

# Optimization of the Business Processes in a Company for Manufacture of Bread and Bakery Products in Macedonia

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**Abstract** –This paper elaborates the problem of optimization of business processes as one of the pillars of the quality house in a bread and bakery company. The paper designs and implements the methodology for analyzing the costs of quality by applying the philosophy of total quality management (TQM). The benefits of using this model are not only increasing the company's business results, which will further serve as a driving force for continuous improvements, but also increasing the commitment of the top management and the employees towards improving processes, customer satisfaction, employees, shareholders, suppliers, community.

**Keywords** – quality system, model, business process optimization, costs of quality, TQM (Total Quality Management) strategy.

## 1. Introduction

The application of the TQM (Total Quality Management) strategy means improving the quality of business processes, not only in terms of defining, improving and designing the process, but also improving productivity and optimizing costs. Quality cost analysis can help company managers understand the impact of poor quality on the financial results and the poor image of the companies [1],[2]. Monitoring

of the quality costs is an important indicator of performance according to Mitreva et al. [2]. The costs that result in poor quality are unproductive costs, and in the companies they can be avoided by implementing the philosophy of the TQM.

According to Mitreva [3], the cost of quality is at the median level of 25 to 30% of the realized annual sales. These unnecessary costs can be eliminated by identifying the causes of inadequacy and errors, as well as the failures through the implementation of prevention activities that are important in the adoption of the TQM philosophy (Total Quality Management).

In this paper, a model for better performance and greater efficiency and effectiveness of the companies is proposed, through optimization of business processes, change of corporate culture and full utilization of the business potential [3].

The benefits of using this model are not only increasing the business results of the companies, which will further serve as the driving force for continuous improvements, but also increase the commitment of the top management and the employees to improve processes, customer satisfaction, employees, shareholders, suppliers, community [4].

## 2. Literature review

The concept of quality costs has existed for more than 30 years and is an essential part of the TQM strategy, as managing them largely affects the profitability and the growth of an organization. Costs of the quality show that quality is free, that teamwork maximizes success and that quick improvements in the quality are possible [5],[6].

The costs of quality arise due to the existence or possible existence of poor quality. Quality cost analysis can help managers understand the impact of poor quality on the financial results and the company's image [7],[8]. First of all, it will help managers to increase their quality improvement activities. The analysis of the cost of quality should

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be simple and practical, and not too administrative and chaotic [9].

It cannot be found in traditional cost calculations, but they are a gold mine and are of great value to a company according to Carr [6].

With prevention, the number of failures / delays / errors / failures decreases. Failure can destroy the team spirit, can be harmful to the buyers / consumers, and affect the financial results [10],[11].

Measuring the costs of quality and their presentation has only one goal, to take action to improve the quality [12],[13].

In the TQM culture, all work activities are tied to the processes. The process can be recognized at any level of the organization, for example, a process can be a certain stage of operation, or it may be the overall process of running a business. In both cases, the process uses materials and resources, so the cost model should outline the total cost of quality for each process [13].

Carr [6] defines the cost of quality as a cost of appropriateness and inadequacy, where the cost of appropriateness is one that makes things in the right direction (for the first time), and the cost of inadequacy makes things in the wrong direction. This concept is more understood by the manufacturing sector because it agrees with the specifications and the standards in the companies. Management in companies that have adopted the TQM philosophy has reduced costs by 25 to 2.5% in a relatively short time, although practice has shown that this concept is a long-term process. An important step in the implementation of the TQM is continuous improvement.

Designing a quality system begins by identifying the wishes and the needs of buyers, and ending with the measurement of customer satisfaction / dissatisfaction [13]. In every company it is necessary to have a centre for quality, an IT centre, as well as a degree of appropriate education for the employees. For this purpose, it is necessary to create more organizational teams: a standard operating procedure development team (SOP) for all business processes, a team for the development of statistical process control (SPC) in business processes, and a team for analyzing the cost of quality. The results obtained are based on the activities of the Deming Circle (plan, do, check, act) [14].

The methodology of the cost of quality is consisted of a set of tools, methods and techniques that interdisciplinarily penetrate the relevant factors that determine this phenomenon [10],[12],[13]. In the further part of this paper, the most widely used methods and techniques for measuring quality and optimization of business processes are identified, which should be managed by educated and trained employees. The methods and techniques used to

optimize business processes describe the company's evolution and behaviour in the environment [15],[16]. The implementation of the methods and the techniques of the TQM philosophy takes a significant role as they direct the company in the direction of continuous improvement of operations [9],[10],[12],[13]. Managers and employees trying to keep in touch with market changes are constantly educated and trained to properly use the tools that contribute to business advancement.

In this paper, the model for better performance and greater efficiency and effectiveness of the companies is proposed and implemented, through optimization of business processes, change of corporate culture and full utilization of business potential [3].

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

According to Mitreva [3], the cost methodology can be used for any company process. It can be used to identify and monitor the process costs within the individual areas of the company's operations, as well as the billing system, the system of issuing work orders or the process of admitting new employees. Alternatively, it can also be used to oversee the total cost of an organizational unit and to represent the total cost of each process. The cost model is made by identifying all the key activities being analyzed and distributed in the compliance cost group (CC) or non-compliance costs (NCC). The source of information should also be identified. This source of information should be linked to the function -finances. The total costs associated with a given process need to be arranged, presented graphically and spreadsheet based on the collected data.

