

Quality cost management in the SMEs of Poland

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management in
SMEs

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Abstract

Purpose – The purpose of the study is to examine the research problem that represents an attempt to approximate the importance of quality costing in managing a modern enterprise using the selected enterprises from small and medium-sized enterprises (SMEs) in Poland.

Design/methodology/approach – The primary goal of the research is a need to acquire knowledge about the use of quality cost accounts in enterprises operating in Poland. The research has been conducted in the SMEs of production and services. From October 2018 to December 2018, survey-based research was carried out in the selected SMEs of production and service in Poland. The targeted participants of the study are from the medium-sized enterprises, employing 50–250 people.

Findings – The pilot studies conducted in companies indicate that modern enterprises are focused on quality. Many enterprises declare to be continuously improving quality system and quality costing. However, generally, these are large companies that have implemented ISO standards, often part of international corporations. The survey result of the study shows that medium-sized enterprises still make little use of modern cost accounting variants. Based on the study, only 9.75% (39 enterprises) from a representative group of 400 companies from the sectors of manufacturing, services and production as well as service companies apply quality costing. Some of the other enterprises are only taking measures to implement quality cost accounting.

Research limitations/implications – The research has been conducted in randomly selected SMEs in the form of a questionnaire interview. In order to further analyze the construction of quality cost management (QCM) systems and the use of information from QCM by enterprises, case study method should be used more widely.

Practical implications – The results of the study provide useful help for companies that are quality-oriented and want to implement quality costing. The survey has been conducted in 400 enterprises, and the survey results of considered SMEs reveal the most important aspects of the application of quality costing.

Originality/value – The questionnaire used, the answers provided and the resulting conclusions fill the identified research gap. In the author's opinion, findings of research are relevant and useful, not only for accounting practice but also for theory. They show that although TQM and quality costing have been very popular in the literature since the 1990s, the degree of application of quality costing in practice (except for large, often international companies) is too low. So, the suitability of QCM in managing a modern enterprise from the SMEs should be promoted.

Keywords Survey research, Quality cost, Management, SMEs, Medium-sized companies

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1. Introduction

Quality is a way of thinking that makes it apply and constantly looking for the best solutions.
Edward Deming

The modern world is constantly changing, which concerns every aspect of life – social, environmental, technological, economic and political conditions. These conditions occur more

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often and are more dynamic, stormy and often unpredictable. They evoke a whole complex of phenomena perceived as challenges for managers and employees, concerning their perspective, rules of conduct and methods of action (Williams *et al.*, 2006). This multilateral process of change associated with the rapid development of environment and tightening of market rules of the game is called globalization process. Its consequence has accelerated the creation of a global economy that raises not only new challenges and opens new horizons but also carries serious threats. This is due to its extensive scope of multithreading, multidimensionality and complexity of phenomena; thus, the term globalization covers various matters (Wudhikarn *et al.*, 2015; Mahmood and Kureshi, 2015; Aart Scholte, 2010).

Within conditions of such an economic environment, the role of management has increased. As a result, the required responsibilities of the people concerning management have also risen. The primary task in a modern economic environment is a pursuit for optimal use of resources, subordinated to overriding goals of achieving maximum customer satisfaction and high profitability in both short- and long terms. Management teams, therefore, face a need to search constantly for management methods that would support and improve the efficiency of organization. In order to survive and develop, the contemporary organizations must continuously review and adjust their basic strategic assumptions and implement innovations, because they are under very strong pressure of changes, the source of which is both increasing complexity and variability of their macro- and micro-environment, as well as increasing competition on the market. They have to solve problems that most of them have never faced before. This forces the organization to dedicate significant investment expenditures for construction and development of effective quality management systems (QMS) that will meet the present requirements (Garza-Reyes *et al.*, 2015; Teli *et al.*, 2017).

It can be said that modern enterprises are condemned to continuous self-improvement.

In the concept of continuous improvement of an enterprise, two concepts appear: “quality” and “cost.” Quality is an essential determinant of market success and is a fundamental requirement of the competition. Researchers and practitioners have been interested in the quality of products and services for centuries (Juran, 1995; Carnerud and Bäckström, 2019).

Interest in quality began to increase significantly in the second half of the 20th century, during the so-called third industrial revolution, also called scientific and technical revolution (Maguad, 2006). Then, according to the teachings of quality gurus, the quality itself has become a high-priority management area (Zairi, 2013).

Currently, the most important challenges faced by enterprises are acquiring knowledge and using the skills of their employees to shape values that are valuable to customers. One of these values is “always” quality. That is why the issue of quality has been the focus of economists and representatives of management sciences for many years.

On the other hand, changes that take place in economic practice are a subject of research in accounting, an economic discipline dealing with measurement and the analysis of economic quantities.

The increasing importance of quality and the emergence of new methods and tools supporting quality management enhance the interest in quality costs. Rapidly changing environment and increasing complexity of processes occurring in the enterprise cause that information from traditional cost accounting to not be sufficient basis for making decisions. More and more often, it is necessary to implement systems that will quickly provide reliable information used in decision-making processes.

The primary rationale for choosing this particular research problem was a belief in the growing importance of information on quality costs in the era of globalization and corporate social responsibility. Though there is a cost-intensive implementation in every enterprise, a wide application of quality costing in enterprises is often considered as an integral part of modern strategic management accounting systems, and it applies on the whole system.

However, considering the fact that over 90% of enterprises are companies SMEs, the question arises whether these enterprises are able, and, above all, whether they are interested in generating information on quality costs.

The author of the present study has taken the effort to approximate importance of quality costing in managing a modern enterprise concerning the selected enterprises from SMEs in Poland. While considering the above matters, the proposed study has raised the following research questions:

What is the degree of application of quality costing among enterprises in the SMEs?

Are enterprises in the SMEs interested in identifying quality costs, and would they like to use quality costing?

In order to achieve such a goal, the following structure of considerations was adopted:

- (1) based on the analysis of literature on the subject, the essence of quality costing in managing a modern enterprise has been presented;
- (2) results of conducted surveys on the implementation of quality costing in selected enterprises from the SMEs have been presented.

Considering the possibilities of enterprises in SMEs and the fact that, micro and small enterprises usually keep only tax records or simplified cost records for reporting purposes. So, the medium-sized enterprises, employing 50–250 people, have been selected as a target research group. The conducted empirical research allows evaluating the application of quality costing within companies from the analyzed group.

2. Literature research

2.1 From quality to quality management

Quality is a difficult concept to define, and it results from its ambiguity. It has accompanied humankind “for centuries.” Even the life of primitive man depended on the utility values of the surrounding nature. Possibility of survival in a given environment is a criterion of quality. According to world authority in the field of quality, as stated by J.M. Juran, “(...) managerial activity (of a primitive man) can be called perfect, because - being the performer of all activities - he could coordinate them with such a perfect device as the human brain” (Juran and Gryna, 1974).

First attempts to indicate the concept of quality can be found in the oldest codes or collections of applicable laws.

It is believed that technical, economic and scientific progress had been observed in ancient times and was a source of foundation of modern quality management as well as interest in its costs. Greek philosophers developed the foundations of concepts in this regard, such as Plato and his student Aristotle, as well as Chinese thinkers, Lao Tzu and Confucius.

The concept of quality has changed along with changes in the economic environment, ranging from purely productive, through philosophical, useable, valuable, psychological, systemic, normative, to comprehensive (Garvin, 1984). The quality management aims at establishing a high-quality product or service that meets and exceeds customer expectations (Ahmed Al-Dujaili, 2013). It is widely suggested from the studies (Ebragimi and Sadeghi, 2013; Ismyrlis and Moschidis, 2015; Leavengood *et al.*, 2014; Fotopoulos and Psomas, 2010) that quality management is the only option in the direction of continuous efforts for survival and sustainable development of the company (Chatzipetrou and Moschidis, 2016).

A significant contribution to modern theory and practice of quality management was the study by Walter A. Shewhart in 1931, regarding economic quality control of products. W.A. Shewhart’s thoughts were the basis for work of Great Quality Teachers, also called Quality Gurus, namely, W. Edwards Deming, Joseph Juran, Philips B. Crosby and Kaoru Ishikawa.

A prototype of principles of quality management is attributed to Armand V. Feigenbaum, who published a book in 1951, titled *Total Quality Control Engineering and Management*. Feigenbaum introduced quality improvement process in 19 steps. Description of these steps shows, among other things, that approach to a comprehensive quality control system is based on the involvement of employees and their managers in improving quality.

The genesis of total quality management (TQM) can be traced back to the 1950s, when W.E. Deming and J.M. Juran, in cooperation with the committee appointed by the Union of Japanese Scientists and Engineers, formulated a new concept of quality, recognizing it as a factor-supporting activity, to increase the efficiency of Japanese enterprises (Imai, 1986, 1997; for more on the implementation of a quality control system in Toyota, see, e.g. Shimokawa and Fujimoto, 2011). Deming encouraged Japanese people, among others, to apply a systematic method of solving problems, later called the Deming cycle, or the cycle “Plan-Do-Study-Act,” which became the cornerstone of continuous improvement, that is, kaizen (Liker, 2005).

Since then, TQM concept has developed and spread, which is influenced by, among others, views of quality researchers from the United States (W.E. Deming, P. Crosby, J.M. Juran and A.V. Feigenbaum), Japan (M. Imai, K. Ishikawa and E. Toyoda) and Great Britain (J. Oakland). The origin and evolution of TQM, differences between the approach of most important gurus to quality management and the widely accepted vision of TQM have been presented, among others, by Martínez-Lorente *et al.*, (1998) and Weckenmann *et al.* (2015). Each quality management (QM) guru defines his own set of “key practices” that are essential to achieve highest quality results (Juran and Gryna, 1980; Deming, 1996, for Crosby’s 14 quality principles, see, for example, Agrawal, 2019).

TQM can be described as a philosophy, a particular doctrine of pro-quality activities, which is based on the idea of achieving success through continuous efforts to improve quality, involving all employees and striving for customer satisfaction (Belay *et al.*, 2014; Van Kemenade and Hardjono, 2019; Holmund, 2007).

It is a continuous natural search for opportunities for improvement in every field based on quick responses, trust, delegation of powers, raising competences, improving work and building the principle of self-control in employees. It is often identified with kaizen, that is, continuous improvement (Carnerud *et al.*, 2018; Kerfai *et al.*, 2016; Weckenmann *et al.*, 2015; Mosadeghrad, 2014).

The comprehensive management by quality means not only the involvement in the process of change of all company cells and the entire crew but also the use of all available tools and techniques for this purpose, such as *just in time*, *benchmarking*, statistical process control (SPC), *failure mode and effect analysis* (FMEA), quality optimization method (Taguchi method) or development of quality function deployment (QFD) (Rhee and Ishii, 2003; Dahlgaard-Park *et al.*, 2013).

Quality management (QM) provides a paradigm shift in management philosophy to improve organizational efficiency and competitive advantage (Barker and Emery, 2006; Psomas and Jaca, 2016; Sinha *et al.*, 2016). According to Bouranta *et al.* (2017), it is a holistic management philosophy in which principles and practices focus on the implementation of QM (Wu, 2019).

It should be emphasized that QM is a mature and well-established field of research (Anttila and Jussila, 2017), which is continually evolving; authors propose new applications and new methods, and new tools are developed. The scientists offer new models and concepts (Wawak *et al.*, 2020).

So far, many papers summarizing previous research and showing the direction of QM development have been published (Ahire *et al.*, 1995, Martí nez-Lorente *et al.*, 1998; Rahman and Sohail, 2002; Sila and Ebrahimpour, 2002; Lo and Chai, 2012; Dereli *et al.*, 2011; Dahlgaard-Park *et al.*, 2013, 2018; Gupta *et al.*, 2014; Weckenmann *et al.*, 2015; Siva *et al.*, 2016; Psomas

et al., 2017; Aquilani *et al.*, 2017; Kumar *et al.*, 2018; Bajaj *et al.*, 2018; Carnerud, 2018; Carnerud and Bäckström, 2019; Wawak *et al.*, 2020).

Some of the publications listed above provide a systematic review of existing literature, while others present the complex discussions. Weckenmann *et al.* (2015) presented a history of paradigm shift in QM and formulated forecasts for new trends, namely, the complexity of production processes, sustainable development and responsibility. Van Kemenade and Hardjono (2019) believe that a new paradigm is required (emergence paradigm) to explain current directions and future needs. Siva *et al.* (2016) conducted an analysis of articles presenting the use of QM methods in combination with sustainable development initiatives.

Whereas Aquilani *et al.* (2017) and Kumar *et al.* (2018) presented a more refined relationship between TQM and company performance, Wu (2019) assessed the individual and synergistic effects of QM practices on operational results. Moccia (2016) analyzed the relationship between values and virtues and the principles of TQM, thus proposing a preliminary framework for relations.

Accordingly, Kumar and Sharma (2017) indicate relating management problem-solving styles of leaders to TQM focus, and Bugdol (2020) raises the aspect of fear in organizations implementing TQM. Based on the literature review, it analyzes its causes, consequences and methods of reduction. Dahlgard-Park *et al.* (2018) argue that a more precise theoretical foundation of TQM is needed to understand the existing position of TQM better (see also Carnerud and Bäckström, 2019).

