

## The Need for Analysis of Costs of Quality in Macedonian Companies

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### Abstract

*The implementation of TQM (Total Quality Management) philosophy requires management of quality processes as well as expenses management.*

*The subject of interest of this paper is the research conducted in Macedonian companies in terms of analysis of their costs of quality. The survey results should help managers to understand the impact of poor quality on the financial results and the image of the company. Data obtained from the survey gave outcomes that will be used as guidance for developing a methodology for analyzing the total cost of a given process. This methodology will help Macedonian managers to increase their efforts to improve the quality of business processes, products and services.*

**Keywords:** quality processes, quality cost, TQM philosophy, model, innovation.

### 1. Introduction

Total quality management (TQM) means greater participation of employees in identifying and solving problems, their involvement in the setting of standards and their efforts for continuous improvement. Employees should not only fulfill their daily routine but they must be trained to act preventively in operation. Decision to develop the quality assurance system goes in line with the growth of the enterprise and advanced concept of total quality management. This means, it is impossible to implement total quality management without formal system for quality assurance. Costs play an important role in the management of quality system.

Each company in its operation is planning an optimal quality of products and services. The quality of the product and/or service should meet the requirements of customers and their ability to purchase, for the manufacturer it should be cost-effective [21]. Nowadays, there are faults and defects in products and services that buyers are not ready to pay for and manufacturer is therefore suffering losses. It is safe to say that bad quality costs more than good quality. The criteria and methods necessary to ensure the effectiveness of the process management should be measured and all activities necessary to achieve the intended results of the process should be incorporated in the documentation of system of quality management (policies, rules, SOP and guidelines), because their importance for quality assurance is big.

### 2. Literature review

The costs of quality cannot be found in the traditional calculations but they are of great value to the company. The concept "costs of quality" exist more than 30 years and plays an essential part of the Total Quality Management (TQM) strategy

(Aune, 1991; Beecroft, 2000, Brannstrom-Stenberg & Deleryd, 1999; Chepurnoska & Mitreva, 2008).

According to Juran (1978): The costs of quality are gold mine that deserve attention and their research is cost effective. As per Crosby (1989): Quality is not expensive, expensive is poor quality. Definition of costs consist the optimal cost that manufacturer need to pay to ensure the quality according to the buyer/user's expectations.

There are various models of costs of quality:

1. P-A-F (Prevention-Appraisal-Failure) model – in which quality expenditures are divided in costs of achieving good quality in a form of costs for preventive examinations and costs due to poor quality in form of internal and external failures, mistakes, complaints, etc.

2. The model of Philip B. Crosby and other authors (Carr, 1995; Mitra, 2016; Mitreva, 2011) shows the costs of quality as a result of costs acquired due to failure to fulfill the quality requirements, i.e. expenses occurred when work is done wrong or incorrect.

3. ABC model – shows the costs of quality of those who add value and those who do not add value.

The American Association of quality (Shepherd, 1998) divides the costs into internal and external. Internal costs occur as result of detecting the errors prior to delivery of the product (inspection, controls, delays) and external are those that are result of inspection after the delivery of the product to the buyer/user (complaints, warranty costs, services, return of the product, change of contracts, bad reputation of the company, etc.).

Any model can be used to analyze the costs of quality as long as the ultimate goal is achieved – reducing the costs. Although the costs of quality can have a significant effect to the financial performance of the organization, there is no legal obligation for their analysis and public announcements (Carr & Tyson, 1992; Carr, 1992; Mitreva & Filiposki, 2012).

According to Yasin, Czuchry, Dorsch and Small, (1999) 85%

the appearance of certain categories of costs of quality in the organization are credited to the top management.

As per Deming (1996), there is no need to throw the blame to the employees but help them in optimization of the processes so everyone can benefit from it.

Wheelwright (1998) has a different view of the costs of quality, those are the costs that won't appear when the employees would be doing their job as it is expected from the, when business processes would be completely safe and the results of the process would be completely cost effective and optimal.

Nitin, Dinesh, and Paul (2011) does not use the term costs of quality but price of quality, which equates costs incurred while meeting the requirements of the buys combined with the costs that arise when fail to meet them.

Deming's catch phrase (1996) refers to the relationship between the quality and the productivity as follows: *Productivity grows if the quality improves*. This fact is known and applicable only for a small number of specialists.

Despite of the quoted paragraph of Deming, other managers have different views and opinions. According to Kondo (1995): Improvement of quality is a good thing but it increases the costs, therefore it has to be reasonable.

