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IMPACT OF PRODUCT QUALITY IN THE BUSINESS OF THE ORGANIZATION

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Abstract: *Quality has become a strategic goal and competition priority in the modern economy and certainly a key weapon in the battles to conquer new markets. Also extremely important is to ensure customer satisfaction, particularly with regard to ensuring high quality at an affordable price. Besides all that, it is essential to balance the alignment of interests, not only of producers and consumers, but of all interested parties. This means that, besides quality in the sense of usefulness of the product, the major importance lies in the performance management of the product realization process with the constant optimization of the cost in order to achieve a competitive and reasonable price for the buyer. Along the competitive price, it is important that the manufacturer provides sufficient funding to ensure a lasting and stable development. This relationship and exchange between quality and cost belongs to the fields of economics of quality and business efficiency. The process of transformation of consumers' desires and needs into a particular product is known as the cycle of quality. The aim of this paper is to lay the foundations, through analyzing the field of quality economics, for the research on the impact of product quality management on the competitiveness and business of organizations, especially those with an implemented quality management system.*

Keywords: *product quality, economics of quality, quality cycle, quality management system, competitiveness*

1. INTRODUCTION

For many years the prevailing approach in the field of production was the one preferring quantity, i.e. volume or amount of production. By preferring the economics of production volume, quality was often in a position of secondary importance and neglected. It used to be determined through inspections (controls) at the end of the production process, when it was already too late. Such approach had prevailed until the 1940s, when the statistical methods and statistical quality control were applied for the first time, thanks to the American expert W. A. Shewhart. His PDCA (Plan-Do-Check-Act) cycle method, also called Shewhart cycle, nowadays still represents the prime moving force and initiator of the constant improvement of the system as one of the fundamental requirements of the quality management system. Quality thus crosses over from the quality department to all parts of the organization, and even beyond, reaching all the way to the top management and becoming a priority strategic goal of a contemporary company, which is a prerequisite for quality to become a competition priority [17, pp. 17]. In this connection, the key to achieving the competitive advantage is the interest of the consumer for the product in the target market. Namely, after having analyzed definitions of quality from that aspect, the definition of quality would be conformity of the product to the requirements of the consumer, which in the long run results in the suitability of the product for use.

Within the framework of this paper, we are going to analyze the impact of quality on the business of the organization, with the special emphasis on this interrelation throughout the field of economics of quality, with the purpose of preparation for the research of the impact of

product quality management on the business and competitiveness of certified companies in the region.

2. IMPACT OF QUALITY ON COMPETITIVENESS AND BUSINESS OF THE COMPAY

2.1 Quality and competitiveness

Although the approach of production volume was still preferred for some time in the period after World War II for legitimate reasons of post-war shortages, the conditions were gradually changing and quality was gaining a more prominent role. The Japanese economy is a good example of this, as its strategy of the application of quality has seriously shaken the American economy lulled into a sense of superiority, thus ensuring the competitiveness of Japanese economy and products on the global market. In the 1970s it surpassed all its earlier competitors (Figure 1). A period of quality competition was thus started, and it did not stop at the product, but spread to the processes and the organization as a whole. This has led to the concept of total, utter quality control, which has given rise to a new philosophy of total quality control.

Quality thus crosses over from the quality department to all parts of the organization, and even beyond, reaching all the way to the top management and becoming a priority strategic goal of a contemporary company, which is a prerequisite for quality to become a competition priority [17, pp. 17]. In this connection, the key to achieving the competitive advantage is the interest of the consumer for the product in the target market. Namely, after having analyzed definitions of quality from that aspect, the definition of quality would be conformity of the product to the requirements of the consumer, which in the long run results in the suitability of the product for use. Product quality can be observed through various dimensions, i.e. product features which contribute to its quality as perceived by the consumer. Quality features can be classified into three basic groups [17, pp. 30]:

1. features determining product functionality
2. features determining product reliability and durability [15]
3. features constituting a hedonistic addition to the product.

In this concern, Gašparović [7, pp. 11] refers to the fact that the functional basis can be explained through different technical features of the product, through which the basic needs of the consumer are met, while the hedonistic element can be explained as a wish to meet the need in a pleasant way. Consequently, the company will have to determine the concrete dimension of quality, i.e. the quality features of the product, as well as all the other features which are in the consumer's best interest and are important to him.