2.2 The concept of quality costing

As interest in TQM increased, interest in quality costs grew. In order to make a QMS functioning correctly, an enterprise needs to identify, document, analyze and optimize quality costs (Dimitrantzou *et al.*, 2020; Malik *et al.*, 2016; Yakup and Sevil, 2012; Kirlioglu and Çevik, 2013). At present, quality costing is recognized as the most essential element of QMS. It is a tool to not only improve the QMS, including determining quality costs, their analysis and the sources of their formation and planning their recognition through many projects based on economic efficiency, but it is also an element of enterprise's quality program (Campanella, 1999; Chiu and Su, 2010; Snieska *et al.*, 2013; Prashar, 2014; Malik *et al.*, 2016; Sturm *et al.*, 2019).

It should be a tool for rational impact on a process of shaping quality, as well as one of the decisive criteria for managing this process.

Each process leading to increased customer value, implemented through the organization, generates others costs related to quality, which should be subjected to detailed analysis, because the use of information provided by these costs and making decisions based on their analysis significantly affect the efficiency of the company (Eben-Chaime, 2013; Ahmed Al-Dujaili, 2013; Sahu and Sridhar, 2013; Satanova *et al.*, 2015).

Understanding and definitions of quality costs have changed over the years (Hwang and Aspinwall, 1996; Williams *et al.*, 1999; Schiffauerova and Thomson 2006; Karg *et al.*, 2011; Malik *et al.*, 2016; Chatzipetrou and Moschidis, 2018) together with changes in the economic environment and business development. Nowadays, the definition proposed by Campanella (1999) is most often cited – cost of quality (CoQ) is “any cost that would not have been expended if the quality was perfect” (Chiadamrong, 2003). CoQ is widely recognized as a cost factor that can significantly affect profitability. However, the CoQ should be recognized as a comprehensive system, and not as a fragmentary tool (Chiadamrong, 2003).

The basis for first quality cost classifications is Shewhart-Deming cycle (consisting of four consecutive stages: plan, execute, check and react) and three quality processes implemented by Juran (planning, control and improvement).

Deming and Shewhart did not address the problem of quality costs as a separate issue worth exploring. It should be remembered, however, that in Deming's 14 principles, a

reference to quality costs can be found. Juran analyzed quality costs for the first time in 1951 in his book *Quality Control Handbook* (Farooq *et al.*, 2017; Kerfai *et al.*, 2016; Malik *et al.*, 2016; Marzuki and Wisridani, 2014). Since then, many researchers and practitioners have developed various methods of measuring CoQ.

The significant role of CoQ in the process of continuous improvement of production companies has been largely analyzed, and its importance has been emphasized (Ahmed Al-Dujaili, 2013; Dale and Plunkett, 1999).

Many concepts of quality costs are known in the literature. Different authors and researchers from various scientific disciplines dealing with the issue of quality costs try to explain this concept differently. However, since concept of quality approximates their structure, the theory of both quality management and economic practice often defines costs through their structure. Most frequently presented are characteristics of the concepts of the most important authorities in this field: A.V. Feigenbaum, J.M. Juran, P. Crosby, G. Taguchi, J. Bank and quality costs based on the international standard ISO 9000 standards (Campanella 1999; Yang, 2008; Kendirli and Tuna, 2009; Guinot *et al.*, 2016; Schiffauerova and Thomson, 2006; Zymonik, 2003; Zymonik, 2013). An overview of definitions and their characteristics according to their concepts have been presented in Table 1.

From the table presented below, it can be concluded that costs of quality are recognized in various combinations – from simple structures, where they are classified (according to a criterion of goodness) into good and bad (J.M. Juran) or treated only as quality losses (G. Taguchi), by distinguishing them according to the criterion of the type of activities for which preventive, assessment and errors are distinguished (A.V. Feigenbaum, ASQC, ISO 9000 international standards). Quality costs are also referred to as the process and classified into compliant and non-compliant (Ph.B. Crosby, J. Bank) and are treated as costs of lost benefits (J. Bank).

Based on the literature review, it should be stated that, currently, quality cost models are most often included in four basic groups. These are: P-A-F or Crosby's model, opportunity cost models, process cost models and activity-based costing (ABC) models. The models within one group are not identical; as a matter of fact, they can differ quite substantially, and suggested categorization only denotes a common underlying principle (Schiffauerova and Thomson, 2006; Sower *et al.*, 2007; Cheah *et al.*, 2011; Sturm *et al.*, 2019).

Review of research in the scope mentioned above was presented by Plunket and Dalle (1987, 1988), Porter and Rayner (1992), Williams *et al.* (1999), Shah and FitzRoy (1998) and Schiffauerova and Thomson (2006).

Of course, traditional models are still accepted by quality specialists, although they are limited to measurable costs only (Teevarapug, 2004; Sailaja *et al.*, 2014).

One of the features characterizing costs of quality is their non-obviousness and difficulty in measuring, which causes problems in identifying them in the company. Very often, managers see only measured quality costs, which are the "tip of an iceberg" of quality costs. By applying this approach to quality cost management, these units may be at risk of undermining their stability. Observation of all quality costs through the use of quality costing can significantly reduce this risk (Durmaz and Sevil, 2012; Cheah *et al.*, 2011; Omar and Murgan, 2014; Alglawe *et al.*, 2019). Dobrin and Stanciuc (2013) argue that intangible or "hidden" costs of quality are the largest contributor to quality loss.

Yang (2008) claims that if hidden costs could be fully assessed, they would amount to more than three times as much as visible costs.

Therefore, various models were also developed subsequently at a later stage to include intangible costs (Kaner, 1996; Akyol *et al.*, 2005; Guinot *et al.*, 2016.) Further, many attempts have been made to overcome the disadvantages of traditional models (Sailaja *et al.*, 2014).

Traditional quality cost models, only to a small extent, take into account good of the client and his economic interest, which leads to a situation in which they are insufficient for

Author	Definition	Characteristics	Items based on this methodology
Juran (1951, 1962), Juran and Gryna (1974)	<p><i>Quality costs = costs of preventive activities + costs of quality assessment + low-quality costs (internal) + low-quality costs (external)</i></p> <p><i>Quality costs = good-quality costs + poor-quality costs</i></p>	<p>Juran introduced in 1951 the concept of economic quality and proposed contractual concept of "quality costs" for the economic measurement of quality. This concept has become known under the name of economic model of quality costs. He used the gold in the mine rule, which defined benefits of high-quality products</p> <p>He defines the cost of quality as an expense related to ensuring the product's usability. This expenditure is associated with costs of good quality and costs of poor (understood as low) quality. Quality costs understood in this way should be balanced with the value of quality, which is understood by Juran as the impact of quality on company's revenues (Juran, Gryna, 1974, pp. 60–64)</p> <p><i>Quality cost model proposed by J.M. Juran was used to build a structure of quality costs according to the criterion of activities</i></p>	<p>Crosby (1979); Schneiderman (1986); Plunket and Dale (1988); Porter and Rayner (1992); Teevarapug (2004); Schiffauerova and Thomson (2006); Weinstein <i>et al.</i> (2009); Kendirli and Tuna (2009); Castillo-Villar <i>et al.</i> (2012); Zymonik (2008, 2012); Sailaja <i>et al.</i> (2014); Stanciu and Pascu (2014); Guinot <i>et al.</i> (2016); Szczepańska (2012); Stadnicka (2016); Sadkowski (2016, 2018); Kerfai <i>et al.</i> (2016)</p>

(continued)

Table 1.
An overview of definitions and its characteristics of the most important authorities of the quality management

Author	Definition	Characteristics	Items based on this methodology
Feigenbaum (1956, 1961, 1991)	<p><i>Quality costs = costs of quality control + costs of lack of quality control</i></p> <p>Costs of quality control (costs of activities implemented in order to create quality, aiming at achieving quality at a specified level) = prevention costs + evaluation costs, costs of no quality control (error costs) = costs of internal errors (defects) and costs of external errors (defects)</p>	<p>Armand V. Feigenbaum was the first to present the cost structure as a model in 1961 in the book <i>Total Quality Control</i>. Basics of this model were earlier presented in 1956 in the <i>Harvard Business Review</i> journal. Based on the structure of errors by Masser (1957) and the concept of economic quality of Juran, he divided the costs of quality into costs of quality control and costs of lack of quality control (costs of errors). Besides, he raised the problem of a need to relate quality costs to his entire life cycle (Feigenbaum, 1991, pp. 109–147]. He proved a need to include feedback in flow of information on quality. According to Feigenbaum, special emphasis should be placed on pre-production area, which specially is a carrier of quality values. Most errors occur within this area. The concept of reference-quality costs to product life cycle also includes the principle of producer liability for product quality. This model is known as the P-A-F model</p>	<p>ASQC (1967), Zymonik (2008, 2012), Teevarapug (2004), Schiffauerova and Thomson (2006), Weinstein <i>et al.</i> (2009) Dror (2010), Szczepanska (2012), Omar and Murgan (2014), Sailaja <i>et al.</i> (2014), Stanciu and Pascu (2014), Guinot <i>et al.</i> (2016), Guinot <i>et al.</i> (2017), Malik <i>et al.</i> (2016)</p>

(continued)

Author	Definition	Characteristics	Items based on this methodology
American Society for Quality Control (1967) – structural model of quality costing	$\text{Quality costs} = \text{prevention costs} + \text{quality evaluation costs} + \text{low internal quality costs} + \text{low external quality costs}$	<p>Quality Cost Committee established as part of ASQC published “<i>Quality Costs – What and How</i>” brochure in 1967, in which, citing classification of quality costs by A. Feigenbaum, it presented a new quality cost structure that was disseminated by J.M. Juran, who was a co-creator of this model. This structure was focused on large-scale and mass production. In the ASQC model, attention is paid to low-quality costs in the production phase. The term production shortages was used here for the first time, which has become established in the terminology of enterprises in all countries. The cost of assessment also included the quality of materials and parts in warehouses, which initiated enterprises’ interest in storage costs. However, the ASQC model goes beyond the enterprise only to a small extent</p>	<p>Juran (1974), Schiffauerova and Thomson (2006), Weinstein <i>et al.</i> (2009), Williams <i>et al.</i> (1999), Dror (2010), Zymonik (2008, 2013)</p>

(continued)

Table 1.

Author	Definition	Characteristics	Items based on this methodology
Crosby (1979, 1996) -concept "zero defects"	<p><i>Quality costs = compliance costs + non-compliance costs</i></p> <p>Non-compliance costs – all expenses related to the improper performance of a specific task</p> <p>Compliance costs = expenditure on ensuring that guidelines are correctly implemented</p>	<p>In his research, Crosby demonstrated a link between costs and low product quality, i.e. losses</p> <p>According to Crosby's concept, quality costs are costs of compliance and non-compliance with both product and process quality requirements. Costs of non-compliance should be minimized and zero defective products should be sought, i.e. "zero defects." This can be achieved through prevention, the costs of which are referred to as compliance costs. The company should have a program to prevent errors</p>	<p>BSI (1981, 1990), Plunket and Dale (1988), Teevarapug (2004), Schiffauerova and Thomson (2006), Cokins (2006), Weinstein <i>et al.</i> (2009), Williams <i>et al.</i> (1999), Dror (2010), Sailaja <i>et al.</i> (2014), Guinot <i>et al.</i> (2016), Malik <i>et al.</i> (2016), Chatzipetrou and Moschidis, 2016, Guinot <i>et al.</i> (2017), Teli <i>et al.</i> (2017)</p>
Taguchi (1979, 1986, 1989)	<p>Quality losses = social losses + producer losses + consumer losses</p>	<p>According to Taguchi's concept, quality costs can be associated with quality losses that occur as a result of non-compliance of consumer requirements and expectations with the product or service rendered. A dissatisfied customer means losses for the producer or service provider</p> <p>Taguchi's quality loss function showed the number of losses that are inversely proportional to the quality of product.</p> <p>Taguchi also pointed to the important role of prevention in reducing quality losses</p>	<p>Madu, (1998), Adil and Moutawakil (2012), Sailaja <i>et al.</i> (2014), Chatzipetrou and Moschidis (2016)</p>

(continued)

Author	Definition	Characteristics	Items based on this methodology
British Standards Institution (BSI) standard BS 6143, (1981, 1990)	Quality costs = prevention, evaluation and error costs (internal and external) + process costs Process costs = compliance costs + non-compliance costs	The quality costing model in this standard consists of two cost models, traditional PAF model and the process cost model, which are in response to new economic and social conditions and trends in business management The process approach was included in the amendment to BS 6143, which took place in 1990 The process cost model was first used for quality valuation by Marsh (1989)	Marsh (1989), Porter and Rayner (1992), Schneiderman (1986), Williams (1999), Zymonik (2008, 2013), Omar and Murgan (2014)
Schneiderman (1986)	Quality costs = compliance costs + non-compliance costs in relation to customer requirements	Arthur M. Schneiderman's concept (1986) is based on zero defects theory, derived from Lao Tsu and Crosby, which focuses on preventive actions. His quality cost model refers to measuring the effectiveness of qualitative activities in organization management and emphasizes customer quality requirements Schneiderman, like Juran, aims at minimizing total quality costs, treated as costs of compliance and non-compliance with quality requirements The model covers the entire product life cycle. It also assumes zero defects, focusing primarily on preventive actions that were to become part of the work of every employee in the organization, and also accepts only self-control as control activities	Tsai (1998), Kaplan, Cooper (2000), Kaplan. (2001), Zymonik (2003), Dror (2010), Sadkowski (2016), Omar and Murgan (2014)

(continued)

Table 1.

Table 1.