For many companies, the analysis of the costs of quality is an integral part of their overall quality system (Youde, 1992; Zairi, 1999; Stojiljković, et. al., 1996).

### 3. Methods in the research and analyses of the results

Subject of interest in this study is the research in Macedonian companies in terms of analyzing the cost of quality as an integral part of their overall quality program. According to the previously defined goals of this empirical research, the list of surveyed companies consisted of 3109 Macedonian companies. The research was conducted in cooperation with the Chamber of Commerce of the Republic of Macedonia. In the process of analysis actively participated only 363 companies and managers from their respective quality control departments; While making the selection of a sample a special attention was made to analyse companies that have established quality system on one side and those who do not have on the other as well as to determine the differences between them.

The research was based on questionnaire and a detailed study of the companies conducted by the research team, although it was planned many Macedonian companies to participate, the research was realized with participation of only 363 companies which is 11.6% of the estimated database, such a response is typical for this type of research (Bohdanowicz 2005a; Jeong et al. 2003; Medina-Munoz Garcia-Falcon 2000). The research in Macedonian companies was made in order to identify their development on the four pillars of the house of quality and what stage of the pyramid of the European quality award they are. These criteria are used to evaluated whereabouts of Macedonian companies to compete for the European Quality Award and to identify the large gap between local and developed European and global companies as well as their ability to compete on the global market. Due to great quantity of investigated material this study only shows the results in terms of whether Macedonian companies are optimizing the business process and if they are doing cost analyses of quality.

The structure of the surveyed companies – participants in the survey, as per the industries to which they belong (National Classification of Activities – NKD rev. 2 - ("Official. Gazette of the Republic of Macedonia" no. 147/08) and amendment of the National Classification of Activities – NKD Rev. 2 in place since 1 January 2013) is shown in *Figure 1*.

The condition of the Macedonian companies was analyzed through the four levels of the quality house (standardization, methods and techniques for non-defective working, education,

motivation and analysis of the quality costs). In this research are presented the results from the research concerning the application of the analysis of the quality costs and the provision of quality.

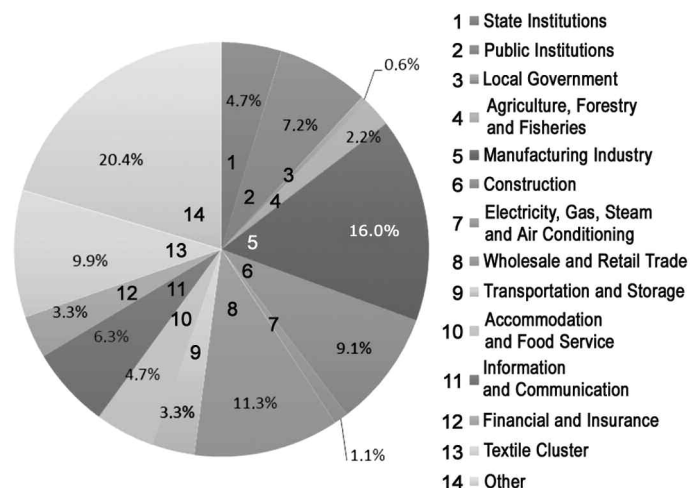


Figure 1. The companies – participants in the research shown in percentages according to the different economic fields

### 3.1. Costs of Quality Management in Macedonian companies

The analysis of costs of quality can help managers to understand the impact of poor quality on the financial results and the bad image of the companies. Above all, it will help managers to increase their efforts to improve the quality of business processes, products and services. Costs of quality caused by the existence or possible existence of poor quality and their analysis should be simple and practical, not very administrative and chaotic.

When asked whether Macedonian companies make cost analysis of quality (defects, complaints, faults, losses etc.) the following results were obtained:

- 72.7% of respondents do cost analysis in terms of quality, i.e. the realized losses of faults and complaints;
- For 27.3% the analysis are reduced to the recording of complaints received from customers/users without analyzing the faults in production, just making a note of the place of its occurrence and the reasons for it. All this leads to large losses and no realization of the projected financial results, losing the reputation of companies, losing additional time and material for correction.

The distribution of research results by industries is shown in *Figure 2*.

