quality costs.

Quality cost accounting – A cost accounting system for decision-making purposes. It constitutes the basis for making long-term and short-term business decisions.

A.4 Responsibility

The management of the enterprise is responsible for the following:

- appointing the quality manager;
- approving the composition of the quality team proposed by the quality manager;
- supporting the quality manager in raising employees' awareness of quality issues;
- approving recordable elements of quality costs;
- implementing the regulation concerning the operation of the quality cost accounting system;
- using the results of quality reports in optimising quality costs; and
- supervising the implementation of optimisation measures.

The quality manager is responsible for the following:

- establishing the quality team, defining the scope of its work and supervising its activities;
- training employees in issues related to quality;
- ensuring compliance with the organisation's quality policy;
- supervising the documentation of quality costs;
- approving quality cost reports prepared by the quality team;
- presenting conclusions and guidelines from quality cost reports to the management, as well as formulating proposals for quality cost optimisation measures; and
- assessing the effectiveness of introduced optimisation measures.

The quality team is responsible for the following:

- laying foundations for the functioning of the quality cost accounting system;
- selecting a structure of quality costs;

- identifying activities generating quality costs in the executed service provision processes;
- developing a methodology for assigning quality costs to these activities;
- providing the accounting department with information on identified quality costs;
- preparing a process matrix and a process budget of quality costs;
- conducting quality cost analyses;
- developing measures to optimise quality costs; and
- preparing quarterly and yearly quality cost reports for the management.

The accounting department is responsible for the following:

- cooperating with the quality team in the preparation of foundations for the functioning of the quality cost accounting system;
- preparing a chart of accounts (or modifying the existing one) taking into consideration quality costs;
- recording quality costs in the bookkeeping system on an ongoing basis, in a selected system classifying costs by type and/or by function;
- exercising supervision of the quality cost accounting system; and
- preparing monthly/quarterly/yearly statements of recorded quality costs and submitting them to the quality team.
- Employees of the service enterprise are responsible for the following:
- identifying quality costs arising in their areas of responsibility, preparing quality cost forms, marking source documents with the QC symbol and submitting such forms and documents to the quality team within two working days of occurrence;
- performing tasks set by the management to optimise quality costs.

A.5 Procedure

1 The management appoints a quality manager and establishes a quality team.
2 The quality team lays foundations for the functioning of the quality cost accounting system in cooperation with the accounting department.
3 The management introduces a regulation concerning the operation of the quality cost accounting system.
4 The quality team identifies quality costs in the service provision processes (on the basis of the received source documents and quality cost estimation forms prepared in accordance with Appendices Z1A and Z6), allocates them to appropriate groups and process phases in accordance with Appendix Z1B. Classified quality costs are forwarded to the accounting department by the fifth day of a given month.
5 The accounting department keeps records of quality costs based on the adopted/modified chart of accounts in the financial and accounting software used by the organisation, in accordance with Appendix Z2.

6 The statements of the monthly account balances of recorded quality costs are forwarded to the quality team by the 15th day of a given month.
7 On the basis of the received data, the quality team carries out analyses of quality costs (vertical and horizontal analyses, a ratio analysis according to Appendix Z3), prepares a quality cost matrix (Appendix Z4) and a process budget of quality costs (Appendix Z5), as well as identifies deviations of these costs from the budget and assesses the efficiency of the management systems based on Appendix Z7. Data analyses should be conducted with the use of a Pareto-Lorenz diagram, and areas for improvement should be identified by means of an Ishikawa diagram.
8 The quality cost report prepared by the quality team is submitted to the quality manager for approval.
9 The quality manager presents the approved (monthly, quarterly, yearly) quality cost report to the organisation's management and recommends possible corrective measures.