Author	Definition	Characteristics	Items based on this methodology
<p>Cooper and Kaplan (1988), Kaplan and Cooper (2000), Kaplan and Norton, (2001)</p>	<p>Quality costs = quality costs creating added value + quality costs not creating added value</p>	<p>R.S. Kaplan used A.M. Schneiderman's quality cost model. He emphasized this with the words "that organizations must also seek improvements in quality, duration and performance of specific internal processes and customer service" (Kaplan and Norton, 2001)</p> <p>According to Kaplan, quality and its contribution to business success should not only focus on determining the number of losses arising as a result of non-compliance with quality requirements but should also include additional costs that will contribute to preventing errors</p> <p>In the theory of R.S. Kaplan, an activity-based quality costing provides information that enables to see if potential improvements are beneficial or can be beneficial, and why such benefits have not been achieved</p>	<p>Tsai (1998), Schiffauerova and Thomson (2006), Vaxevanidis <i>et al.</i> (2009), Teli <i>et al.</i> (2017), Zymonik (2003, 2008)</p>

(continued)

Author	Definition	Characteristics	Items based on this methodology
Bank (1996)	<p>Quality costs = compliance costs + non-compliance costs + lost benefit costs</p> <p>Compliance costs = prevention costs + evaluation costs</p> <p>Costs of non-compliance = costs of internal errors + costs of external errors + costs of exceeding the requirements</p>	<p>J. Bank's structural model includes three categories of costs: costs of compliance and non-compliance with quality requirements, initiated in the BS 6143 model from 1990, and costs of lost profits due to inadequate quality of products or services. J. Bank recognizes costs of quality in an extensive range (1992), recognizing that "quality costs are the quintessence of all costs related to quality creation." It focuses on those elements of costs that were previously poorly addressed or not included at all. Costs of quality were related to manufacturing activities, auxiliary and service</p> <p>A characteristic element of his model is the costs of lost benefits resulting from the resignation of dissatisfied customers</p>	<p>Zymonik (2003, 2008), Szczepańska (2012), Sadkowski (2016, 2018)</p>

(continued)

Table 1.

Author	Definition	Characteristics	Items based on this methodology
<p><i>The most frequently cited definition of the polish author Zymonik (2003)</i> Quality costs = compliance costs + non-compliance costs</p>	<p>A proprietary risk-based approach is related to quality costs. This model goes far beyond the interior of the enterprise and is treated as a supplement to the models: Feigenbaum, ASQC, BS 6143, Banka and ISO 90041 and ISO 9004-3. It is related to the efficiency of business processes of a given enterprise (organization). The model is based on activity-based costing (ABC)</p> <p>Compliance costs refer to those enterprise activities that require proper product safety management and are therefore a contribution to its success. Non-compliance costs include inefficient use of resources, i.e. waste</p> <p>In addition, Z. Zymonik takes into account the added value and risk of defects in the product</p> <p>This concept emphasizes feedback between the customer and the product/service and also emphasizes the strategic nature of quality costs. Comprehensive information on pro-quality activities should be included in the strategic scorecard, and a full assessment should be made from four perspectives</p>	<p>Szczepańska (2012), Stadnicka (2016), Sadkowski (2016)</p>	

Source(s): Own study

enterprises which, by implementing quality costing, count on improving the efficiency of pro-quality activities. Achieving the appropriate level of effectiveness at each of the examined organizational, process and workplace levels is possible by using appropriate input and output measures. According to [Chatzipetrou and Moschidis \(2016\)](#), all these quality cost models have been extensively criticized. In particular, the P-A-F model has been characterized as “limited and inadequate.” [Dale and Plunkett \(1999\)](#) give a comprehensive overview of the main limitations of the P-A-F model. Besides, [Kim and Nakhai \(2008\)](#) and [Freiesleben \(2004\)](#) describe existing models as “static” and “old,” respectively, and propose modified or new descriptive models to explore those aspects of quality costing that traditional models do not take into account. [Chiadamrong \(2003\)](#) identifies further weaknesses of traditional quality cost models and presents an empirical model as a function of two main components: traditional costs of prevention, assessment and removal of failures, and costs of quality loss of hidden opportunities ([Chatzipetrou and Moschidis, 2016](#); [Teli et al., 2017](#)).

What is more, new quality cost models based on activities that allow achieving intended results have been created. ABC of quality is presented by quality cost models prepared by J.M. Juran and A.M. Schneiderman. Cooper and Kaplan developed activity costing model (see [Table 1](#)).

ABC approach is not a CoQ model. It is an alternative approach that can be used to identify, quantify and allocate quality costs among products, and therefore helps to manage quality costs more effectively.

[Tsai \(1998\)](#) proposes an integrated CoQ-ABC framework, in which ABC and CoQ systems are merged and share a common database in order to supply various cost and nonfinancial information for related management techniques. The long-term goal of ABC systems is to eliminate non-value-added activities and to continuously improve processes, activities and quality so that no defects are produced.

Considering today’s pro-market attitude of enterprises and undertaking difficult-to-measure activities, such as shaping the company’s image (which may also be a value for the client), quality costs can be defined as all costs incurred by the enterprise to achieve full customer satisfaction at the time of sale and during the use of the product ([Rogala, 2012](#)).

Based on the traditional concepts of quality baskets, proprietary solutions are created and adapted to the requirements of modern economic environment ([Kim and Nakhai, 2008](#); [Kiani et al., 2009](#); [Chopra and Garg, 2012](#); [Ayati and Schiffauerova, 2014](#); [Omar and Murgan, 2014](#); [Rosiawan et al., 2019](#)). Existing and commonly used CoQ models help in creating cost categories and then finding and placing cost elements in the appropriate categories.

As already mentioned, many new CoQ models are being developed. However, studies show that despite criticism, the P-A-F model is most commonly used in business practice because it is used in most companies where required data collection systems are more or less available ([Plunkett and Dale, 1985](#); [Malik et al., 2016](#); [Alglawe et al., 2019](#); [Chatzipetrou and Moschidis, 2017](#)). It is derived from the works of [Juran \(1951\)](#) and [Feigenbaum \(1956\)](#), and has since been developed, expanded and enriched. His initial categorization, however, was used as a useful tool in many case research studies aimed at better visualizing and reorganizing company’s structure and processes ([Chatzipetrou and Moschidis, 2017, 2018](#); [Dimitrantzou et al., 2020](#)).

The Prevention-Appraisal-Failure (P-A-F) model categorizes costs into three main categories (prevention, evaluation and failure costs) and manages to capture all costs related to the quality system and product control, as well as costs incurred when the product fails to meet requirements ([Teli et al., 2017](#)).

[Chatzipetrou and Moschidis \(2017\)](#), [Chatzipetrou and Moschidis \(2016\)](#), [Farooq et al. \(2017\)](#), [Kirlioglu and Çevik \(2013\)](#), [Tye et al. \(2011\)](#), [Jafar et al. \(2010\)](#) and [Desai \(2008\)](#) have

conducted studies based on the PAF model. Traditional assumption of the above model assumes a static representation of economics of quality costs. It suggests that investments in preventive and evaluation measures will reduce the cost of failure, and further investments in preventive measures will reduce the costs of assessment. It is confirmed that the costs of non-compliance (internal and external costs of failure) can only be reduced by increasing expenditure on compliance activities (Ittner, 1996; Chatzipetrou and Moschidis, 2017).

Improving operations of a company in the area of quality requires measuring not only costs related to quality but also their skillful analysis. It turns out that in business practice, collecting information on quality costs often becomes a goal, not a way, to achieve goals. CQM, as an effective and efficient instrument in company management, is aimed at recording and analyzing costs related to quality leading to their optimization, thanks to the identification of ineffective actions and undertaking internal improvement actions. Therefore, quality costs must not only be measured appropriately but also analyzed in terms of their sources, causes and effects of product defects.

Information on quality costs should be useful in fulfilling management functions in an organization, that is, it should be used in planning (including improvement), performance, control and improvement of activities. The company should take steps to ensure that information on quality costs is obtained and used in a continuous and repeatable manner. That is why it is so important to analyze quality costs, because of which it is possible to improve the QMS in many areas of company's activity (Kiani *et al.*, 2009). Analysis of quality costs should be performed in many cross-sections in order to obtain an assessment of the effectiveness of operations of the business unit, as well as minimization of production costs. It includes changes in the structure of quality costs, interpretation of relations between individual cost groups, the trend of their changes over time, assessment of quality costs concerning established quality policy of the company and determination of reasons for deviations of actual costs from planned quantities. This analysis provides the enterprise with necessary information about places of generating costs, as well as on the company's weaknesses and processes occurring in it. This information should be used by management in the decision-making process, both operational and strategic, as well as for planning and analyzing quality objectives and the organization's quality policy.

Implementation of CoQ system can improve results (Chopra and Garg, 2012; Srivastava, 2008). However, organizations should treat CoQ as an integrated approach and a long-term process, and focus on cost factors to improve customer satisfaction (Kiani *et al.*, 2009; Teli *et al.*, 2017). CoQ has a direct impact on company's overall financial goal, and even a small reduction in CoQ can significantly increase a company's profitability (Sahu and Sridhar, 2013; Satanova *et al.*, 2015). Measuring quality costs on a small scale of industry is very important and useful. It helps to define specific levels of quality and ultimately improves quality (Chopra and Garg, 2011).

Psomas *et al.* (2018), Teli *et al.* (2017), Garza-Reyes *et al.* (2015), Marzuki and Wisridani (2014), Lari and Asllani (2013), Rasamanie and Kanapathy (2011), Dror (2010), Arvaiova *et al.* (2009), Weinstein *et al.* (2009) Tye *et al.* (2007), Sower (2007), Dale and Wan (2002), Roden and Dale (2001) and Superville and Gupta (2001) have pointed out the benefits of using CoQ systems as well as the problems and difficulties associated with the implementation of a quality cost system.

Lari and Asllani (2013) have also proposed a quality management support system that enables the organization to collect and analyze better the data on quality costs. Such a support system can also be used if a standard quality cost procedure is available.

However, it should be noted that many of studies conducted so far have shown that few companies use CoQ data at all (Gupta and Campbell, 1995; Viger and Anandarajan, 1999; Sower *et al.*, 2002; Rasamanie and Kanapathy, 2011; Guinot *et al.*, 2016). Pursglove and Dale

(1996) suggest three reasons for the low use of CoQ: a lack of understanding of CoQ concepts and principles, lack of data and lack of interest in quality costs on managers side. To this list, Rodchua (2006) and Rasamanie and Kanapathy (2011) add lack of cooperation between various departments involved in the process. Johnson and Kaplan (1987) note that quality costs are often included in overheads and are not divided into useful categories for analysis (Guinot *et al.*, 2016). Özkan and Karaibrahimoğlu (2013) noted that small and medium-sized enterprises show a lower level of quality cost management when compared to large companies. This is due to the slow implementation of TQM, lack of advanced accounting systems or the higher initial costs of cost management tools.

Other results are obtained by Glogovac and Filipovic (2018), whose research shows that there is a high level of awareness that CoQ is significant and that there is an increase in the number of companies managing these costs. The authors have based their research on the analysis of relationship between ISO 9001:2015 and effectiveness of quality cost management. Chiarini (2015) also recognized and discussed in his article the relationship between the requirements of ISO 9001 and CoQ. He analyzed the relationship between quality cost system and basic requirements of ISO 9001:2015.

It should also be emphasized that in recent years, the interest of scientists and practitioners in the CoQ concept has increased, as evidenced by a large number of publications in various contexts and disciplines (Uyar and Neyis, 2015; Grbac *et al.*, 2015; Johnston and Ozment, 2015; Sawan *et al.*, 2018; Psomas *et al.*, 2018).

3. Methodology

Despite the high interest in quality cost management among scientists, current research indicates that few companies have implemented quality costing (Guinot *et al.*, 2016; Glogovac and Filipovic, 2018). The primary goal of research, which has been implemented, is a need to acquire knowledge about the use of pro-quality cost accounts in enterprises operating in Poland. An important determinant is also recognition of the degree of application of quality costing and pro-quality accounts depending on the size of enterprise. Since 99.8% of enterprises in Poland are SMEs (<https://www.parp.gov.pl>), the research was based on enterprises from this group from the production and services sectors.

The pilot studies were made from April to October 2018 as a prelude to relevant surveys. The pilot studies were conducted in the form of personal interviews with managerial staff of selected production and service companies from SMEs in order to determine target research group.

The vast majority of enterprises in SMEs are microenterprises and small enterprises, which face many threats and barriers to overcome. Often the reason for their occurrence is internal factors resulting from the company structure itself.

Undoubtedly, significant diversity of enterprises in this respect is essential, both in terms of size, potential, objectives, scope and structure of operations, as well as due to organizational and legal form. This group includes one-person and family companies, often run by people who do not have necessary preparation and qualifications to efficiently solve multifunctional and interdisciplinary problems, improve the decision-making process in an enterprise and stimulate innovation and entrepreneurship. Many enterprises in the SMEs, especially microenterprises, are not able to withstand economic situation and liquidate their activities. Insolvency, lack of market strategy, lack of economic preparation, lack of knowledge of legal regulations or lack of qualified staff often become a problem.

Most of these companies apply simplified forms of accounting only for tax purposes, which means that these units have access to a much smaller amount of information supporting the decision-making process and limited knowledge about costs incurred. Small

enterprises keep accounting books, and they very often limit their activity to recording costs only for reporting purposes. Within the group of these companies, quality costs, even if counted, have a simplified form. Due to the above, mid-sized companies, employing from 50 to 250 people, were selected as a target research group.