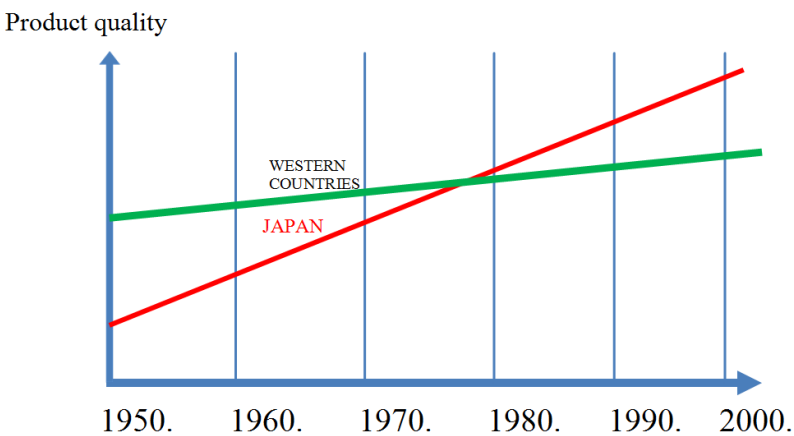

Figure 1: New quality competition

Garvin [6, pp. 104] proposes eight substantial dimensions or types of quality:

1. performance (primary functional features) – referring to the primary technical features of the product
2. special quality features (secondary functional features) – referring to the product features which constitute a supplement to the basic functions
3. reliability – probability that the product will function in a satisfactory way throughout a certain specified period of time under defined operating conditions
4. quality conformance (accordance, i.e. conformity with standards and specifications) – dimension showing to what extent the product meets the established standards and specifications
5. durability – measure of useful lifetime of the product (it has a technical and an economic dimension)
6. after-sales service (maintenance service) – dimension comprising promptness, kindness, readiness to help, capability and ease during the repair work
7. aesthetic quality – besides recognized quality this is the most subjective one because the product features constituting this dimension of quality are a matter of personal evaluation and validation by an individual (appearance, sensation, touch, sound, taste, smell, etc.)
8. recognized quality – quality based on the reputation.

The above dimensions of product quality make up the basis for comparison with the competition. Depending on the situation and circumstances the company will focus on one or more of them in an effort to achieve the competitive advantage on the market.

2.2 Impact of quality enhancement on profit increase

The fundamental objective of every board of directors or management is the productive and competitive managing, i.e. managing with a view of achieving the economic value of productivity. Since the economic value of quality is nowadays increasingly accepted as well, it is interesting to analyze the impact of quality and productivity on profitability, which is a function of revenue and expenses. The basic definition of profit is the following:

PROFIT = REVENUE – EXPENDITURE

and it points to the fact that profit is realized when the revenue exceeds the expenditure i.e. expenses. In this connection, the change in any of the following factors may lead to a change in profit:

- selling price
- quantity of manufactured and sold products
- unit costs of resources
- amount of resources used per output unit

If the price of materials or other resources increases during the product realization process, the strategy for neutralization of cost increase will inevitably have to be applied. This could be achieved through the increased product price, which could result in the reduced demand and that would directly influence the revenues and thus the profit as well. The alternative would be the increase of output per unit of input (resource) use, i.e. the reduction of input per unit of output (which leads to the increase in productivity).

The alternative approach for the maintenance or increase of profit is the enhancement of product quality, which may be an objective prerequisite for the price increase or enhancement of market share. This leads to the conclusion that profitability is susceptible to changes in productivity and product quality. The productivity itself depends on the quality enhancement of production and production processes through the decrease of reject and repairs, which leads to lower production costs and higher profit. As shown in (Figure 2) [5, pp. 12 and 326; 4], the role and impact of product quality, production and production processes is significant, not only for the development of values for consumers, but also for the profitability of the company. Another category which is directly linked to profit is customer, i.e. consumer satisfaction. Organizations of all kinds have become aware of the fact that the main focus should be on their consumers' satisfaction. This refers equally to industrial companies, retail and wholesale companies, government entities, service

companies, non-profit organizations and all the other subgroups within organizations.
This imposes two important questions:

1. Who are the consumers?
2. How to meet their needs? [1].

Consumers are all those that the organization provides with products and services. Historically, organizations used to consider as consumers those who bought and used their products. The organization uses certain processes in order to manufacture its products.

The people collaborating with the organization before those processes used to be seen as suppliers. Consistently, those dealing with the organization after the processes used to be considered as consumers.