A.6 Appendices

Z1A/RKJ/1/2019 Quality cost estimation form for the quality team
Z1B/RKJ/1/2019 Classification of quality costs in the processes of service enterprises
Z2/RKJ/1/2019 Chart of accounts for quality costs in sets 4 and 5
Z3/RKJ/1/2019 Quality cost ratios
Z4/RKJ/1/2019 Process matrix of quality costs
Z5/RKJ/1/2019 Process budget of quality costs
Z6/RKJ/1/2019 Quality cost spreadsheet
Z7/RKJ/1/2019 Management system efficiency metrics

Z1A/RKJ/1/2019

Name of process	*Name of cost*	*Type of cost*	*Amount of cost in the period*	*Source document*	*Additional information*
Process no. 1	Cost no. 1				
	Cost no. 2				
	Cost no. n				
Process no. 2	Cost no. 1				
	Cost no. 2				
	Cost no. n				
Process no. n	Cost no. 1				
	Cost no. 2				
	Cost no. n				

Planning phase			*Procurement phase*			*Service delivery phase*			*Sales phase*		
Quality costs	*Amount*	*Reference document no.*	*Quality costs*	*Amount*	*Reference document no.*	*Quality costs*	*Amount*	*Reference document no.*	*Quality costs*	*Amount*	*Reference document no.*
Prevention costs			*Prevention costs*			*Prevention costs*			*Prevention costs*		
Ensuring efficient organisation of employees/ team/department responsible for quality			Ensuring efficient organisation of employees/team/ department responsible for procurement (e.g. recruitment process of employees responsible for procurement)			maintenance, inspections, repairs (e.g. of equipment, warehouses)			examining preferences of existing and potential customers		
Training of employees responsible for quality assurance			Training of employees responsible for procurement			ensuring appropriate conditions for provision of service			ensuring efficient organisation of employees/ team/ department responsible for sales and distribution (e.g. recruitment process for employees responsible for sales and distribution)		

(*Continued*)

Planning phase			*Procurement phase*			*Service delivery phase*			*Sales phase*		
Quality costs	*Amount*	*Reference document no.*	*Quality costs*	*Amount*	*Reference document no.*	*Quality costs*	*Amount*	*Reference document no.*	*Quality costs*	*Amount*	*Reference document no.*
Researching consumer preferences (in entire market)			Analysis and selection of suppliers			Training of employees responsible for provision of service			Training of employees responsible for sales and distribution		
Projection and development of the process of service provision and the system of process planning, monitoring and supervision			Costs of supplier market monitoring and market assessment			Other			Ensuring appropriate conditions for provision of service		
Implementation costs connected with obtaining quality certificates (costs of consultations and preliminary audits, implementation costs, licence fees)			Other						Ensuring good quality of contacts with customers		
Other									Other		

Appraisal costs

Audit consultations, internal expert opinions and quality audits

Costs of maintaining quality certificates (annual fee and costs of annual audits)

Costs of purchasing and maintaining measurement, inspection and testing equipment

Other

Appraisal costs

Checks and inspections of deliveries

Measurement and evaluation of critical parameters of procurement process (suppliers, delivery quality and monitoring system)

Other

Appraisal costs

Control of service quality during service provision

Assessment of compliance of service quality with applicable requirements

Other

Appraisal costs

Verification of consistency of service sales documents with customer's order

Assessment of quality of promotional activities

Checks and inspections of employees/ team/ department responsible for sales and marketing as well as assessment of their work quality

Quality checks after service delivery

Other

(*Continued*)

Planning phase			*Procurement phase*			*Service delivery phase*			*Sales phase*		
Quality costs	*Amount*	*Reference document no.*	*Quality costs*	*Amount*	*Reference document no.*	*Quality costs*	*Amount*	*Reference document no.*	*Quality costs*	*Amount*	*Reference document no.*
Internal failure costs			*Internal failure costs*			*Internal failure costs*			*Internal failure costs*		
Repair of measurement and control equipment			Additional deliveries to eliminate deficiencies			Elimination of deficiencies arising during service provision			Correction of quality failures in organisation of employees/ team/ department responsible for sales and marketing		
Other (e.g. correction of identified errors in process design, use of external support)			Repair or supply from another supplier resulting from insufficient quality of previous deliveries			Failures and downtime			Additional checks after correction of errors		
			Other (e.g. use of external consultants to correct errors arising in delivery quality monitoring systems, additional checks after correcting errors)			Corrections and rework (e.g. change of subcontractor during service provision)			Other (e.g. correction of errors resulting from inadequate quality of promotional campaigns)		
						Other (e.g. costs of scrapping equipment used in service provision)					