Obtaining information on cost accounting and application of solutions in the field of quality cost accounting was important while formulating a questionnaire. In addition, in October 2018, selected enterprises from target group were asked to fill in the questionnaire in order to verify it. The respondents were managerial staff and main accountants. These people were asked to complete the questionnaire and provide comments, both content-based and technical, regarding ergonomics of the survey. The purpose of this activity was to prepare a questionnaire in such a way that it would be clear and understandable for respondents. On the one hand, it was detailed, but on the other hand, it was not leading to negative reception. Collected remarks have been used to develop the final version of questionnaire, which is being implemented.

The survey was divided into three parts. The first part is a data sheet and contains data characterizing of an enterpris; the second part deals with applied cost records. In contrast, the third part contains fundamental questions concerning the use of quality costing and pro-quality costing. The questionnaire also used a formula of open questions, allowing respondents to comment more broadly on a specific problem. The comment complements an answer, with precious opinions from the point of view of survey participants. The collected material, to the extent it was possible, was subjected to analysis and statistical inference. This allowed, *inter alia*, to determine the relationship between the use of individual solutions and cost accounting instruments and characteristics of enterprises, and to assess the degree of use and interest in quality costing and other pro-quality cost accounting (Biadacz, 2019).

This study presents only a fragment of research on application and interest in quality accounting in a group of randomly selected medium-sized enterprises operating in Poland.

4. Analysis of research results

The survey was carried out on a representative group of 400 companies from the manufacturing, production and service companies. The scope of research was nationwide. Ordinary and dichotomous scales were used in the study. Therefore, the formula for structure indicator was considered appropriate to determine the minimum sample size. Assuming a 5% error, a minimum sample size of 385 has been determined. The resulting sample $N = 400$ meets this condition. Questions used in the questionnaire were verified for quality using Cronbach's alpha. The value $\alpha = 0.822$ for aggregated data and exceeding in each case 0.700 for individual issues indicate that the scales and the sequence of questions used are correct. Due to the scale used in the study, Wilcoxon pair tests and Mann–Whitney U test were used for comparing scores of individual targets. To examine the correlation, φ , Youl coefficient based on χ^2 statistics was used. In the study, 0.05 was used as a significance level for the tests applied.

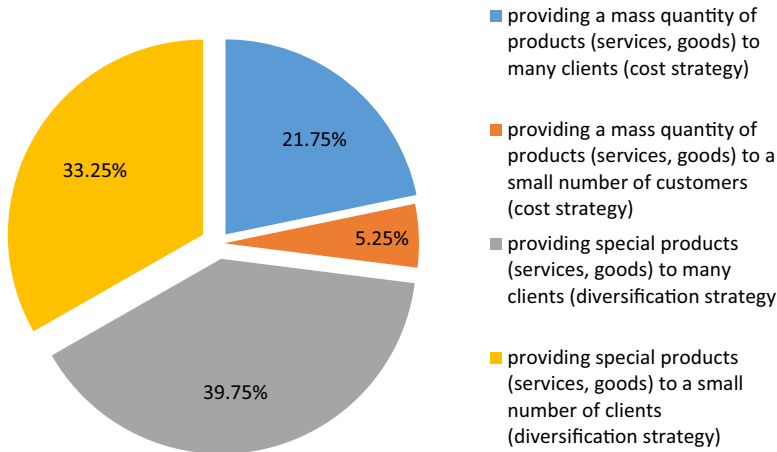
The questionnaire was filled mainly by entities, which are national enterprises (producing and selling products/providing services only on the domestic market) –93.75%. Most respondents conduct business activity in the scope of providing services – 82.75% of all surveyed units and 24% in the area of production.

Some companies are engaged not only in services but also in production. For this reason, the percentage reference applies to all surveyed enterprises, but the provision of services does not exclude manufacturing activities. The respondents could indicate more than one answer. In further analysis, the author deals with sometimes overlapping categories, for instance, in the case of enterprises operating on the market. An enterprise operating for over ten years can

also be included among those operating for over five years. Not all categories analyzed were specified in the interpretation.

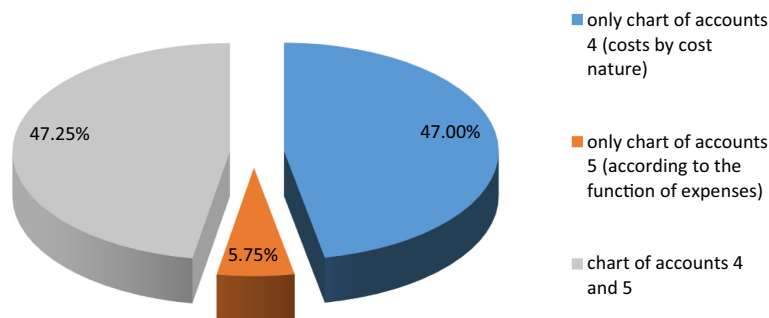
Among surveyed respondents, 88.5% were enterprises with a 100% share of domestic capital. In the case of 4.5% of enterprises, foreign capital is at least 50%, and 5.75% of all respondents are financed exclusively with foreign capital. The vast majority of surveyed companies have been on the market for many years: over fifteen years –87%, over six years –10.75%. An analysis of the population of surveyed enterprises from the perspective of adopted strategy of gaining market allows concluding that over 73% of surveyed entities apply a diversification strategy by providing unique products (services), with 39.8% offering their products or services to a large number of clients. The basic areas of activity of the surveyed enterprises are presented in Figure 1.

One of the essential areas of research was the cost accounting system used by respondents. The data presented in Figure 2 show that 47% of enterprises present their



Source(s): Own study

Figure 1. Basic areas of activity of surveyed enterprises



Source(s): Own study

Figure 2. Method of keeping records of operating costs in the surveyed enterprises

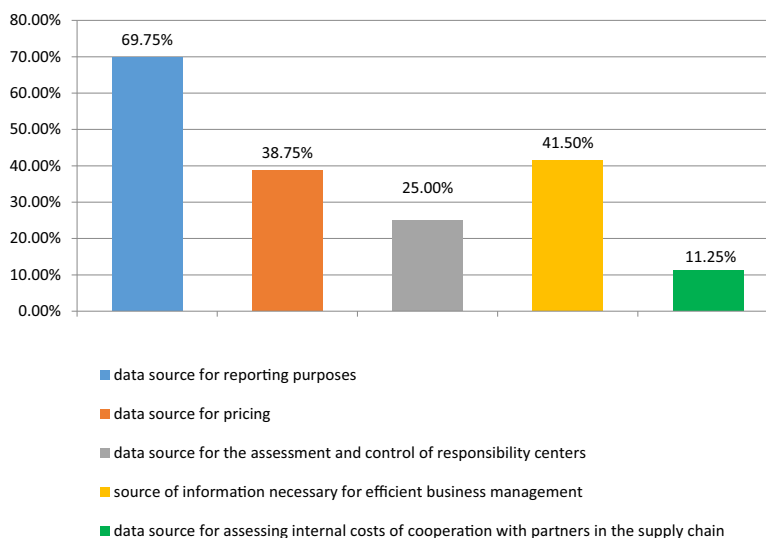


Figure 3.
The role of cost accounting in the enterprise

Note(s): Respondents could indicate more than one answer

Source(s): Own study

operating costs by cost nature (chart of accounts 4), 6% according to the function of expenses (chart of accounts 5) and 47% in the chart of accounts 4 and 5.

Opinions of surveyed enterprises indicate that cost accounting used is primarily a data source for reporting purposes (69.75% of responses). Notably, 41.5% of respondents indicated that the cost accounting used is a source of information necessary for efficient business management. Figure 3 presents the full range of respondents' answers to the above question.

Table 2 presents the values of correlation coefficients and the Mann–Whitney U test for equal distribution for the role of cost accounting, depending on the time of operation on the market.

The correlation and Mann–Whitney U test show that in the case of analysis of the role played by cost accounting for entrepreneurs, only the source for reporting purposes is

Table 2.
The values of correlation coefficients and the Mann–Whitney U test for equal distribution for the role of cost accounting, depending on the time of operation on the market

Metrics Role	Correlation			Equality	
	χ^2	φ	p	Z	p
Data source for reporting purposes	7.165*	−0.134	0.007	2.673*	0.008
Data source for pricing	2.470	−0.079	0.116	1.569	0.117
Data source for the assessment and control of responsibility centers	1.061	−0.052	0.303	1.028	0.304
Source of information necessary for efficient business management	0.016	0.006	0.899	−0.126	0.900
Data source for assessing internal costs of cooperation with partners in the supply chain	1.023	0.051	0.312	−1.009	0.313

Source(s): Own study

indicated in a manner significantly dependent on the time of operation of enterprises ($\chi^2 = 7,165$; $\varphi = -0.134$; $p = 0.007$), which has also been confirmed by the Mann–Whitney U test ($Z = 2,673$; $p = 0.008$). Businesses that have been on the market longer are more likely to use cost accounting as a data source for reporting purposes. Another important question of the survey was about the use of modern varieties of cost accounting, including quality costing. The answers show that only 9.75% of the surveyed enterprises use this variation of cost accounting. This is consistent with previous studies (Kerfai *et al.*, 2016; Guinot *et al.*, 2016; Rasamanie and Kanapathy, 2011; Rodchua, 2006; Sower *et al.*, 2002; Viger and Anandarajan, 1999; Pursglove and Dale, 1996; Gupta and Campbell, 1995), as confirmed in above-mentioned discussion, which proves that the number of enterprises using quality costing among SMEs is still relatively small.

It is also worth mentioning that 69.75% of respondents answered that they do not use any modern cost accounting methods.

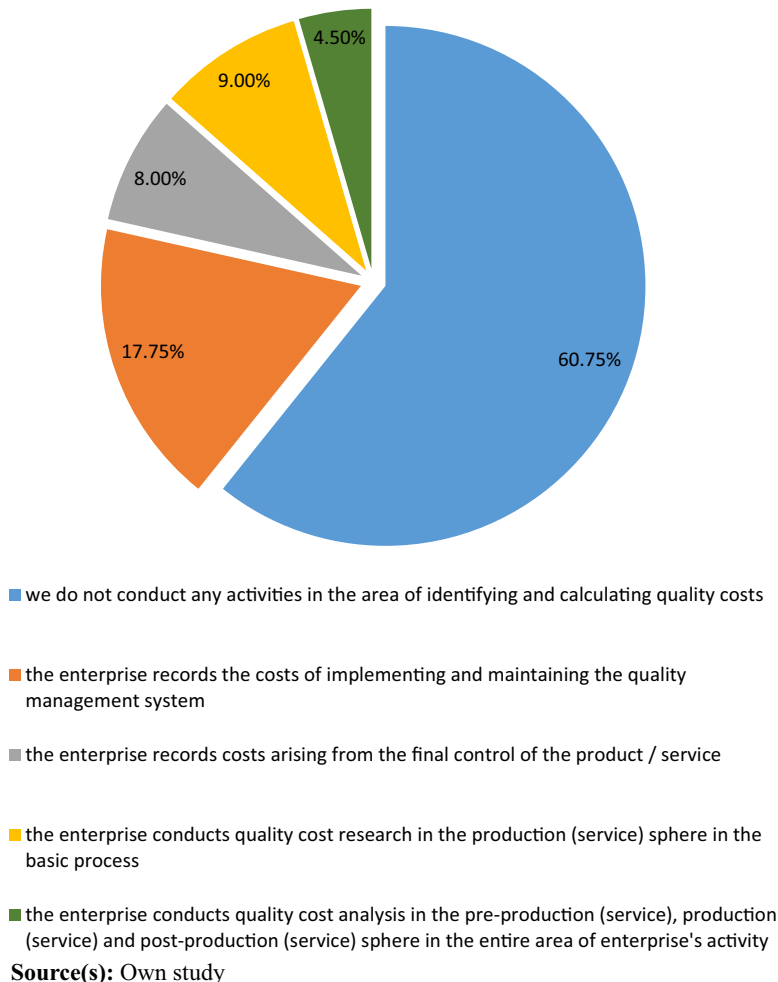


Figure 4. Actions aimed at identifying and accounting for quality costs carried out in the surveyed enterprises

Interestingly, however, 47.75% of surveyed enterprises declare that they are implementing a quality policy. Additionally, 39.25% of the respondents indicated that they undertake activities aimed at identifying and accounting for quality costs. The detailed distributions of answers concerning activities aimed at identification and settlement of quality costs carried out in the surveyed companies are presented in [Figure 4](#).

This is in line with the research carried out, among others, by [Glogovic and Filipovic \(2018\)](#), whose research shows a tendency to increase the applicability of CoQ in practice, as evidenced by a number of companies that have started this practice in the last five years.

One should also agree with the conclusion of [Chopra and Garg \(2011, 2012\)](#) that measuring quality costs and applying quality cost accounting in enterprises of SMEs are very important and useful.

One part of the survey included questions about the application of quality costing. All respondents were asked to respond, regardless of quality costing in their company.

The opinion of surveyed enterprises on the degree of importance of tasks of quality costing operating or which the questioned entity would like to implement was analyzed using a 6-point Likert scale (6: very important, 1: completely invalid).

The distribution of assessments of the degree of importance of cost accounting tasks is presented in [Figure 5](#), and the results of Wilcoxon paired test for assessments of the importance of individual cost accounting tasks in [Table 3](#).