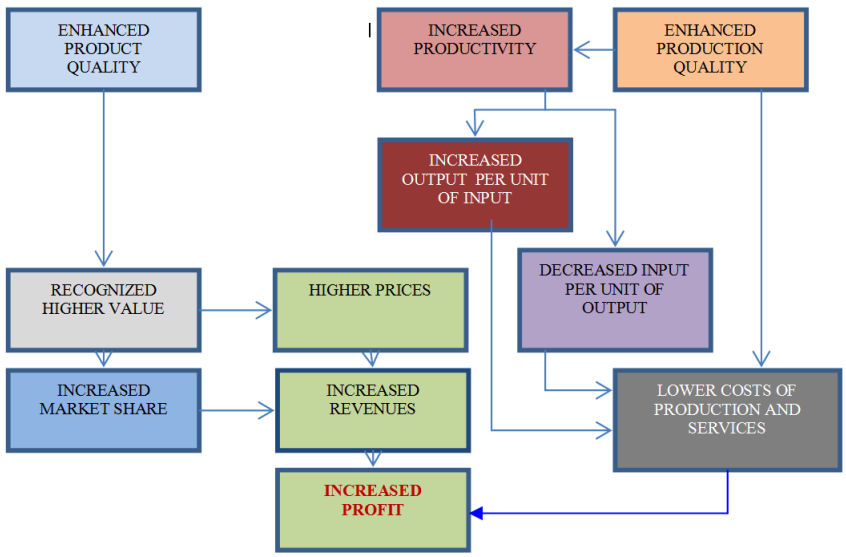

Figure 2: Economic impacts of productivity and quality

From the traditional point of view, suppliers and consumers are seen as outside subjects. Within the framework of overall quality, suppliers and consumers exist both within and outside of the organization. Each employee whose work precedes the work of the next one represents a supplier for him. Consequently, the employee whose work follows after another employee's work, and thus depends on him, represents a consumer for him [8, pp. 198-199].

So, for example, warehouses receive finished products from the production, the sales department gets inputs from the marketing department, the production department receives orders from the sales etc. The focus on the internal customer helps in the realization of organizational excellence, while the focus on the external ones enables the organization to survive and thrive on the market [9, pp. 160; 14]. If we view the abovementioned business interactions from the point of view of quality management, it is clear that the interior customers have the crucial impact on effectuating the quality requirements coming from the external ones. Most of the definitions of quality take as a starting point the fact that consumer requirements are a goal that needs to be achieved. The ASQ (American Society for Quality) also defines quality as "A subjective term for which each person has his or her own definition". In other words, to each individual person, quality represents the interrelation between wishes and expectations on one side and financial possibilities on the other. We can assert the following: "to me, a good quality product is the one I can afford at this moment, and which is going to fulfill the function that I expect". In spite of numerous definitions of quality, it cannot be defined as a relative category because it clearly positions each product on a certain market. In the technical sense, quality has two meanings:

1. Characteristics of a product or service which have the capability of meeting the determined or assumed needs; and
2. A flawless product or service.

Their connection to profit is given in (Figure 3) [12, pp. 5]. Armand Feigenbaum has defined quality in a more extensive way: „Quality is a customer determination based upon a customer's actual experience with a product or service, measured against his or her requirements - stated or unstated, conscious or merely sensed, technically operational or entirely subjective - and always representing a moving target in a competitive market [18, pp. 60]. Whether or not the consumers are satisfied depends on the way in which they perceive all the above mentioned factors. The question of consumer satisfaction is even more complicated due to the fact that different consumers give different priority to particular factors. It is therefore important for the organizations to maintain close, personal and lasting relationships with the consumers [8, pp. 211]. The focus group is usually used in cases when we want to focus our research on how the consumers (or a certain age group of consumers) perceive a new product or service that has been launched on the market. The panel of consumers represents a longitudinal research on the same sample of individual consumers or households, whereby their behavior as regards purchasing and consumption of the chosen products is chronicled (usually by means of a diary) [13, pp. 427]. However, the question that poses itself is whether there is a link between quality and productivity, cost-effectiveness and profitability of the business. Skoko [17, pp. 35] has studied the interrelations and the impact of quality on productivity, cost-effectiveness and profitability. He claims that the effects on the business which are possible to achieve through quality enhancement, will have a positive impact on all three basic economic indicators of business success: productivity, cost-effectiveness and profitability. Quoting Feigenbaum, who argues that quality has become the single most important force leading to organizational success and growth in both national and international markets, as well as his conclusion that, in its essence, quality is a way of managing the organization, we can come to the conclusion that quality has become a necessary element of modern management, as much as finances and marketing.

In the current conditions, when the marketing concept is crucial for the survival on the market, the economically important indicator of productivity is the one reflecting the level to which the product as a good quality output ensures consumer satisfaction. This means that the emphasis is not only on the enhancement techniques for efficacy and effectiveness of the product realization process, but also on the consumer-oriented productivity, which implies the introduction of modern quality programs. These quality programs help in the realization of the fundamental changes and activities in the marketing and in product planning in the conventional production practice. Productivity thus needs to focus on the input – output effectiveness through the whole scope of the company organization, which, according to Skoko, would mean total productivity.