External failure costs	*External failure costs*	*External failure costs*	*External failure costs*
Other (e.g. correction of errors resulting from inadequate performance of external consultant, additional costs of supervising planning and design processes)	Repair costs of provided services (additional deliveries resulting from inadequate quality of provided services)	correction of poorly performed services	handling of returns, complaints and claims
	Additional tests and checks after correction of errors	Repeat testing of corrected services	Costs of non-performed services (e.g. contractual penalties)
	Unscheduled downtime and time required for repairs	Repeat assembly at customer's premises	Costs of repeat delivery of service
	Other	Repair of errors resulting from poor service information	Other
		Other	
Other quality costs	*Other quality costs*	*Other quality costs*	*Other quality costs*
Total	**Total**	**Total**	**Total**

Z2/RKJ/1/2019

Number and name of account	*Type of account*
400 Depreciation	**Ordinary, revenue/cost**
401 Consumption of materials and energy	**Ordinary, revenue/cost**
402 External services	**Ordinary, revenue/cost**
403 Taxes and charges	**Ordinary, revenue/cost**
404 Wages and salaries	**Ordinary, revenue/cost**
405 Social and other insurance	**Ordinary, revenue/cost**
406 Quality costs	**Ordinary, revenue/cost**
406-1 Prevention costs	Ordinary, revenue/cost
406-2 Appraisal costs	Ordinary, revenue/cost
406-3 Internal failure costs	Ordinary, revenue/cost
406-4 External failure costs	Ordinary, revenue/cost
406-5 Other quality costs	Ordinary, revenue/cost
409 Other costs by type	**Ordinary, revenue/cost**
510 Core activity costs	**Ordinary, revenue/cost**
510-x Quality costs	Ordinary, revenue/cost
510-x-1 Prevention costs	Ordinary, revenue/cost
510-x-2 Appraisal costs	Ordinary, revenue/cost
510-x-3 Internal failure costs	Ordinary, revenue/cost
510-x-4 External failure costs	Ordinary, revenue/cost
510-x-5 Other quality costs	Ordinary, revenue/cost
520 Departmental costs	**Ordinary, revenue/cost**
520-x Quality costs	Ordinary, revenue/cost
520-x-1 Prevention costs	Ordinary, revenue/cost
520-x-2 Appraisal costs	Ordinary, revenue/cost
520-x-3 Internal failure costs	Ordinary, revenue/cost
520-x-4 External failure costs	Ordinary, revenue/cost
520-x-5 Other quality costs	Ordinary, revenue/cost
530 Costs of auxiliary activity	**Ordinary, revenue/cost**
530-x Quality costs	Ordinary, revenue/cost
530-x-1 Prevention costs	Ordinary, revenue/cost
530-x-2 Appraisal costs	Ordinary, revenue/cost
530-x-3 Internal failure costs	Ordinary, revenue/cost
530-x-4 External failure costs	Ordinary, revenue/cost
530-x-5 Other quality costs	Ordinary, revenue/cost
540 Cost of sales	**Ordinary, revenue/cost**
540-x Quality costs	Ordinary, revenue/cost
540-x-1 Prevention costs	Ordinary, revenue/cost
540-x-2 Appraisal costs	Ordinary, revenue/cost
540-x-3 Internal failure costs	Ordinary, revenue/cost
540-x-4 External failure costs	Ordinary, revenue/cost
540-x-5 Other quality costs	Ordinary, revenue/cost
550 Overheads	**Ordinary, revenue/cost**
550-x Quality costs	Ordinary, revenue/cost
550-x-1 Prevention costs	Ordinary, revenue/cost
550-x-2 Appraisal costs	Ordinary, revenue/cost
550-x-3 Internal failure costs	Ordinary, revenue/cost
550-x-4 External failure costs	Ordinary, revenue/cost
550-x-5 Other quality costs	Ordinary, revenue/cost