The number of high marks is significantly higher for the first three tasks. Providing information to various levels of management on the size and structure of quality costs (a) was rated 4 by almost 40% of respondents and 5 by nearly 30%. Besides, in these three cases (but also in other cases), the “2” was the least frequent. Therefore, it can be assumed that low scores were indicated by respondents who had firm views on the subject. The most difficult task to assess – with the most balanced assessments – turned out to be “determining reasons of quality costs generation” (e). Here, none of the answers exceeded 25% of indications.

Indication of products (services) with the highest quality costs and determining reasons for quality costs generation were ranked significantly higher than others, while determining and analyzing measures of quality of productions and services were ranked significantly lower.

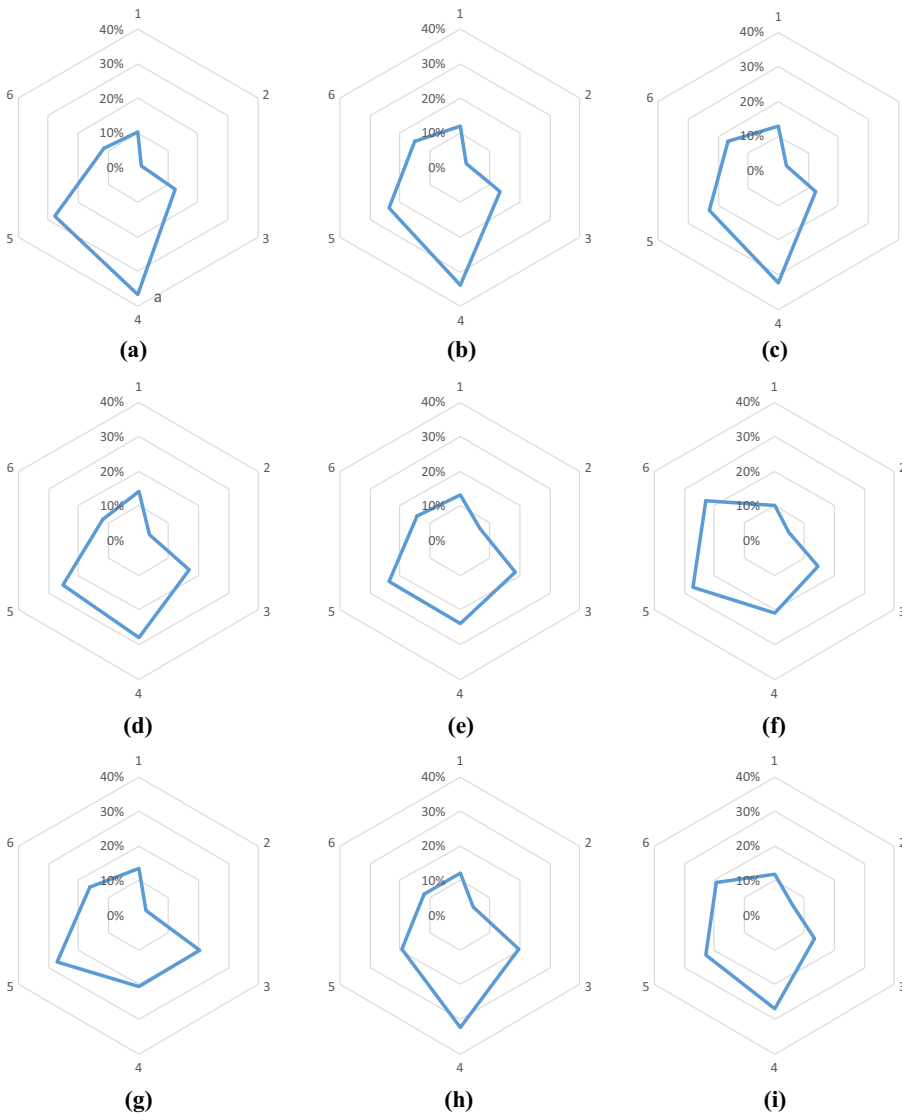
The distribution of answers regarding the significance of differences (using tests for two means and Wilcoxon) for assessing the importance of tasks of quality costing of operating or one that entrepreneurs would like to implement is presented in [Table 4](#).

Analysis, including the previous period, turned out to be top-rated (4.19) – higher than almost all other tasks of the quality costing operating or one that entrepreneurs would like to implement. In fact, all tasks were indicated significantly more often as important or as invalid. Some of the tasks were graded significantly lower: establishing and analyzing production and service quality measures (3.78), determining causes of quality costs (3.81) and identifying products with the highest quality costs (3.82).

When asked what quality costs are (should be) identified, the distribution of answers is as follows ([Figure 6](#)).

Data presented in the figure above show that most of the respondents have indicated costs of quality assessment (41.75%), followed by costs of external complaints (36.5%), costs of internal deficiencies (31%) and costs of preventive activities (30%). The least significant according to respondents is the cost of external quality assurance, which should be identified only according to 18.75% of respondents.

These results show that surveyed enterprises attach too low importance to identifying costs of prevention. On the other hand, numerous previously conducted studies on the effectiveness of implementation of quality costing indicate that in order to gain a



Note(s): a) providing information to various levels of management about the size and structure of quality costs; b) the basis for optimizing quality costs; c) indication of main places where quality costs are generated; d) indication of products (services) with the highest quality costs; e) determining reasons of quality costs generation; f) analysis including the previous period; g) indication of possibilities for improvement in quality management system; h) establishing and analyzing production and service quality measures; i) determining the impact of quality costs on the company's financial result

Source(s): Own study

Figure 5.
Distribution of assessments of the importance of cost accounting tasks

Table 3.
Results of Wilcoxon
paired test for
assessing the
importance of
individual cost
accounting tasks

task	a	b	c	d	e	f	g	h
b	-							
c	-	-						
d	↑	↑	↑					
e	↑	↑	↑	-				
f	-	-	-	←	←			
g	-	-	-	-	-	↑		
h	↑	↑	↑	-	-	↑	-	
i	-	-	-	←	←	-	-	←

Note(s): Explanation: e.g. to question d in relation to a: assessment of category a was significantly higher than category d; assessment of the relation of question f to d: assessment of category f was significantly higher than assessment of category d

Source(s): Own study

competitive advantage and increase profitability, enterprises should incur higher outlays for preventive activities. This is in line with the conventional wisdom of “prevention is better than cure.” Monitoring of these costs, together with assessment costs, is widely recognized as very important (Chopra and Garg 2011; Chatzipetrou *et al.*, 2016; Kerfai *et al.*, 2016).

In the opinion of 70.5% of respondents, records and analysis of quality costs are (should be) kept in the enterprise according to their place of origin; 43.75% of respondents indicate that they should be presented by nature of *the* expense. Only 15.25% of respondents indicate that records and cost analysis quality should be maintained throughout the product life cycle.

The next question referred to the method of recording quality costs, whether it should be done continuously, or as a partial registration or as a one-off operation. The distribution of answers to the above question is shown in Figure 7.

Presented data indicate that, according to 51.75% of respondents, quality costs should be recorded continuously – as part of current financial and accounting system together with other costs.

Besides, 50.75% of respondents believe that cost accounting should allow for settlement of all costs for goods/services (full costing). According to 35.25% of respondents, it should allow control of all costs for information purposes. Only 14% of respondents believe that quality costing should allow for settlement of some costs for goods/services and control of others (direct costing). A question was also asked for what purposes the quality costing should be used. The distribution of answers is illustrated in Figure 8.

Presented data show that quality costing should primarily be used to identify and eliminate weaknesses of the company (57.25% of responses) as well as to optimize production costs (51.25%). The least indications are with regard to the formulation of short-term plans and budgets (26.75%).

The last question concerned the benefits the implementation of a quality costing system in an enterprise had to bring, or it could bring. This question uses a 6-point Likert scale.

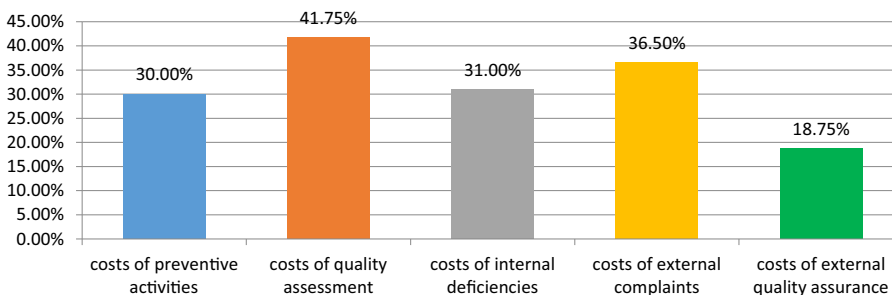
The distribution of answers regarding the significance of differences (using tests for two means and Wilcoxon) for assessing benefits of implementing cost accounting is presented in Table 5.

task	providing information to various levels of management about the size and structure of quality costs	the basis for optimizing quality costs	indication of main places where quality costs are generated	indication of products (services) with the highest quality costs	determining reasons of quality costs generation	analysis including the previous period	indication of possibilities for improvement in quality management system	establishing and analyzing production and service quality measures	determining the impact of quality costs on the company's financial result
providing information to various levels of management about the size and structure of quality costs		-	-	←	←	↑	-	←	-
the basis for optimizing quality costs	-		-	←	←	-	-	←	-
indication of main places where quality costs are generated	-	-		←	←	←	-	←	-
indication of products (services) with the highest quality costs	↑	↑	↑		-	↑	-	-	↑
determining reasons of quality costs generation	↑	↑	↑			↑	-	-	↑
analysis with the previous period	-	←	←	←	←		←	←	←
indication of possibilities for improvement in quality management system	-	-	-	-	-	↑		←	-
establishing and analyzing production and service quality measures	↑	↑	↑	-	-	↑	-		↑
determining the impact of quality costs on the company's financial result	-	-	-	←	←	↑	-	←	

Note(s): Arrows indicate statistically significant differences in grades or averages. The direction of the arrow indicates a higher average/assessment. Significance was confirmed at $\alpha = 0.05$, the table also indicates - with thinner arrows - significant differences at $\alpha = 0.10$

Source(s): Own study

Table 4. A graphic illustration of significance of differences for assessing the importance of tasks of quality costing



Note(s): Respondents could indicate more than one answer

Source(s): Own study

Figure 6. Types of quality costs that should be identified in the enterprise

Figure 7.
Methods for recording
quality costs

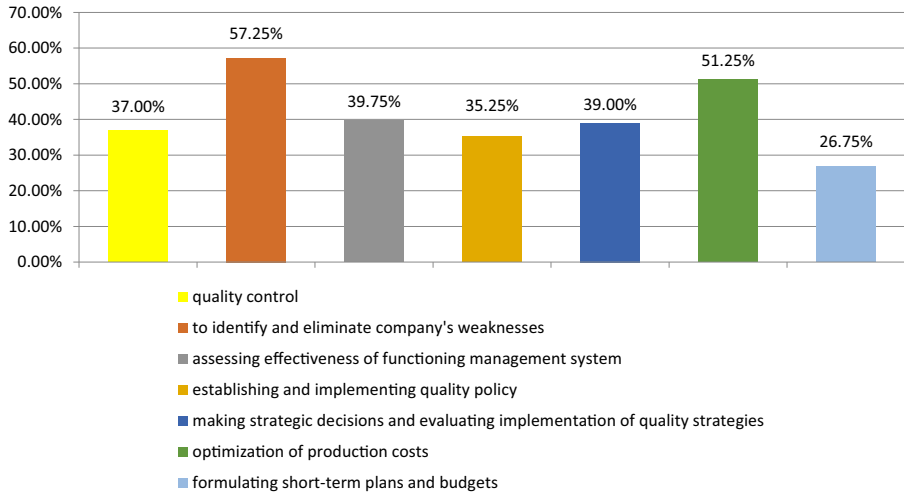
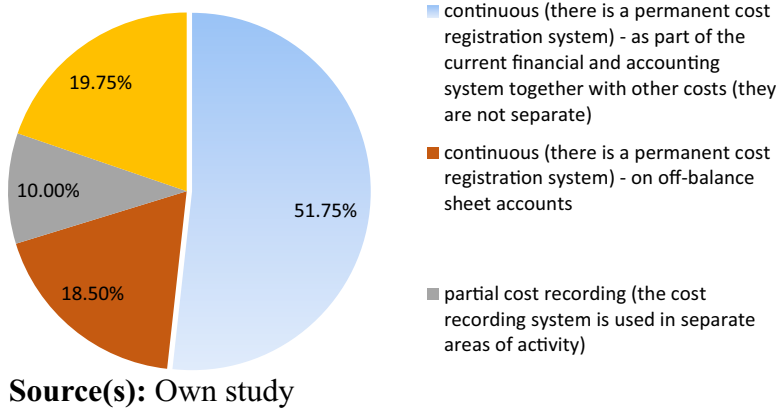


Figure 8.
The objectives of using
quality costing

Highest-rated benefit turned out to be lower overall production costs (4.22) and improved unit management (4.14). A clearly (statistically significant) weaker rating compared to others was characterized by a change in the structure of quality costs (3.69) and an increase in sales (3.68).