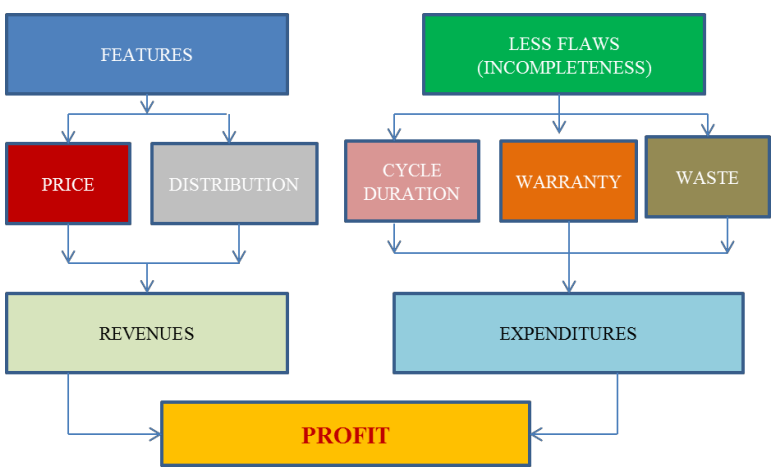

Figure 3: Relationship between product features and flaws and profit

We can therefore conclude that, in accordance with the current views, there is a close connection and determination between quality and productivity, i.e. there is no opposition between them, as it used to be thought in the past. The same concept was historically linked to the relationship between quality and cost-effectiveness, especially if it is viewed through the costs of quality. In order to prove the opposite, it is necessary to view quality through two different aspects, i.e. from two points of view: the construction quality and the conformance quality (conformity to requirements). A higher construction quality in principle implies higher costs. However, innovation, creativity and engineer's inventiveness, especially in view of construction simplification, optimization of components and substitution of construction materials etc., have turned the expenditures in a different direction, i.e. towards cost reduction, meeting the defined consumer needs and requirements. On the other hand, along with conformance quality, the reduction of the amount of errors and other flaws by means of better manufacture quality, results in the reduction of overall costs. This clearly shows the link between quality and cost-effectiveness and there are still considerable reserves for business enhancement of the organizations lying in this field. In order to indicate the connection between profitability and quality, the research and data of the PIMS (Profit Impact of Market Strategy) study have been analyzed in view of the impact of quality on the amount of return in relation to (Figure 4):

– investment (return on investment, ROI, profitability)
– sales value (return on sales, ROS) [3].

In the graph, along the span of relative quality, we can see the strong positive interrelation between quality and business success.

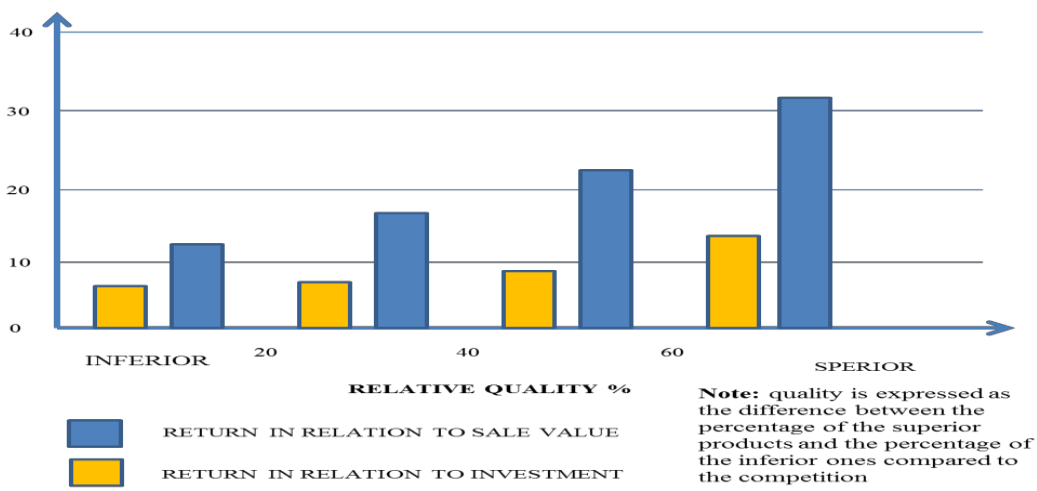

Figure 4: Relationship between relative quality and rate of return

3. ECONOMICS OF QUALITY

In today's business, ensuring consumer satisfaction is very important, especially from the aspect of ensuring high quality at a reasonable price. Moreover, it is vital to restore the balance in the harmonization of interests, not only of producers and consumers, but of all the interested parties. This means that besides quality in the sense of product usefulness, what is also important is managing the efficiency of product realization process with a continual tendency towards the optimization of costs in order to achieve a competitive price acceptable to the costumer. Besides the competitive price, it is important for the producer to ensure enough financial means for the assurance of permanent and stable development. This relationship and exchange between quality and costs belong to the field of the economics of quality and business efficiency [17, pp. 41].