**The real picture of Macedonian companies indicated that they do not pay attention to the analysis of the costs of quality due to lack of knowledge and because their products and services are not competitive on the market.**

In the selection of methods and techniques for quality optimization in business processes, a number of factors has effect. Above all, their implementation depends on the design or structuring of the quality system. To understand what is the effect of applying methods and techniques of quality in the optimization of business processes the following question arises: **In what way companies learn that their products and services do not meet user's expectations?**

- 42.1% of respondents said that about the poor quality of their products and services they learn from *complaints by the customers*;
- 16.5% of them from the *reports of the quality control office*;
- 14.6% of the *actual sales (whether increased or decreased)*;

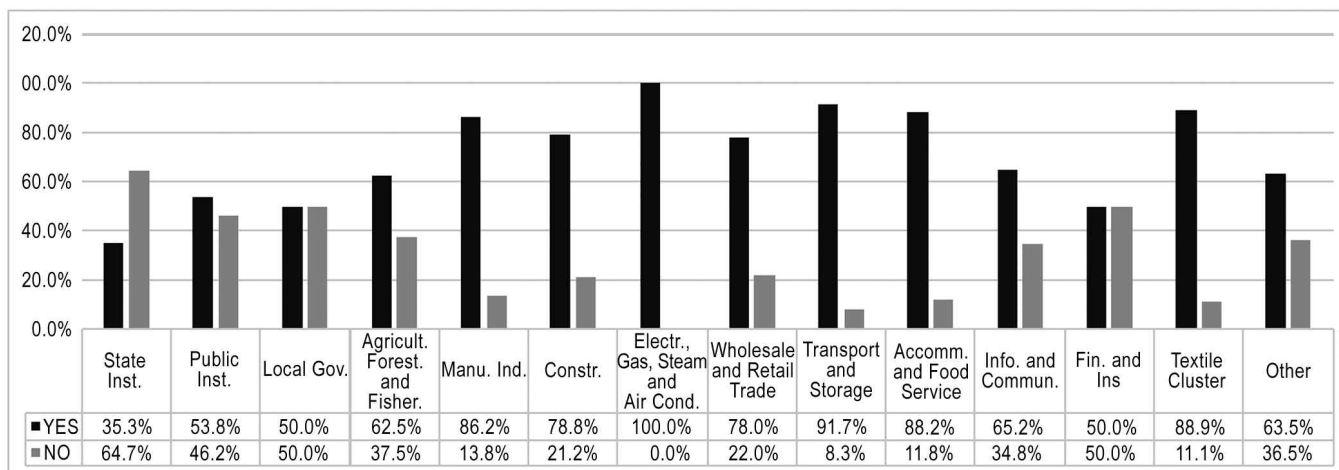


Figure 2. Analysis of the costs of quality in companies/institutions per industries

- 9.1% by analyzing the customer *satisfaction survey*;
- 4.7% from *monitoring the competitors* and
- 12.9% of them were in favor of something else (*direct contacts with users* helps in detecting if products and services are meeting their expectations).

This survey shows that companies are not finding out about the poor quality of its products and services from the quality department, but from complaints received from the customer who is indicating that bad quality is passing all the checkpoints and going directly to the user. These findings suggest that many companies operate with inefficient quality control department which allows insufficient products and services to reach the customer.

To inquire whether Macedonian companies have established effective control of processes by achieving a certain quality at the lowest operating cost, the following question was asked: **Is there any control of quality of products and services?**

- 41.9% of the companies are applying linear control;
- 28.7% stated that they apply integral quality control and spot-check;
- 20.9% of them have final control;
- 8.5% of them have only entry control.

In Macedonian companies quality is yet on unsatisfactory level due to poor management of business processes, inefficient control, with a big percentage of errors, even greater than allowed.

The companies should establish checkpoints for identifying and analyzing weak points, to analyze the costs of reclamation, errors, defects or costs incurred because the requirements for quality were not followed. The fact that SPC (Statistical Process Control) is not followed is evident in the data from the survey: **What is the amount of daily production output that is returned for repair in percentage?**

- 55.9% of the companies recorded a return of the daily production for repair with up to 15% faults;
- 33.9% registered restoring daily production with up to 5% defects to repair;
- 8.3% registered restoring daily production with up to 10% defects to repair;
- 1.9% recorded return of the daily production with up to 20% defects.

When quality control is optimally organized there shouldn't be more than 3% defects. Complaints, errors, defects should be reduced by timely internal functional cooperation between research, marketing, production and information technology department. In case of introducing a new product and/or service, technology or operational method, organized training program for all employees is necessary.