It is indicated from the above results that the most significant benefits of using quality costing are (could be) lowering overall production costs and improving quality management. They are consistent with results of previous research in this area, in which benefits of implementing CoQ are emphasized by many studies (Teli *et al.*, 2017; Chatzipetrou *et al.*, 2016; Lari *et al.*, 2013; Rasamanie and Kanapathy, 2011; Chopra and Garg 2011; Kiani *et al.*, 2009; Kim and Nakhai, 2008; Ramudhin *et al.*, 2008; Yang, 2008; Sower, 2007).

benefit	reducing overall manufacturing costs	reduction of quality costs	changing the structure of quality costs	increasing the quality of products	increase in sales	increasing the company's competitiveness	obtaining more information useful for making management decisions	improving unit management
reducing overall manufacturing costs	↘	←	←	←	←	←	←	-
reduction of quality costs	↑	↘	←	-	←	-	-	↑
changing the structure of quality costs	↑	↑	↘	↑	-	↑	↑	↑
increasing the quality of products	↑	-	←	↘	←	←	-	↑
increase in sales	↑	↑	-	↑	↘	↑	↑	↑
increasing the company's competitiveness	↑	-	-	↑	←	↘	↑	↑
obtaining more information useful for making management decisions	↑	-	←	-	←	-	↘	↑
improving unit management	-	←	←	-	←	←	←	↘

Note(s): Arrows indicate statistically significant differences in grades or averages. The direction of the arrow indicates a higher average/assessment. Significance was confirmed at $\alpha = 0.05$, the table also indicates - with thinner arrows - significant differences at $\alpha = 0.10$

Source(s): Own study

Table 5. Distribution of answers regarding the significance of differences for assessing benefits of implementing cost accounting

5. Conclusion

In this research, both pilot and survey studies show that many SMEs have already taken the first step on the quality path; according to Lao Tsu: *Even a journey of a thousand miles must start with the first step*. Now it is worth taking even small steps toward perfection because, according to the thought of Thomas J. Watson, *it is better to aim at perfection and miss it than it is to aim at imperfections and hit it*. The word quality has been ubiquitous for many years; it is included in offers, company visions, as well as in advertising slogans. However, it became more widely used only after the economic system was changed in the 1990s. Surveys carried out by researchers at various times indicated that the dynamically developing market and the continuous changes in the environment since then have increased interest in the implementation of ISO standards and quality costing. However, as a rule, research on the implementation of quality costing was carried out on enterprises that implemented ISO standards. Most often, they are large companies, often representing part of international concerns. The scope and form of implementation of this tool are often determined by the implementation of QMS and expectations toward it. If this tool represents for a company to improve competitiveness, reduce operating costs, provide services and improve quality of products manufactured and sold, the natural consequence will be the implementation and use of a framework that allows assessment of effects in this area.

In many such enterprises, quality costing is now an integral part of the management process. It has become an information, control and decision system, with an extended scope of implemented tasks. Quality costs, which were originally part of operational management, now also serve strategic decisions and are also reflected in management accounting.

Currently, more and more often, the quality costing is an integral part of modern strategic management accounting systems, that is, ABC or *lean management accounting*, in these companies.

The author of this article has set herself the goal of verifying the degree of interest in contemporary types of quality costing, including quality costing in selected medium-sized enterprises from production and services sectors employing 50–250 people and operating in Poland.

This research shows that medium-sized enterprises in Poland still make little use of modern cost accounting variants. Based on the results from earlier research, only 9.75% (39 enterprises) from a representative group of 400 companies from the sector of manufacturing, production and service companies apply the quality costing. Some of the other enterprises are only taking measures to implement the cost accounting under consideration.

However, it should be noted that this situation is changing. Interest in new solutions provided by accounting has been increasing recently, and new management accounting solutions are being implemented. There is an increasing interest in initiating pro-quality activities, which may increase interest in pro-quality costing. More and more companies perceive quality cost management as one of the important elements for assessing and improving efficiency. This is also confirmed by research carried out by the author, and it shows that 47.75% of surveyed enterprises implement quality policy, and 39.25% undertake actions aimed at identifying and accounting for quality costs.

5.1 Implications for research and practice

From the theoretical point of view, this study represents a contribution to the literature on identification of the degree of implementation of quality costing in medium-sized enterprises operating in Poland.

Questions asked, their answers and the resulting conclusions fill identified research gap. In the author's opinion, findings made as a result of research are relevant and useful, not only for accounting practice but also for theory. They show that although TQM and quality costing have been very popular in the literature since the 1990s, the degree of application of quality costing in practice is too low in Poland (except for large, often international companies). So, the suitability of QCM in managing a modern enterprise from the SMEs should be promoted.

This research can help the companies that are quality-oriented and want to implement quality costing. The survey conducted on a group of 400 enterprises presents opinion of all surveyed enterprises on the most important aspects of application of quality costing.

The conducted research has also justified raising the following questions – “Why in the age of robotization and digitization, so many companies still only use traditional solutions in the framework of cost accounting and management?” and “Why do not companies use quality costing?”

First of all, this is due to the fact that the majority of these companies, despite the challenges they have to face, despite the rapid increase in information and control requirements set out for accounting systems, to support the decision-making process in the era of sustainable development, when they are expected to take actions in the field of social responsibility, either do not realize a need to optimize costs, including quality costs, or they do not have sufficient capital to implement new accounting solutions. Many of these companies are trying to survive on the market; they are not sure what will be “tomorrow.” The basic barriers to implementation and development of quality costing in Polish enterprises include time-consuming, labor-consuming and costly process of implementing quality costing; lack of standards for keeping records, planning, control and analysis of quality costs; expected small financial effects of using this tool; and a low level of

qualifications of employees of finance and accounting departments in the field of methods developed by management accounting and a difficult financial situation that hinders the implementation of new solutions.

Besides, lack of interest in management in the implementation of new solutions is a significant barrier.

Based on the conducted research, the following recommendations can also be made for enterprises taking into consideration the implementation of quality costing in the future:

- (1) implementation of quality costing should be considered by both manufacturing and service companies wishing to increase efficiency and effectiveness of their operations;
- (2) quality costing can be used to complement traditional cost accounting system;
- (3) companies planning to implement cost accounting should be aware that QCM systems do not have to be too comprehensive (especially in the initial phase of their use);
- (4) QCM can be integrated with other modern management methods, such as ABC, target costing or balanced scorecard;
- (5) implementing quality costing does not directly improve the company's competitiveness or its financial results. The creation of QCM, however, allows management to optimize quality control planning in terms of quality, reveals areas with high cost, and allows for more accurate observation and more efficient analysis of non-compliances occurring and removal of sources of costs.

In order to further analyze the construction of QCM systems and the use of information from QCM by enterprises, case study method should be used more widely. This method would allow a detailed look at how QCM systems are implemented in a particular company (companies), how they function and to what extent they are used, how they are modified and how various people from the company assess functioning of QCM. From the point of view of scientific research, companies that have decided to implement QCM, but they resign constitute an extremely interesting group. Based on this population, one can examine the reasons for abandoning QCM implementation. It may also be interesting for future research to compare companies that have decided to implement QCM after analysis, and those who have rejected QCM.

The list of acronyms:

SMEs -	Small and Medium-sized Enterprises
ISO -	International Organization for Standardization
TQM -	Total Quality Management
QCM -	Quality Cost Management (QCM).

References

- Aart Scholte, J. (2010), "Governing a more global world", *Corporate Governance*, Vol. 10 No. 4, pp. 459-474.
- Adil, A. and Moutawakil, A. (2012), "The quality cost reduction in hollow glass manufacturing by Taguchi method", *Journal of Scientific Research*, Vol. 4 No. 1, pp. 155-172.
- Agrawal, N. (2019), "A framework for Crosby's quality principles using ISM and MICMAC approaches", *The TQM Journal*, Vol. 32 No. 2, pp. 305-330.
- Ahire, S.L., Landeros, R. and Golhar, D.Y. (1995), "Total quality management: a literature review and an agenda for future research", *Production and Operations Management*, Vol. 4 No. 3, pp. 277-306.

- Ahmed Al-Dujaili, M.A. (2013), "Study of the relation between types of the quality costs and its impact on productivity and costs: a verification in manufacturing industries", *Total Quality Management and Business Excellence*, Vol. 24 No. 4, pp. 397-419.
- Akyol, D.E., Tuncel, G. and Bayhan, M. (2005), "A comparative analysis of activity based costing and traditional costing", *World Academy of Science, Engineering and Technology*, Vol. 3, pp. 44-47.
- Alglawe, A., Schifffauerova, A., Kuzgunkaya, O. and Shiboub, I. (2019), "Supply chain network design based on cost of quality and quality level analysis", *The TQM Journal*, Vol. 31 No. 3, pp. 467-490.
- Anttila, J. and Jussila, K. (2017), "Understanding quality – conceptualization of the fundamental concepts of quality", *International Journal of Quality and Service Sciences*, Vol. 9 Nos 3/4, pp. 251-268.
- Aquilani, B., Silvestri, C., Ruggieri, A. and Gatti, C. (2017), "A systematic literature review on total quality management critical success factors and the identification of new avenues of research", *The TQM Journal*, Vol. 29 No. 1, pp. 184-213.
- Arvaiova, M., Aspinwall, E.M. and Walker, D.S. (2009), "An initial survey on the use of costs of quality programmes in Telecommunications", *The TQM Journal*, Vol. 21 No. 1, pp. 59-71.
- ASQC Quality Costs Committee (1967), *Quality Costs — What and How*, American Society for Quality Control, Milwaukee, WI.
- Ayati, E. and Schifffauerova, A. (2014), "Study of cost of quality behavior in manufacturing supply chain based on the quality maturity status", *ASME 2014 International Mechanical Engineering Congress and Exposition*, Vol. 14.
- Bajaj, S., Garg, R. and Sethi, M. (2018), "Total quality management: a critical literature review using Pareto analysis", *International Journal of Productivity and Performance Management*, Vol. 67 No. 1, pp. 128-154.
- Bank, J. (1996), *Management through Quality*, Gebethner and Ska Publishing House, Warsaw, 112-113, 124, pp. 32-33.
- Barker, K.J. and Emery, C.R. (2006), "The effect of TQM factors on financial and strategic performance: an empirical test using manufacturing firms", *Academy of Strategic Management Journal*, Vol. 5, pp. 39-59.
- Belay, M.A., Helo, P., Kasie, F.M., Takala, J. and Powell, D.J. (2014), "Adoption of quality management practices an investigation of its relationship with labor productivity for labor-intensive manufacturing companies", *Benchmarking: An International Journal*, Vol. 21 No. 1, pp. 77-100.
- Biadacz, R. (2019), "Pro-quality cost accounts in a time of sustainable development", *International Journal of Supply Chain Management*, Vol. 8 No. 4, pp. 985-986.
- Bouranta, N., Psomas, E.L. and Pantouvakis, A. (2017), "Identifying the critical determinants of TQM and their impact on company performance: evidence from the hotel industry of Greece", *The TQM Journal*, Vol. 29 No. 1, pp. 147-166.
- British Standards Institute (BSI) (1981), *BS 6143: "Guide to the Determination and Use of Quality Related Costs"*, British Standards Institute, London.
- British Standards Institute (BSI) (1990), *BS 6143: 2 "Guide to the Economics of Quality"*, British Standards Institute, London.
- Bugdol, M. (2020), "The problem of fear in TQM – causes, consequences and reduction methods – a literature review", *The TQM Journal*, ahead-of-print No. ahead-of-print.
- Campanella, J. (1999), *Principles of Quality Costs: Principles, Implementation and Use*, ASQ, Quality Press, Milwaukee, p. 5.
- Carnerud, D. (2018), "25 Years of quality management research—outlines and trends", *International Journal of Quality and Reliability Management*, Vol. 35 No. 1, pp. 208-231.