3.1 Product quality development cycle

The criterion of the consumer is essential for the product quality assessment. So, the answer to the question how good that quality is, will depend on the extent to which it meets some of the consumer's various needs. The assessment of the fitness for use is a relative notion which varies from consumer to consumer [17, pp. 42]. That is why the process of product quality development starts with the identification of the consumer's wishes and needs in several stages during which the manufacturer implements them into the specifications and standards. They are the essential parts of the project and construction of the future product. The process of transformation of the consumer's wishes and needs into a concrete product is called a cycle of quality and its schematic representation is given in (Figure 5) [16, pp. 96].

The realization of such a goal is a very challenging and demanding task. In order for it to be carried out properly, the coordinated and synchronized activities of all the factors actively participating in the cycle of quality development are of exceptional importance.

This coordination of activities is important in order to avoid having to return to the beginning in later phases, due to the unsatisfactory quality, which would increase the overall costs. In the effort to manufacture good quality products, the constant interaction between the consumers, i.e. the market, marketing, designing and production is necessary, as well as between the other functions within the company, which contribute, each in its own way, to that common task [17, pp. 44; 11]. That is why the construction quality and the conformance quality are considered in the continuation.

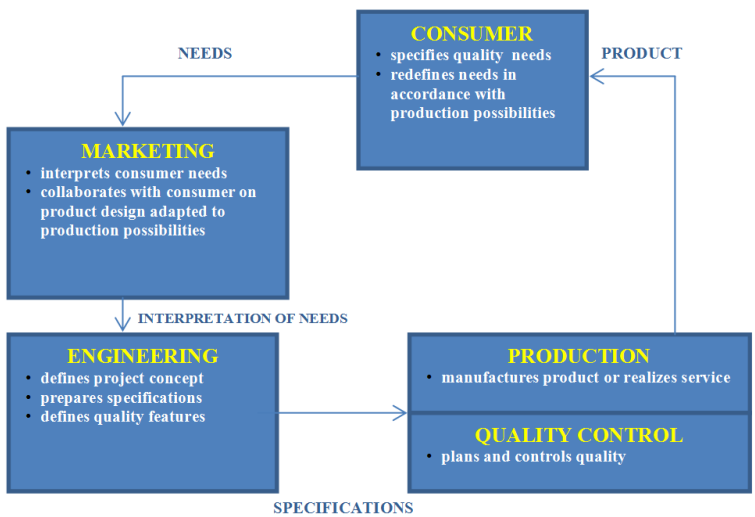

Figure 5: Quality cycle

3.2 Product quality from the aspect of construction and conformance

Product quality can be defined from the aspect of its construction and from the aspect of its manufacture, i.e. its conformance (harmonization) with the specification. The construction quality of a product regarding the level of quality for the same functional use develops earlier, in the construction and development stages, while conformance quality, as a degree to which the product is available to the consumer, reflects the conformance with the specifications and develops during the direct production. While the construction quality belongs more to the strategic level, the conformance quality belongs more to the tactical and operative ones. Both aspects of quality depend on certain factors given in (Figure 6).

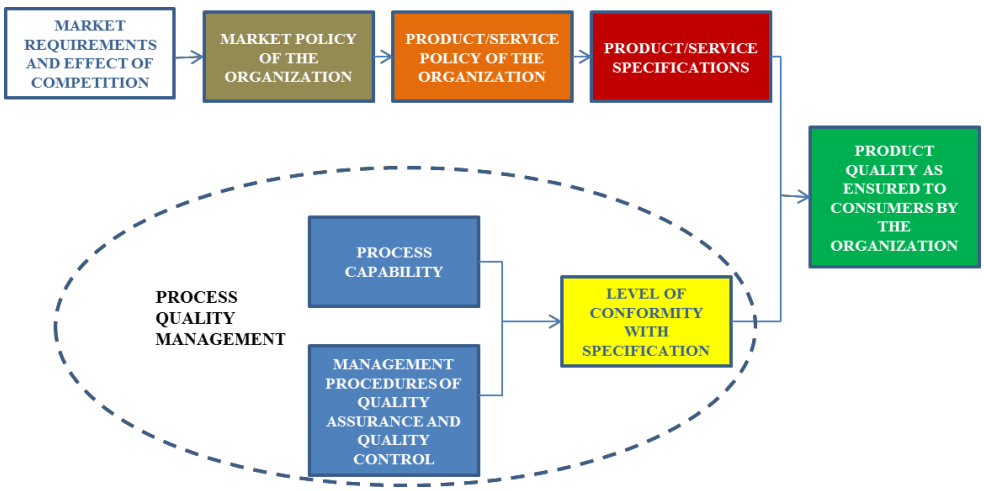

Figure 6: Factors of the impact on product quality as it is delivered to the consumers [*19, pp. 586*]