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#	*Name of ratio*	*Formula*
1	Quality costs to total costs	WKUJwKO = (Quality costs/Total costs)*100%
2	Conformance costs to quality costs	WKZ = [(Prevention costs + Appraisal costs)/ Quality costs]*100%
3	Nonconformance costs to quality costs	WKNZ = [(Internal failure costs + External failure costs)/Quality costs]*100%
4	Prevention costs to quality costs	WKP = (Prevention costs/Quality costs)*100%
5	Appraisal costs to quality costs	WKO = (Appraisal costs/Quality costs)*100%
6	Internal failure costs to quality costs	WKBw = (Internal failure costs/Quality costs)*100%
7	External failure costs to quality costs	WKBz = (External failure costs/Quality costs)*100%
8	Other quality costs to total quality costs	WPKJ = (Other quality costs/Quality costs)*100%
9	Number of nonconformances to quality costs	WuN = (Number of nonconformances/Quality costs)*100%
10	Quality costs to sales revenues	WuKJwP = (Quality costs/Sales revenues)*100%
11	Quality costs to net profit	WuKJwZN = (Quality costs/Net profit)*100%
12	Nonconformance costs to net profit	WKNZZN = [(Internal failure costs + External failure costs)/Net profit]*100%
13	Quality costs to operating costs	WKJwKO = (Quality costs/Operating costs)*100%

Z4/RKJ/1/2019

Quality costs	*Core (operational) processes*	*Managerial (strategic) processes*	*Auxiliary processes*	*Total*	*Vertical analysis of quality costs*
Prevention costs					
Appraisal costs					
Internal failure costs					
External failure costs					
Other quality costs					
Total					
Vertical analysis of processes generating quality costs					

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#	*Process budget of quality costs for service process no. 1 in the period …*	*Core processes in service no. 1*	*Managerial processes in service no. 1*	*Auxiliary processes in service no. 1*	*Total for service no. 1*	
1	Forecast prevention costs					
2	Forecast appraisal costs					
3	Forecast internal failure costs					
4	Forecast external failure costs					
5	Forecast other quality costs					
6	**Total**					
	Process budget of quality costs for service process no. 2 in the period …	**Core processes in service no. 2**	**Managerial processes in service no. 2**	**Auxiliary processes in service no. 2**	**Total for service no. 2**	**Total quality costs for services nos. 1 and 2**
8	Forecast prevention costs					
9	Forecast appraisal costs					
10	Forecast internal failure costs					
11	Forecast external failure costs					
12	Forecast other quality costs					
13	**Total**					
	Process budget of quality costs for service process no. n in the period …	**Core processes in service no. n**	**Managerial processes in service no. n**	**Auxiliary processes in service no. n**	**Total for service no. n**	**Total quality costs for services nos. 1, 2 and n**
15	Forecast prevention costs					
16	Forecast appraisal costs					
17	Forecast internal failure costs					
18	Forecast external failure costs					
19	Forecast other quality costs					
20	**Total**					

Z6/RKJ/1/2019

Quality cost estimation form						
Name and surname of employee						
Contact details (email, phone)						
Department						
Position						
#	*Activity*	*Cost calculation method*	*Prevention costs*	*Appraisal costs*	*Internal failure costs*	*External failure costs*	*Other quality costs*
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
		Total					

Z7/RKJ/1/2019

Area of assessment	*Element of the model*	*Metric adopted for assessment*	*Value of the metric*	*Scale for assessing the efficiency of management systems*
Quality cost accounting	Quality cost structure	Conformance costs	Above 80%	Very high level
			60–80%	High level
			40–60%	Medium level
			20–40%	Low level
			Below 20%	Very low level
	Share of quality costs in individual process phases	Share of quality costs in the service delivery phase	Above 80%	Very high level
			60–80%	High level
			40–60%	Medium level
			20–40%	Low level
			Below 20%	Very low level

(Continued)