To acknowledge whether management of costs of quality influences profitability and growth of the company, the following question arises: **If companies do financial analysis of the costs of quality (defects, complaints, faults, losses, etc.) what is the ration between anticipated and actual cost of quality?**

The data obtained from surveyed companies who are actually doing analysis (72.7% of the surveyed companies) and calculate the proportion of anticipated and actual costs of quality, indicate the following:

- 47.1% anticipated expenditures are equal to the actual;
- 31.1% are companies where there is intense difference between the anticipated and actual costs – sometimes higher, sometimes lower;
- 15.2% reported that anticipated costs are slightly lower than actual;
- For 6.6% anticipated costs are slightly higher than the actual costs.

Macedonian companies should aim to minimize the costs which means, for any level of production they should use as many resources as it is required. For organizations, this should add profit because at minimum costs there is a greater difference in the cost of production and the selling price.

The analysis of research findings as to whether there is quality costs analysis, pointed at the following conclusions:

- Macedonian companies are not familiar with the standards of quality and they only practice the standards of quantity;
- application of benchmarking strategy consists of doing exactly as competitors do, without the possibility of innovation or new creative ideas;
- factors that dictate the price of the product and service in Macedonian companies are detailed analysis of competition, the needs and potential of the market, rather than the analysis of its own costs and policy;
- about the poor quality of their products and services companies learn from complaints by customers or from the sales results;
- problems that are facing Macedonian companies when performing on the market (local and international) are: unfair competition, high prices of products, strong competition, lack of marketing activities, liquidation of companies, frozen exchange rate of the euro, fake brands etc.

The survey results helped shape the methodology for cost analysis of quality as part of the general integrated methodology for the planning and implementation of TQM (Total Quality Management) system in the companies (Mitreva, 2011).



## 4. Proposed methodology for analyzing the total cost of a given process

Proposed costs methodology can be used for any process in the company. It can be used for identification and monitoring of process costs within the individual areas of the company, charging system, the system of issuing work orders or the process of admission of new employees. Alternatively, it can be used for surveillance of the total cost of an organizational unit and to present the total cost of each process.

Cost model is done by identifying of all key activities which are subject of analysis and their allocation in the group of costs of compliance or the costs of non-compliance. The source of information should be associated with the function - finance. The total costs associated with a process needs to be calculated, presented graphically and tabular based on the collected data. The analysis of cost of quality should be simple and practical not too administrative and chaotic.

Management of total costs consists of several steps as shown on Figure 3.

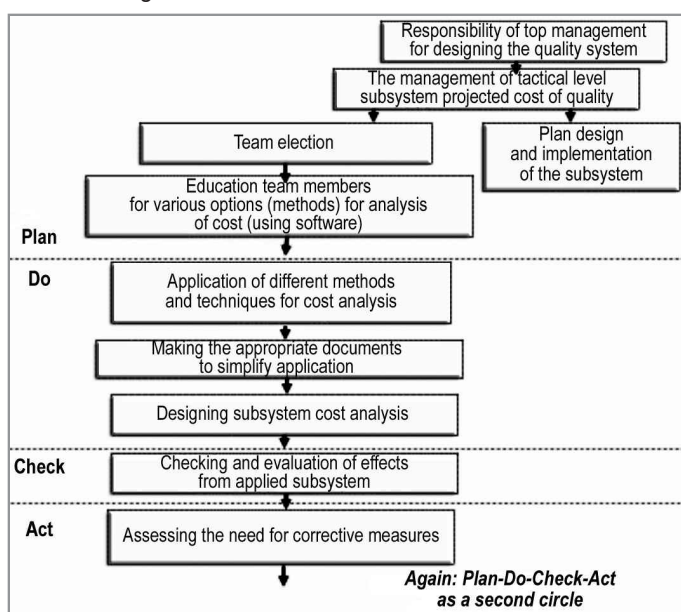


Figure 3. The duration of the process of projecting and implementing the subsystem of costs of quality

### □ (Plan) Step 1: Plan for designing and implementing subsystem of costs of quality.

The higher management is planning the activities for design and implementation of subsystem of costs.

#### □ Step 2: Select the team members.

Team for preparation of cost model should consist of competent people who are involved in the process and are familiar with the cost analysis. This team needs assistance to prepare the model especially in the phase of collecting and analysing data. The team should be responsible for the overall direction and coordination in the optimization of the business process, goals related to saving the costs of quality should be set and met.

#### □ Step 3: Forming teams and their education for various possibilities (methods) for cost analysis.

Education of the team refers to training for the application of different methods and techniques for cost analysis. Commonly used are software solutions for the optimization of business processes that operate at the lowest cost. It is important to include quality and cost of quality in all training programs for all employees to help them realize that reaching and maintaining the reputation associated with quality is crucial to the success and growth of the company as well as for all other users. Spread awareness of the costs associated with quality is possible by acquainting employees with the importance of the cost of quality

in a language understood by all.