In order to assure the level of demanded product quality and at the same time meet the aspects of construction and conformance quality it is important to establish permanent contacts with customers and listen to their wishes and requirements. However, it is equally important to establish good contacts within the company, with the representatives of the production, in order to have the timely information on the possibilities (technical, technological and organizational) of the realization of the defined product. Of course, during the production of a good quality product, one should constantly keep in mind the cost-effectiveness, i.e. efficiency and effectiveness of the production process, as well as of the company as a whole.

4. ECONOMICS OF CONSTRUCTION QUALITY

The economics of construction quality is connected with the optimization of construction quality, product value in the techno-economical sense and the computer-supported design and its impact on the increase of the product value. **Optimization of construction quality** directly influences the level and the costs of quality. If the project and construction solution is not a good quality one, it is impossible to change the irregularities during the process of product realization (production process) because the task of the head of production is to harmonize the realization of the product with the given requirements in the specification as precisely as possible. In this connection, the costs of quality, i.e. their optimization, are especially significant. It is therefore important to act strictly in accordance with the so-called principle technology. Under the principle of technology we understand the suitability of construction from the point of view of the production costs and its adaptation to the given conditions of production. The construction quality and the costs of quality are interrelated. It is always possible to assure high level of construction quality with high expenses. However, the goal is to optimize quality and expenses in such a way as to establish the construction quality optimum as regards the cost-effectiveness, above which the increase of expenses would not be profitable because that would increase the price of the product and cause the loss of competitiveness on the market. **Product value in the techno-economic sense** and its functional relationship are given by A.Đurašević [3, pp. 21-26 and 29-30] in the following form:

Product value = **f** (functionality, technology, exploitability, market conditions)

In order for the product to fulfill its function in exploitation (product functionality) in the best possible way, it is necessary to clearly define its aim and purpose during the development process, and design it accordingly. In that process, it is necessary to define the product as a whole and its

component parts (their usage characteristics and materials) in such a way as to meet its purpose to the greatest extent possible. The first insight into the realized functionality can be obtained through the testing of the prototype and the test series, followed by the testing of the product during and at the end of its production process. The objective of the testing is to eliminate the problems through the corrective action.

The technology of the product is determined through the assessment of construction suitability from the point of view of the production costs and its adaptation to the given conditions of production. The technology of the product reflects in the production costs so that lower costs mean better technology. The choice of materials, dimensions and geometrical shapes of the component parts influence the technology of the product, as well as their integration into the assemblies and the product. The adaptability of the product for exploitation is called exploitability. It is defined through the expenses caused by the exploitation, i.e. its use during its lifespan. The lower the total costs for a certain product during its exploitation period, the higher its exploitability. The market conditions also influence the value of the product, especially when it is the matter of consumer products, since they are often influenced by fashion, taste, etc. The hedonistic component thus becomes prominent, significantly influencing the product value, and consequently its price as well. The product value is a suitable framework and a good analytical basis for a research on the economics of quality, i.e. its optimization in a dynamic sense, especially because there are visible factors which can and should be influenced with the purpose of its maximum increase [17, pp. 52]. The value analysis, i.e. value engineering is a method developed with the aim of increasing the product value and an operation technique with the same goal. It eliminates all the factors that cause the expenditures, but do not contribute to the function, i.e. the value of the product. It is important to be aware of the fact that the decisions which determine more than 75% of the total production costs are made already during the process of product formation. According to Blanchard [2, pp. 131] that percentage is as high as 90 to 95%(Figure 7).

The third domain influencing the increase of product value is the computer-supported design. The information technology in the function of the automatization and integration of production systems has the potential for the assurance of the performance level that is unsurpassable at the moment.