Area of assessment	*Element of the model*	*Metric adopted for assessment*	*Value of the metric*	*Scale for assessing the efficiency of management systems*
	Process matrix	Share of quality costs in the core processes	Above 80%	Very high level
			60–80%	High level
			40–60%	Medium level
			20–40%	Low level
			Below 20%	Very low level
	Pareto-Lorenz diagram of prevention costs	Share of each category of prevention costs generating 80% of these costs	Below 20%	Very high level
			20–40%	High level
			40–60%	Medium level
			60–80%	Low level
			Above 80%	Very low level
	Pareto-Lorenz diagram of irregularities	Share of each irregularity category generating 80% of all irregularities	Below 20%	Very high level
			20–40%	High level
			40–60%	Medium level
			60–80%	Low level
			Above 80%	Very low level
	Quality cost ratios	Quality costs to total costs	Above 80%	Very high level
			60–80%	High level
			40–60%	Medium level
			20–40%	Low level
			Below 20%	Very low level
		Conformance costs to quality costs	Above 80%	Very high level
			60–80%	High level
			40–60%	Medium level
			20–40%	Low level
			Below 20%	Very low level
		Nonconformance costs to quality costs	Above 80%	Very low level
			60–80%	Low level
			40–60%	Medium level
			20–40%	High level
			Below 20%	Very high level
		Prevention costs to quality costs	Above 80%	Very high level
			60–80%	High level
			40–60%	Medium level
			20–40%	Low level
			Below 20%	Very low level
		Appraisal costs to quality costs	Above 80%	Very high level
			60–80%	High level
			40–60%	Medium level
			20–40%	Low level
			Below 20%	Very low level
		Internal failure costs to quality costs	Above 80%	Very low level
			60–80%	Low level
			40–60%	Medium level
			20–40%	High level
			Below 20%	Very high level
		External failure costs to quality costs	Above 80%	Very low level
			60–80%	Low level
			40–60%	Medium level
			20–40%	High level
			Below 20%	Very high level

Other quality costs to total quality costs	Above 80%	Very low level
	60–80%	Low level
	40–60%	Medium level
	20–40%	High level
	Below 20%	Very high level
Number of nonconformances to quality costs	Above 80%	Very low level
	60–80%	Low level
	40–60%	Medium level
	20–40%	High level
	Below 20%	Very high level
Quality costs to sales revenues	Above 80%	Very low level
	60–80%	Low level
	40–60%	Medium level
	20–40%	High level
	Below 20%	Very high level
Quality costs to net profit	Above 80%	Very low level
	60–80%	Low level
	40–60%	Medium level
	20–40%	High level
	Below 20%	Very high level
Nonconformance costs to net profit	Above 80%	Very low level
	60–80%	Low level
	40–60%	Medium level
	20–40%	High level
	Below 20%	Very high level
Quality costs to operating costs	Above 80%	Very high level
	60–80%	High level
	40–60%	Medium level
	20–40%	Low level
	Below 20%	Very low level

Appendix 2
Interview questionnaire

Jagiellonian University, Faculty of Management and Social Communication, Institute of Economics, Finance and Management, ul. Łojasiewicza 4, p. 2.316, 30–348 Kraków

Anonymous interview for the research entitled:

Perception of quality costs and quality cost accounting in service enterprises

The objectives of the interview are to check the level of enterprises' knowledge of, and involvement in, quality costing issues and related processes, as well as to determine their openness to new solutions in quality cost management and willingness to take the risk of their implementation.

Interviewee's particulars

Enterprise*	Size	Possession of a quality management system and ISO certificates	Operation of a full book-keeping system	Type of provided services	Position

□ Private	□ Large	□ Yes	□ Yes
□ Public	□ Medium	□ No	□ No
	□ Small		

* Please tick the selected answer

Thank you very much for your time

Wojciech Sadkowski

Please answer the questions below. For some questions, more than one answer can be given

#	*Question*	*Answer sheet*	*Code key*
	Block I – General questions about the enterprise's activities		
1	How was the chart of accounts developed in your enterprise?	a) Developed internally by the responsible organisational units	3
		b) Developed by an external entity	2
		c) Adopted without changes in the form of templates available on the market in dedicated publications or in the form of computer software for the accounting department	1
		d) Other (specify…)	0
2	Costs are recorded:	a) By type and by function	3
		b) By type only	2
		c) By function only	1
		d) Not in either of these systems	0
3	What is the main goal of your enterprise?	a) To provide top quality services to customers and ensure their satisfaction	6
		b) To improve the efficiency of the management systems	5
		c) To maximise profit	4
		d) To increase sales revenues by 5% or more year on year	3
		e) To optimise costs	2
		f) Other (specify…)	1
4	What is your enterprise's short term goal?	a) To provide top quality services to customers and ensure their satisfaction	6
		b) To improve the efficiency of the management systems	5
		c) To maximise profit	4
		d) To increase sales revenues	3
		e) To optimise costs	2
		f) Other (specify...)	1
5	Does each employee have sufficient knowledge of the processes for which they are responsible?	a) Yes, they do	3
		b) Yes, but their knowledge requires improvement by way of appropriate training	2
		c) I don't know	1
		d) No, they don't	0