- Carnerud, D. and Bäckström, I. (2019), "Four decades of research on quality: summarising, trendspotting and looking ahead", *Total Quality Management and Business Excellence*, Vol. ahead-of-print No. ahead-of-print.
- Castillo-Villar, K.K., Smith, N.R. and Simonton, J.L. (2012), "The impact of the cost of quality on serial supply-chain network design", *International Journal of Production Research*, Vol. 50 No. 19, pp. 5544-5566.
- Chatzipetrou, E. and Moschidis, O. (2016), "Quality costing: a survey in Greek supermarkets using multiple correspondence analysis", *International Journal of Quality and Reliability Management*, Vol. 33 No. 5, pp. 615-632.
- Chatzipetrou, E. and Moschidis, O. (2017), "An exploratory analysis of quality costing in Greek F&B enterprises", *The TQM Journal*, Vol. 29 No. 2, pp. 324-341.
- Chatzipetrou, E. and Moschidis, O. (2018), "A multidimensional longitudinal meta-analysis of quality costing research", *International Journal of Quality and Reliability Management*, Vol. 35 No. 2, pp. 405-429.
- Cheah, S.J., Shah, A., Shahbudin, M., Fauziah and Taib, M. (2011), "Tracking hidden quality costs in a manufacturing company: an action research", *International Journal of Quality and Reliability Management*, Vol. 28 No. 4, pp. 405-425.
- Chiadamrong, N. (2003), "The development of an economic quality cost model", *Total Quality Management and Business Excellence*, Vol. 14 No. 9, pp. 999-1014.
- Chiarini, A. (2015), "Effect of ISO 9001 non-conformity process on cost of poor quality in capital intensive sectors", *International Journal of Quality and Reliability Management*, Vol. 32 No. 2, pp. 144-155.
- Chiu, Y. and Su, D. (2010), "Considering quality cost, time-value of money, and process quality improvement function in the economic product quantity model", *Journal of the Chinese Institute of Industrial Engineers*, Vol. 27 No. 4, pp. 249-259.
- Chopra, A. and Garg, D. (2011), "Behavior patterns of quality cost categories", *The TQM Journal*, Vol. 22 No. 5, pp. 510-515.
- Chopra, A. and Garg, D. (2012), "Introducing models for implementing cost of quality system", *The TQM Journal*, Vol. 24 No. 6, pp. 498-504.
- Cokins, G. (2006), "Measuring the cost of quality for management", *Quality Progress*, Vol. 39 No. 9, pp. 45-54.
- Cooper, R. and Kaplan, R.S. (1988), "Measure costs right: make the right decisions", *Harvard Business Review*, Vol. 66 No. 5, pp. 66-103.
- Crosby, P. (1979), *Quality Is Free*, McGraw-Hill, New York, NY.
- Crosby, P. (1996), *The Absolutes of Leadership*, Jossey-Bass Publishers, San Francisco.
- Dahlgaard-Park, S.M., Chen, C.K., Jang, J.Y. and Dahlgaard, J.J. (2013), "Diagnosing and prognosticating the quality movement –a review on the 25 years quality literature (1987–2011)", *Total Quality Management and Business Excellence*, Vol. 24 Nos 1-2, pp. 1-18.
- Dahlgaard-Park, S., Reyes, L. and Chen, C. (2018), "The evolution and convergence of total quality management and management theories", *Total Quality Management and Business Excellence*, Vol. 29 Nos 9-10, pp. 1108-1128.
- Dale, B. and Plunkett, J. (1999), *Quality Costing*, 3rd Ed., Gower.
- Dale, B.G. and Wan, G.M. (2002), "Setting up a quality costing system", *Business Process Management Journal*, Vol. 8 No. 2, pp. 104-116.
- Deming, J.M. (1996), *Out of the Crisis*, Massachusetts Institute of Technology, Cambridge, MA.
- Dereli, T., Durmuşoğlu, A., Delibaş, D. and Avlanmaz, N. (2011), "An analysis of the papers published in total quality management and business excellence from 1995 through 2008", *Total Quality Management and Business Excellence*, Vol. 22 No. 3, pp. 373-386.

- Desai, D.A. (2008), "Cost of quality in small and medium-sized enterprises: case of an Indian engineering company", *Production Planning and Control*, Vol. 19 No. 1, pp. 25-34.
- Dimitrantzou, C., Psomas, E. and Vouzas, F. (2020), "Future research avenues of cost of quality: a systematic literature review", *The TQM Journal*, Vol. 32 No. 6, pp. 1599-1622.
- Dobrin, C. and Stanciuc, A. (2013), "Cost of quality and Taguchi loss function", *Journal of the Faculty of Economics*, Vol. 1 No. 1, pp. 1479-1485.
- Dror, S. (2010), "A methodology for realignment of quality cost elements", *Journal of Modelling in Management*, Vol. 5 No. 2, pp. 142-157.
- Durmaz, Y. and Sevil, Z. (2012), "A theoretical approach to the concept of the costs of quality", *International Journal of Business and Social Science*, Vol. 3 No. 11, pp. 83-86.
- Eben-Chaime, M. (2013), "A note on the economic effects of quality improvements", *Total Quality Management and Business Excellence*, Vol. 24 Nos 3-4, pp. 374-377.
- Ebrahimi, M. and Sadeghi, M. (2013), "Quality management and performance: an annotated review", *International Journal of Production Research*, Vol. 51 No. 18, pp. 5625-5643.
- Farooq, M.A., Kirchain, R., Novoa, H. and Araujo, A. (2017), "Cost of quality: evaluating cost-quality trade-offs for inspection strategies of manufacturing processes", *International Journal of Production Economics*, Vol. 188, pp. 156-166.
- Feigenbaum, A.V. (1956), "Total quality control", *Harvard Business Review*, Vol. 34 No. 6, pp. 93-101.
- Feigenbaum, A.V. (1961), *Total Quality Control, Engineering and Management*, McGraw Hill Book Company, New York, NY.
- Feigenbaum, A.V. (1991), *Total Quality Control*, McGraw Hill, New York, NY.
- Fotopoulos, C.V. and Psomas, E. (2010), "The structural relationships between TQM factors and organizational performance", *The TQM Journal*, Vol. 22 No. 5, pp. 539-552.
- Freiesleben, J. (2004), "On the limited value of cost of quality models", *Total Quality Management and Business Excellence*, Vol. 15 No. 7, pp. 959-969.
- Garvin, G.A. (1984), "What does product quality really mean", *Sloan Management Review*, Vol. 1, p. 25.
- Garza-Reyes, J.A., Rocha-Lona, L. and Kumar, V. (2015), "A conceptual framework for the implementation of quality management systems", *Total Quality Management and Business Excellence*, Vol. 26 Nos 11-12, pp. 1298-1310.
- Glogovac, M. and Filipovic, J. (2018), "Quality costs in practice and an analysis of the factors affecting quality cost management", *Total Quality Management and Business Excellence*, Vol. 29 Nos 13-14, pp. 1521-1544.
- Grbac, T.G., Car, Ž. and Huljениć, D. (2015), "A quality cost reduction model for large-scale software development", *Software Quality Journal*, Vol. 23 No. 2, pp. 363-390.
- Guinot, J., Evans, D. and Badar, M.A. (2016), "Cost of quality consideration following product launch in a present worth assessment", *International Journal of Quality and Reliability Management*, Vol. 33 No. 3, pp. 399-413.
- Guinot, J., Sinn, J.W., Badar, M.A. and Ulmer, J.M. (2017), "Cost consequence of failure in failure mode and effect analysis", *International Journal of Quality and Reliability Management*, Vol. 34 No. 8, pp. 1218-1342.
- Gupta, M. and Campbell, V. (1995), "The cost of quality", *Production and Inventory Management Journal*, Vol. 36 No. 3, pp. 43-49.
- Gupta, V., Garg, D. and Kumar, R. (2014), "Depiction of total quality management during a span of 2003-2013", *Journal of Engineering and Technology*, Vol. 4 No. 2, pp. 81-86.
- Holmlund, M. (2007), "Suggesting and comparing different scopes on quality management: production, service, relationship, and network", *Total Quality Management*, Vol. 18 No. 8, pp. 847-859.

-
- Hwang, G.H. and Aspinwall, E.M. (1996), "Quality cost models and their application: a review", *Total Quality Management*, Vol. 7 No. 3, pp. 267-282.
- Imai, M. (1986), *Kaizen. The Key to Japan's Competitive Success*, Kaizen Institute Randan Haus Business Division, New York, NY.
- Imai, M. (1997), *Gemba Kaizen. A Commonsense, Low-Cost Approach to Management*, McGraw Hill Companies, New York, NY.
- Ismyrlis, V. and Moschidis, O. (2015), "The use of quality management systems, tools and techniques in ISO 9001:2008 certified companies with multidimensional statistics: the Greek case", *Total Quality Management and Business Excellence*, Vol. 26 Nos 5-6, pp. 497-514.
- Ittner, C.D. (1996), "Exploratory evidence on the behavior of quality costs", *Operations Research*, Vol. 44 No. 1, pp. 114-130.
- Jafar, A., Mohammad, T., Fariba, E. and Mehrdad, G.C. (2010), "Effect of the quality costing system on implementation and execution of optimum total quality management", *International Journal of Business and Management*, Vol. 5 No. 8, pp. 19-26.
- Johnson, H.T. and Kaplan, R.S. (1987), "Rise and fall of management accounting", *Management Accounting*, January, pp. 22-30.
- Johnston, A. and Ozment, J. (2015), "A firm-specific analysis of service quality costs", *International Journal of Logistics Research and Applications*, Vol. 18 No. 5, pp. 387-401.
- Juran, J.M. (1951), *Quality Control Handbook*, 1st ed., McGraw-Hill, New York, NY.
- Juran, J.M. (1962), *Juran's Quality Control Handbook*, McGraw Hill, New York, NY.
- Juran, J.M. (1995), "Summary, trends, and prognosis", in Juran, J.M. (Ed.), *A History of Managing for Quality: The Evolution, Trends, and Future Directions of Managing for Quality*, ASQ Press, Milwaukee, WI, pp. 603-653.
- Juran, J.M. and Gryna, F.M. (1974), *Quality - Design - Analysis*, p.38, WNT, Warsaw, pp. 78-79.
- Juran, J.M. and Gryna, F.M. (1980), *Quality Planning and Analysis*, McGraw-Hill, New York, NY.
- Kaner, C. (1996), "Quality cost analysis: benefits and risks", available at: http://www.kaner.com/pdfs/Quality_Cost_Analysis.pdf
- Kaplan, R.S. and Cooper, R. (2000), *Managing Cost and Effect*, ABC Publishing House, Warszawa, pp. 184, 192-196.
- Kaplan, R.S. and Norton, D.P. (2001), *The Balanced Scorecard: Translating Strategy into Action*, Polish Scientific Publishers PWN, Warsaw, pp. 131-132.
- Karg, L.M., Grottke, M. and Beckhaus, A. (2011), "A systematic literature review of software quality cost research", *Journal of Systems and Software*, Vol. 84, pp. 415-427.
- Kendirli, S. and Tuna, M. (2009), "Quality cost's constitution and effects on financial decision in enterprises: a research in corum's enterprises", *Proceedings of the Academy of Accounting and Financial Studies*, Vol. 14 No. 1, pp. 21-32.
- Kerfai, N., Bejar Ghadhab, B. and Malouche, D. (2016), "Performance measurement and quality costing in Tunisian manufacturing companies", *The TQM Journal*, Vol. 28 No. 4, pp. 588-596.
- Kiani, B., Shirouyehzad, H., Khoshsaligheh Bafti, F. and Fouladgar, H. (2009), "System dynamics approach to analysing the cost factors effects on cost of quality", *International Journal of Quality and Reliability Management*, Vol. 26 No. 7, pp. 685-698.
- Kim, S. and Nakhai, B. (2008), "The dynamics of quality costs in continuous improvement", *International Journal of Quality and Reliability Management*, Vol. 25 No. 8, pp. 842-859.
- Kirlioğlu, H. and Çevik, Z. (2013), "Measuring and reporting cost of quality in a Turkish manufacturing company: a case study in electric industry", *Journal of Economic and Social Studies*, Vol. 3 No. 2, pp. 87-100.
- Kumar, V. and Sharma, R.R.K. (2017), "Relating management problem-solving styles of leaders to TQM focus: an empirical study", *The TQM Journal*, Vol. 29 No. 2, pp. 218-239.

- Kumar, P., Maiti, J. and Gunasekaran, A. (2018), "Impact of quality management systems on firm performance", *International Journal of Quality and Reliability Management*, Vol. 35 No. 5, pp. 1034-1059.
- Lari, A. and Asllani, A. (2013), "Quality cost management support system: an effective tool for organisational performance improvement", *Total Quality Management*, Vol. 24 No. 4, pp. 432-451.
- Leavengood, S., Anderson, T.R. and Daim, T.U. (2014), "Exploring linkage of quality management to innovation", *Total Quality Management and Business Excellence*, Vol. 25 Nos 9-10, pp. 1126-1140.
- Liker, J.K. (2005), *Toyota Way. 14 Management Principles of the World's Leading Production Company*, Publishing House: MT Biznes, Warszawa, pp. 47-63.
- Lo, Q.Q. and Chai, K.H. (2012), "Quantitative analysis of quality management literature published in total quality management and business excellence (19962-2010)", *Total Quality Management and Business Excellence*, Vol. 23 Nos 5/6, pp. 629-651.
- Madu, C.N. (Ed.), (1998), *Handbook of Total Quality Management*, Springer Science + Business Media, BV, New York, NY, pp. 611-625.
- Maguad, B.A. (2006), "The modern quality movement: origins, development and trends", *Total Quality Management and Business Excellence*, Vol. 17 No. 2, pp. 179-203.
- Mahmood, S. and Kureshi, N.I. (2015), "A literature review of the quantification of hidden cost of poor quality in historical perspective", *Journal of Quality and Technology Management*, Vol. 11 No. 1, pp. 1-24.
- Malik, T.M., Khalid, R., Zulqarnain, A. and Iqbal, S.A. (2016), "Cost of quality: findings of a wood products ' manufacturer", *The TQM Journal*, Vol. 28 No. 1, pp. 2-20.
- Marsh, J. (1989), "Process modeling for quality improvement", *Proceedings of the Second International Conference on Total Quality Management*, p. 111.
- Martínez-Lorente, A.R., Dewhurst, F. and Dale, B.G. (1998), "Total quality management: origins and evolution of the term", *The TQM Magazine*, Vol. 10 No. 5, pp. 378-386.
- Marzuki, P.F. and Wisridani, M. (2014), "Identifying contractors' planned quality costs in Indonesian construction projects", *Journal of Engineering and Technological Sciences*, Vol. 46 No. 4, pp. 368-380.
- Masser, W.J. (1957), "The quality management and quality costs", *Industrial Quality Control in India*, Vol. 14, pp. 5-8.
- Moccia, S. (2016), "The role of value and virtues in TQM: an overview of literature", *The TQM Journal*, Vol. 28 No. 2, pp. 216-234.
- Mosadeghrad, A.M. (2014), "Why TQM programmes fail? A pathology approach", *The TQM Journal*, Vol. 26 No. 2, pp. 160-187.
- Omar, M.K. and Murgan, S. (2014), "An improved model for the cost of quality", *International Journal of Quality and Reliability Management*, Vol. 31 No. 4, pp. 395-418.
- Özkan, S. and Karaibrahimoğlu, Y.Z. (2013), "Activity-based costing approach in the measurement of cost of quality in SMEs: a case study", *Total Quality Management and Business Excellence*, Vol. 24 Nos 3-4, pp. 420-431.
- Plunkett, J.J. and Dale, B.G. (1985), "Some practicalities and pitfalls of quality-related cost collection", *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, Vol. 199 No. 1, pp. 29-33.
- Plunkett, J.J. and Dale, B.G. (1987), "A review of the literature on quality-related costs", *International Journal of Quality and Reliability Management*, Vol. 4 No. 1, pp. 40-52.
- Plunkett, J.J. and Dale, B.G. (1988), "Quality costs: a critique of some 'economic cost of quality models'", *International Journal of Production Research*, Vol. 26 No. 11, pp. 1713-1726.
- Porter, L.J. and Rayner, P. (1992), "Quality costing for total quality management", *International Journal of Production Economics*, Vol. 27, p. 69.