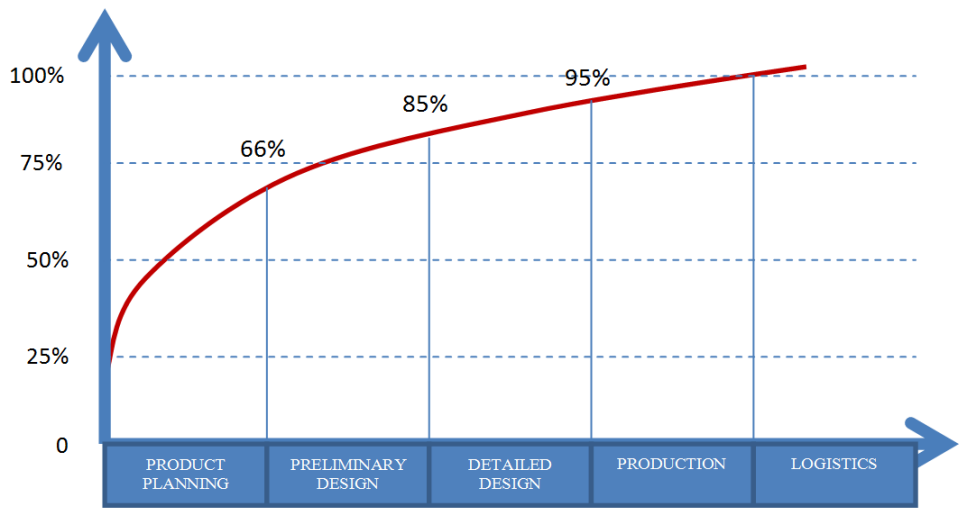

Figure 7: Share of expenses in the particular stages of the product development cycle

According to Skoko [17, pp. 53] it can be expressed primarily through the following four strategic dimensions: expenses, quality, time, delivery conditions and flexibility.

5. ECONOMICS OF CONFORMANCE QUALITY

Conformance quality as the degree to which the product is available to the consumer reflects the conformity to the specifications and develops in the direct production. In the process of optimization of conformance quality we take as the starting point the existence of the connection and a certain relationship between the costs of quality and the degree of product conformance quality [17, pp. 65]. When the degree of conformance quality is low, the failure costs are high, but at the same time, the costs of assessment and prevention are low. The same holds true the other way round: when the degree of conformance quality is high, the failure costs are low, but at the same time the costs of assessment and prevention are high. For that reason, and from the aspect of a good organizational management, it is important to establish the optimization model and implement it continuously .

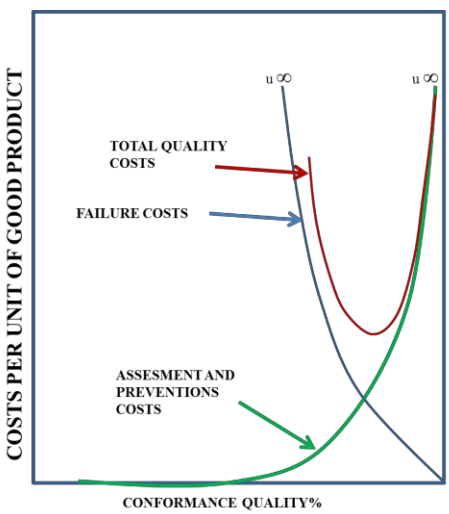

Figure 8: Traditional model of optimization of quality costs and conformance quality level

The graph in (Figure 8) [10, pp. 419] shows the costs per unit of a good product dependent on conformance quality expressed as a percentage with three curves of quality costs [10, pp. 66]:

a) the curve of the failure costs (internal and external) – they are equal to zero when the product is 100% good, and grow to infinity when the product is 100% bad,
b) the curve of the costs of quality assessment (testing) and the costs of prevention– they are equal to zero at 100% deficient quality, and grow to infinity as quality is brought nearer to perfection
c) the curve of the total quality costs – it equals the total sum of the two previous curves

In the traditional model of the optimization of quality costs and level of quality, the presented conditions are the ones that prevailed through the major part of the last century. The main tasks of control were a lot of assessment and little prevention (which is still the case in big organizations), with all the negative aftermaths connected with the human factor (errors due to subjectivism, loss of concentration, fatigue etc.). The consequence of this is the limitation of the effort to achieve perfection, conditioned by human susceptibility to errors, which is why in the described model the curve of assessment and prevention comes near to perfection only in infinity (100% conformance quality). Analyzing such a situation, we could conclude that there is no justified way into the perfection of conformance quality because it turns out that the optimum level of conformance quality is at a lower level than the level of perfection. At the end of the twentieth century, the philosophy and approach to quality through the development process forms a new (contemporary) model of conformance quality optimization (Figure 8) [17, pp. 69]. In the current circumstances the prevention as a priority (as opposed to the quality assessment as a priority) with the purpose of eliminating all the possible causes of failure (errors, non-harmonization, non-conformity etc.) gets an irreplaceable role both in theory and in practice [17, pp. 96]. The new technologies reduce the inherent errors, i.e. flaws of the materials and products, providing the unimagined advantages in the rational use of all the factors of production and running a business, while the robotics and other forms of automatics reduce the human error [17, pp. 96]. All of the above indicates the possibility of attaining perfection at a finite cost, i.e. each higher level of conformance quality conditions lower and lower quality costs. This is the result of the awareness that the failure costs are diminished primarily by increasing the costs of prevention, resulting in the permanent decrease in the total cost of quality,