#	*Question*	*Answer sheet*	*Code key*
6	Does your enterprise organise training on quality issues?	a) Yes (please go to question 7) b) I don't know (skip question 7 and go straight to question 8) c) No (skip question 7 and go straight to question 8)	2 1 0
7	How often are quality training sessions held?	a) At least once a year b) At least once every 5 years c) At least once every 10 years	3 2 1
Block II – Quality costs			
8	Is the problem of quality costs identified in your enterprise?	a) Yes b) I don't know c) No	2 1 0
9	Are any quality improvement measures taken in your enterprise?	a) Yes b) I don't know c) No	2 1 0
10	Are quality costs recorded in the accounting system in your enterprise?	a) Yes (please go to question 11) b) I don't know (skip questions 11and 12 and go straight to question 13) c) No (skip questions 11 and 12 and go straight to question 13)	2 1 0
11	Are quality costs recorded on a continuous basis using a uniform method?	a) Yes b) I don't know c) No	2 1 0
12	Is the accounting department in your enterprise involved in the recording of quality costs?	a) Yes b) I don't know c) no	2 1 0
13	What is the level of readiness of the accounting department to undertake changes including the recording of quality costs in the accounting systems of your enterprise?	a) Full readiness to modify the accounting system for the purposes of quality costing b) Strong resistance to change c) No readiness to modify the system	2 1 0
14	Who should be responsible for identifying quality costs?	a) The accounting department b) The quality team c) Heads of department d) Someone else (specify…)	4 3 2 1

#	*Question*	*Answer sheet*	*Code key*
15	Is it possible to obtain information on the amount of quality costs in your enterprise?	a) Yes (please go to question 16) b) I don't know (skip question 16 and go straight to question 17) c) No (skip question 16 and go straight to question 17)	2 1 0
16	What are the sources of information on quality costs in your enterprise? (Please choose from one to three answers)	a) Accounting documents b) Bookkeeping accounts c) Materials from audits and inspections d) Failure reports e) Records of claims and complaints f) Other (specify…)	6 5 4 3 2 1
17	Do the management team have sufficient knowledge of quality costs generated in all processes carried out in your enterprise?	a) Yes b) I don't know c) No	2 1 0
Block III – Quality cost accounting			
18	Does your enterprise operate a quality cost accounting system?	a) Yes (please go to question 19) b) I don't know (please skip questions 19 and 20 and go straight to question 21) c) No (skip questions 19 and 20 and go straight to question 21)	2 1 0
19	Is there a detailed procedure for operating a quality cost accounting system in your enterprise?	a) Yes b) I don't know c) No	2 1 0
20	Does your enterprise use a quality cost classification system?	a) Yes b) I don't know c) No	2 1 0
21	In your opinion, what are the objectives of quality costing? (Please choose from one to three answers)	a) To improve the efficiency of enterprise management systems b) To optimise costs c) To improve service quality d) To increase revenues e) To increase financial security f) Other (specify…)	6 5 4 3 2 1

#	*Question*	*Answer sheet*	*Code key*
22	Does quality cost analysis improve the efficiency of management systems?	a) Yes b) I don't know c) No	2 1 0
23	Do increasing expenditures on preventing poor service quality contribute to a decrease in failure costs?	a) Yes b) I don't know c) No	2 1 0
24	Does service quality processes management allow for the optimisation of quality costs?	a) Yes b) I don't know c) No	2 1 0
25	Does your enterprise prepare a quality cost matrix and a quality cost budget?	a) Yes b) I don't know c) No	2 1 0
26	Does your enterprise prepare quality cost reports?	a) Yes (please go to question 27) b) I don't know (skip question 27 and go straight to question 28) c) No (skip question 27 and go straight to question 28)	2 1 0
27	Who is responsible in your enterprise for quality cost reports?	a) The quality team in cooperation with the accounting department b) The quality team c) The accounting department d) Someone else (specify…)	4 3 2 1
28	Does your enterprise have a comprehensive quality management system?	a) Yes b) I don't know c) No	2 1 0
29	Does quality costing influence the efficiency of management systems?	a) Yes b) I don't know c) No	2 1 0

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