- Prashar, A. (2014), "Adoption of Six Sigma DMAIC to reduce cost of poor quality", *International Journal of Productivity and Performance Management*, Vol. 63 No. 1, pp. 103-126.
- Psomas, E.L. and Jaca, C. (2016), "The impact of total quality management on service company performance: evidence from Spain", *The International Journal of Quality and Reliability Management*, Vol. 33 No. 3, pp. 380-398.
- Psomas, E., Vouzas, F., Bouranta, N. and Tasiou, M. (2017), "Effects of total quality management in local authorities", *International Journal of Quality and Service Sciences*, Vol. 9 No. 1, pp. 41-66.
- Psomas, E., Dimitrantzou, C., Vouzas, F. and Bouranta, N. (2018), "Cost of quality measurement in food manufacturing companies: the Greek case", *International Journal of Productivity and Performance Management*, Vol. 67 No. 9, pp. 1882-1900.
- Pursglove, A. and Dale, B. (1996), "The influence of management information and quality management systems on the development of quality costing", *Total Quality Management*, Vol. 7 No. 4, pp. 421-432.
- Rahman, S.U. and Sohal, A.S. (2002), "A review and classification of total quality management research in Australia and an agenda for future research", *International Journal of Quality and Reliability Management*, Vol. 19 No. 1, pp. 46-66.
- Ramudhin, A., Alzaman, Ch. and Bulgak, A.A. (2008), "Incorporating the cost of quality in supply chain design", *Journal of Quality in Maintenance Engineering*, Vol. 14 No. 1, pp. 71-86.
- Rasamanie, M. and Kanapathy, K. (2011), "The implementation of cost of quality (COQ) reporting system in Malaysian manufacturing companies: difficulties encountered and benefits acquired", *International Journal of Business and Social Science*, Vol. 2 No. 6, pp. 243-247.
- Rhee, S.J. and Ishii, K. (2003), "Using cost based FMEA to enhance reliability and serviceability", *Advanced Engineering Informatics*, Vol. 17 Nos 3-4, pp. 179-188.
- Rodchua, S. (2006), "Factors, measures and problems of quality costs program implementation in the manufacturing environment", *Journal of Industrial Technology*, Vol. 22 No. 4, pp. 2-6.
- Roden, S. and Dale, B.G. (2001), "Quality costing in a small engineering company: issues and difficulties", *The TQM Magazine*, Vol. 13 No. 6, pp. 388-400.
- Rogala, P. (2012), "Certification and improvement of management systems. Quality cost analysis", in Borys, T. and Rogala, P. (Eds), *Quality and Environmental Management Systems*, University of Economics, Wroclaw, p. 128.
- Rosiawan, M., Singgih, M.L. and Widodo, E. (2019), "Model of quality costs and economic benefits of a business process of manufacturing companies", *Cogent Engineering*, Vol. 6, 1678228, pp. ahead-of-print.
- Sadkowski, W. (2016), *Review of Existing Models of Quality Costs Calculation*, Research Papers of Wroclaw University of Economics, Wroclaw, No. 442, pp. 388-398.
- Sadkowski, W. (2018), "Selected models of quality costs calculation and their application", *Entrepreneurship – Education*, Vol. 14, pp. 221-232.
- Sahu, N.M. and Sridhar, D. (2013), "Development of model for quality costing in A medium scale industry-A case study", *IOSR Journal of Mechanical and Civil Engineering*, Vol. 6 No. 4, pp. 19-23.
- Sailaja, A., Basak, P.C. and Viswanadhan, K.G. (2014), "Analysis of economics of quality in manufacturing industries", *International Journal for Quality Research*, Vol. 8 No. 1, pp. 121-138.
- Satanova, A., Zavadsky, J., Sedliacikova, M., Potkany, M., Zavadska, Z. and Holikova, M. (2015), "How Slovak small and medium manufacturing enterprises maintain quality costs: an empirical study and proposal for a suitable model", *Total Quality Management and Business Excellence*, Vol. 26 No. 11, pp. 1146-1160.
- Sawan, R., Low, J.F. and Schiffauerova, A. (2018), "Quality cost of material procurement in construction projects", *Engineering Construction and Architectural Management*, Vol. 25 No. 8, pp. 974-988.

- Schiffauerova, A. and Thomson, V. (2006), "A review of research on cost of quality models and best practices", *International Journal of Quality and Reliability Management*, Vol. 23 No. 6, pp. 647-669.
- Schneiderman, A.M. (1986), "Optimum quality costs and zero defects", *Quality Progress*, Vol. 19 No. 11, pp. 28-31.
- Shah, K.K.R. and FitzRoy, P.T. (1998), "A review of quality cost surveys", *Total Quality Management*, Vol. 9 No. 6, p. 479.
- Shimokawa, K. and Fujimoto, T. (Eds) (2011), *Lean Management. The Birth of Management*, 171-216, Publishing House: Lean Enterprise Institute Polska, Wrocław, pp. 1-20.
- Sila, I. and Ebrahimpour, M. (2002), "An investigation of the total quality management survey based research published between 1989 and 2000: a literature review", *International Journal of Quality and Reliability Management*, Vol. 19 No. 7, pp. 902-970.
- Sinha, N., Garg, A.K. and Dhall, N. (2016), "Effect of TQM principles on performance of Indian SMEs: the case of automotive supply chain", *The TQM Journal*, Vol. 28 No. 3, pp. 338-359.
- Siva, V., Gremyr, I., Bergquist, B., Garvare, R., Zobel, T. and Isaksson, R. (2016), "The support of quality management to sustainable development: a literature review", *Journal of Cleaner Production*, Vol. 138, pp. 148-157.
- Snieska, V., Daunoriene, A. and Zekeviciene, A. (2013), "Hidden costs in the evaluation of quality failure costs", *Engineering Economics*, Vol. 24 No. 3, pp. 176-186.
- Sower, V.E. (2007), "Cost of quality usage and its relationship to quality system maturity", *International Journal of Quality and Reliability Management*, Vol. 24 No. 2, pp. 121-140.
- Sower, E.V., Quarles, R. and Broussard, E. (2002), *Cost of Quality Usage and its Relationship to Quality System Maturity*, Center for Business and Economic Development at Sam Houston State University, Huntsville, Texas, TX, November.
- Srivastava, S.K. (2008), "Towards estimating cost of quality in supply chains", *Total Quality Management*, Vol. 19 No. 3, pp. 193-208.
- Stadnicka, D. and Pacana, A. (2016), *Construction and Development of Effective Quality Management Systems*, Rzeszów University of Technology, Rzeszów, pp. 33-35.
- Stanciu, I. and Pascu, E. (2014), "Quality costs", *Knowledge Horizons-Economics*, Vol. 6 No. 4, pp. 39-41, available at: http://orizonturi.ucdc.ro/arhiva/2014_khe_6_pdf4/stanciu.pdf
- Sturm, S., Kaiser, G. and Hartmann, E. (2019), "Long-run dynamics between cost of quality and quality performance", *International Journal of Quality and Reliability Management*, Vol. 36 No. 8, pp. 1438-1453.
- Superville, C.R. and Gupta, S. (2001), "Issues in modelling, monitoring and managing quality costs", *The TQM Magazine*, Vol. 13 No. 6, pp. 419-423.
- Szczepańska, K. (2012), *Fundamentals of Quality Management*, Warsaw University of Technology Publishing House, Warsaw, pp. 13-14.
- Taguchi, G. (1986), *Introduction to Quality Engineering: Designing Quality into Products and Process*, Asian Productivity Organization, New York, NY.
- Taguchi, G. (1989), *Quality Engineering in Production Systems*, McGraw-Hill, New York, NY.
- Taguchi, G. and Wu, Y. (1979), *Introduction to Off-Line Quality Control*, Central Japan Quality Control Association, Nagoya.
- Teeravaraprug, J. (2004), "Quantification of Tangible and intangible quality costs", *Proceedings of the Fifth Asia Pacific Industrial Engineering and Management Systems Conference*.
- Teli, S.N., Jagtap, M. and Chanewar, N. (2017), "Cost of quality applications and challenges: a review", *International Journal of Scientific Engineering and Research*, Vol. 8 No. 3, pp. 52-58.
- Tsai, W.H. (1998), "Quality cost measurement under activity-based costing", *International Journal of Quality and Reliability Management*, Vol. 15 No. 6, pp. 719-752.

- Tye, L.H., Halim, H.A. and Ramayah, T. (2007), "An exploratory study on cost of quality implementation in Malaysia: the case of Penang manufacturing firms", *Total Quality Management and Business Excellence*, Vol. 22 No. 12, pp. 1299-1315.
- Tye, L.H., Halim, H.A. and Ramayah, T. (2011), "An exploratory study on cost of quality implementation in Malaysia: the case of Penang manufacturing firms", *Total Quality Management and Business Excellence*, Vol. 22 No. 12, pp. 1299-1315.
- Uyar, A. and Neyis, A. (2015), "Does the healthcare industry report quality costs? Comparative investigations of public and private hospitals", *Total Quality Management and Business Excellence*, Vol. 26 Nos 7-8, pp. 733-74.
- Van Kemenade, E. and Hardjono, T.W. (2019), "Twenty-first century total quality management: the emergence paradigm", *The TQM Journal*, Vol. 31 No. 2, pp. 150-166.
- Vaxevanidis, N.M., Petropoulos, G., Avakumovic, J. and Mourlas, A. (2009), "Cost of quality models and their implementation in manufacturing firms", *International Journal for Quality Research*, Vol. 3 No. 1, pp. 27-36.
- VigeranAnandarajan, C.A. (1999), "Cost management and pricing decisions in the presence of quality cost information: an experimental study with marketing managers", *Journal of Cost Management*, Vol. 13 No. 1, pp. 21-28.
- Wawak, S., Rogala, P. and Dahlgaard-Park, S.M. (2020), "Research trends in quality management in years 2000–2019", *International Journal of Quality and Service Sciences*, Vol. ahead-of-print No. ahead-of-print, pp. ahead-of-print.
- Weckenmann, A., Akkasoglu, G. and Werner, T. (2015), "Quality management – history and trends", *The TQM Journal*, Vol. 27 No. 3, pp. 281-293.
- Weinstein, L., Vokurka, R.J. and Graman, G.A. (2009), "Costs of quality and maintenance: improvement approaches", *Total Quality Management and Business Excellence*, Vol. 20 No. 5, pp. 497-507.
- Williams, A.R.T., van der Wiele, A. and Dale, B.G. (1999), "Quality costing: a management review", *International Journal of Management Reviews*, Vol. 1 No. 4, pp. 441-460.
- Williams, R., van der Wiele, T., van Iwaarden, J., Bertch, B. and Dale, B. (2006), "Quality management: the new challenges", *Total Quality Management*, Vol. 17 No. 10, pp. 1273-1280.
- Wu, S.J. (2019), "Assessing the individual and synergistic effects of quality management practices on operations performance", *International Journal of Productivity and Performance Management*, Vol. 69 No. 2, pp. 297-320.
- Wudhikarn, R., Chakpitak, N. and Neubert, G. (2015), "An analytic network process approach for the election of green marketable products", *Benchmarking: An International Journal*, Vol. 22 No. 6, pp. 994-1018.
- Yakup, D. and Sevil, Z. (2012), "A theoretical approach to the concept of the costs of quality", *International Journal of Business and Social Science*, Vol. 3 No. 11, pp. 83-86.
- Yang, C.C. (2008), "Improving the definition and quantification of quality costs", *Total Quality Management*, Vol. 19 No. 3.
- Zairi, M. (2013), "The TQM legacy–gurus' contributions and theoretical impact", *The TQM Journal*, Vol. 25 No. 6, pp. 659-676.
- Zymonik, Z. (2003), *Quality Costs in Company Management*, Wroclaw University of Technology, pp. 66-88, available at: https://www.parp.gov.pl/storage/publications/pdf/raport_o_stanie_sektora_2018.pdf (accessed 11 August 2019).
- Zymonik, Z. (2008), "Structural models of quality costs", *Problems of quality*, Vol. 1, pp. 4-9.
- Zymonik, Z. (2012), "The evolution of knowledge about quality costs", *The Journal of Management and Finance*, Vol. 10 No. 3, pp. 51-60.

Zymonik, Z. (2013), "History, philosophy, the essence of quality", in Zymonik, Z., Hamrol, A. and Grudowski, P. (Eds), *Quality and Safety Management*, 131-143, Publishing House: PWE, Warsaw, pp. 19-21.

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