which brings the level of conformance quality nearer to perfection (100%). It can also be concluded from the model in (Figure 9) [10, pp. 419] that there are no failure costs at the point of perfection of conformance quality, while the costs of assessment and prevention have a certain value. Within the framework of quality management, attaining perfection is a long-term, i.e. permanent goal which is achieved gradually, through the continuous system enhancement (step by step), whereby the basic hypothesis is achieving permanent prevention with the application of contemporary technology with the purpose of gradual diminishing, i.e. elimination of all kinds of flaws.

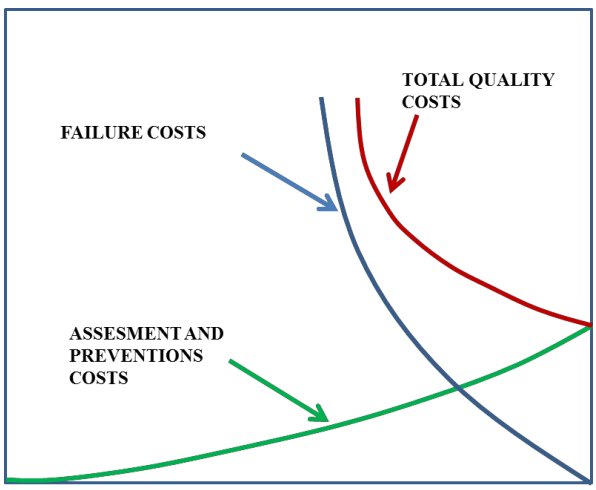

Figure 9: Current model of optimization of quality costs and conformance quality level

This points to the need for constant reduction of quality costs, enabled by the change in the production system including technology, training, perception and management. Consequently, the costs of poor quality and the costs of control can be reduced, as shown in (Figure 10) [17, pp. 71] If used in a correct way, the cost of quality is a powerful tool for quality enhancement because it indicates to the management whether the money is being squandered due to excessive omissions or high costs of quality, so it ensures the quantitative basis for enhancement monitoring in the sense of their decrease. The basic objective of the economics of quality is to increase product value (in the end expressed through the relationship between its usefulness, i.e. quality and price) through permanent quality enhancement and cost reduction.

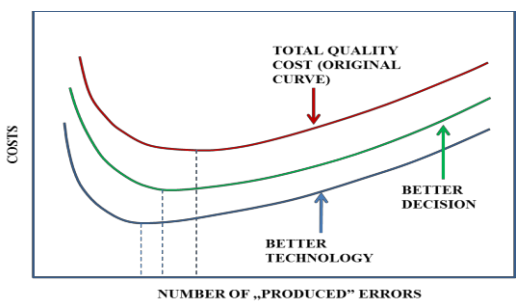

Figure 10: Quality cost decrease

Based on the preventive culture and its application in the practice, it is possible to decrease simultaneously through time the flaws and costs of quality, thus gradually advancing towards the production without flaws in an economic way (Figure 11).

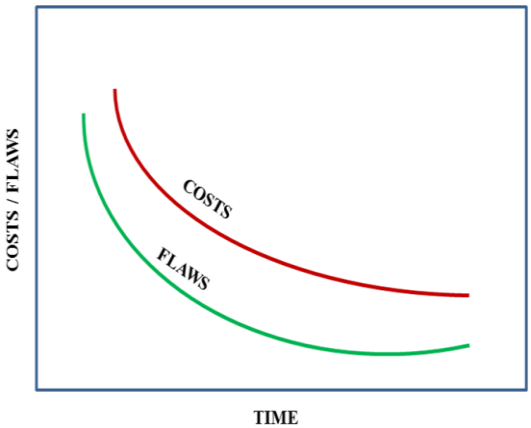

Figure 11: Basis of preventive culture

The overview of the impact of product quality and the economics of quality on the overall result of the company is given through this paper, with a special emphasis on competitiveness. The analysis of the past research and results, leads to the conclusion that the product quality management has a significant influence on competitiveness and doing business. In particular, it is manifested through the construction quality and the conformance quality, which have a direct impact on the efficiency and effectiveness of the product realization process, as well as on the final result. The objective of this paper has thus been attained, and it consists in the performance of the theoretical preparation, through analysis, useful for the study aiming at the analysis of the impact of the product quality management on the business of the certified companies within the business environment of the region.

4. CONCLUSION

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