### □ (Do) Step 4: Application of different methods for analyzing the total cost of a given process in the company.

To apply different methods for analyzing the total cost of a specific process it is necessary to identify and isolate it as a separate set of activities, to name the process and to name or identify the owner of the process. Each of the outputs of the process should determine its user i.e. who is it intended to. For the analysis of the total cost is necessary to identify the process inputs (materials, information, controls, people, and equipment) as well as outputs. Some of the methods for analysing the total cost of a given process or for the whole company are: cumulative error histogram; Pareto diagram of the costs; trending costs line; social costs and quality; methods for analysing the effects of actual errors (FMEA); applying Taguchi formula for evaluating the costs due to variation of quality; mathematical modelling etc.

### □ Step 5: Preparation of relevant documents to simplify deployment of methods for cost analysis.

The company is required to formulate a specific form for cost reporting. The report should contain a comprehensive list of costs of compliance and non-compliance. After collecting all the data tabular display with prior arrangement is required.

### □ Step 6: Designing subsystem of cost analysis.

In subsystem of costs, management outlines the way of information and responsibilities of staff between different departments and agencies. Hence, special reports inform top management of all costs, especially the cost of quality, their place of occurrence, the capabilities of process optimization and more. In subsystem of cost management, the following points should be defined: the place where costs will be recorded and analyzed; employees responsible for recording and analyzing costs; in what way the costs are shown; the flaw of information of costs.

### □ (Check) 7 step: Checking and evaluating the effects of the applied subsystem.

When a list of elements of costs is established, data collection can begin. In the company where there was no system of cost analysis according to the place of occurrence, deeper analysis are needed.

Data collection related to costs is collected and systematized in the accounting and is processed and analysed by the Quality Manager, Quality Assurance department or team set up to analyse the total cost (depending on the size and complexity of the company).

Checking the authenticity of the data collected should be as close as possible to their source.

There are no set rules for data sources, but the following can be recommended:

- analysis of payroll;
- reports on production costs;
- report of faults; reports/permits for repair;
- requests for compensation of travel expenses;
- data on the cost of products; repairs on site, reports of reclamation of products and repair costs during the warranty;
- entries for controlling and testing;
- direct costs for late delivery;
- reports of noncompliance.

After collecting all the data tabular report on cost of quality is required. Analysis of the performance is done by reviewing the initial terms of costs of compliance and non-compliance with the business process. These type of activities are: initial analysis; interpreting the results and making preliminary conclusions; making additional measurements/analyses if necessary and preparation of the results for presentation.

### □ (Act) step 8: Evaluating the need for corrective measures.

The holder of the process is necessary to consider the proposed corrective measures using teams or individuals and track the results of cost analysis.

Considering the initial terms of costs of compliance and non-compliance the holder of the process can decide what is a priority changing the design of the process or elimination of the faults.

For further results of the research, we can take measures to improve the conduct of business processes, implement changes based on experience or simply increase the practice of the process, if the applied measures are economically attractive. On this way a positive impact on the results can be achieved.

Ideas for reducing the cost of quality can arise from any department in the company. The maximum employee participation in this activity can be achieved with the promotion, initiation, subordination, consideration, respect and implementation of new ideas, quality workshops and more. Studies worldwide show that, after the introduction of total quality management, the proportion of the cost of quality in terms of total sales is drastically reduced. Proposing corrective measures and their implementation can ensure revolving of the circle of quality.

## 5. Conclusion

Application of this methodology of analysing the total cost of a process was done in several companies in Macedonia (Mitreva et al., 2015; Mitreva et al., 2016a; Mitreva et al., 2016b). Effects of these methods have shown that they can be used in different industries. Some of the methods and techniques that have been applied are: Pareto approach to detecting operations in which highest percentage of irregularities occur, CE (Cause and Effect) diagram for detecting the causes that led to higher costs; methods for analysing efficiency of working in shifts. The use of these methods enabled identification of the losses in euro that these factories were doing in their daily, monthly and annual operation in various business processes.

The analysis of costs allowed these companies to reduce the same, thus, enhance their reputation in the market due to competitive prices and a good brand image. A thorough cost analysis of quality allows a clear picture of the financial results of the organization, thereby enabling management of total costs and achieving positive operating results.

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