The total cost management takes place in a few steps, Figure 1. [3]:

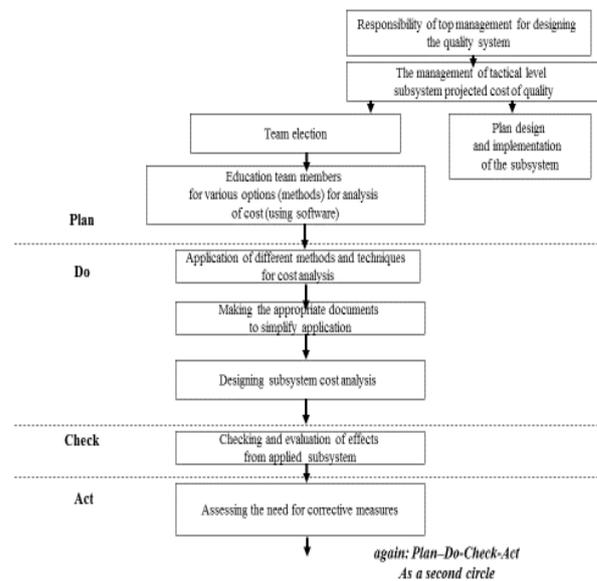


Fig. 1. Flow of the process by designing the subsystem of costs

Optimizing business processes in the bread and bakery company requires timely identification, analysis, planning and control of inputs. Often the question arises: why is it necessary to optimize business processes? The answer to the question is precisely in the built leadership position of this company on the market, its competitiveness, its commitment to the end customers and its profitability. Optimization of business processes is extremely important for the employees because it is a large enterprise with more than 400 employees. Below is a traditional model of business processes that lead to delays, errors and errors that increase the total cost of a given process. This process implements the quality cost model.

The process of dough preparation is carried out in the following manner, Fig. 2.

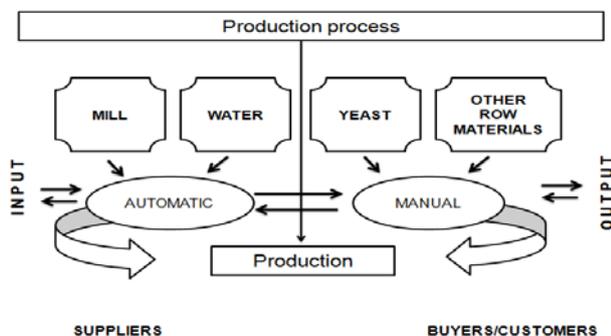


Fig. 2. Traditional process for dough preparation

The method of preparation of the dough is done by automatic addition of flour and water and manual addition of other raw materials and premixes. All raw materials are subjected to sterilization and pasteurization techniques. The dough is prepared for a period of 1.8 – 2.0 minutes. Then it is worn in chambers, shaped and baked in ovens. One oven has the capacity to bake 5000 pieces in a time of 15 minutes. After baking, the bread is transported on conveyor belt system to cool down. After cooling, the product is packaged into foils and bags made of polypropylene material, or is packaged in paper bags. The warehouse department serves for the proper storage of the products. For that purpose, the warehouse space is divided into three parts: a warehouse for storing bread, a warehouse for storing white baked goods, and a storage room for storing biscuits. The warehouse has trained warehouse keepers who take care of all the job - related activities.

The mill is intended for wheat grinding, as well as obtaining and packing flour. Before the wheat processing is started, it is subjected to laboratory testing. These tests provide information on whether the wheat has the specified quality, and then it is stored in silos from where it is transported to the

mills. In the mills, the grains are broken and processed, and as a final product, the flour is obtained which is subjected to various examinations and controls in order to determine the quality. If the flour fulfils the quality standards, it is transported to the production plant, and if it does not fulfil the prescribed standards, the flour is not used for future use.

When it comes to the quality of flour, farinograph and extensograph tests are performed. Through them, the quality of the wheat grain, the norm, the ratio and the quantity are determined. Water as one of the main resources in the process is required to meet the standards for drinking water. The yeast should increase the volume and the size of the dough, change the hardness and the structure of the dough and affect the taste of the products. The remaining raw materials should fulfil the requirements in accordance with the standards and improve the physical properties of the products. The need for optimization of business processes in the company "for bread and baked goods" imposed proactive management of the business processes for the preparation of the dough.

By applying the quality cost methodology [3], the management has created a team to prepare the cost model of people who are competent for the process being analyzed, who know the cost analysis methods, in order to re-examine certain processes and areas of the company's operations. This team needs help to prepare the model, especially during the data collection and analysis phase, to diagnose which improvement issues (topics) need to be explored, and later, in the control phase, to submit a report on the achieved results. For the application of different methods for analyzing the total cost of a given process, it is necessary to identify and isolate it as a discrete set of activities and to name itself or identify the holder of the process. Each of the exits of the process should be determined for which users it is intended. To analyze the total costs it is necessary to identify: the inputs to the process (materials, information, controls, people, equipment), as well as the outputs.

Data related to quality costs are collected and systematized by the accounting, and processed and analyzed by the quality manager, the quality assurance team or the team set up to analyze the total costs, depending on the size and the complexity of the company.

Methods and techniques have been applied in this research which enabled valid conclusions and appropriate solutions to overcome the problems encountered as applying a histogram to the analysis of the moodiness of the process [17].

The histogram is the basic tool for quality management and problem solving that can arise in

the business process. During the graphic design of the histogram, the values from the tested property are applied on the aptitude and the frequency is stated on the ordinate. At the end of the test, graphical results are obtained in the form of rectangles.

In line three (line for toast breads and duplex), a loss of the weight of toast breads was observed. The prescribed weight of toasted breads is 480g. In the analysis of the process, 100 samples of bread were measured. Measured samples of the weight property (g) are shown using the histogram in Figure 3.

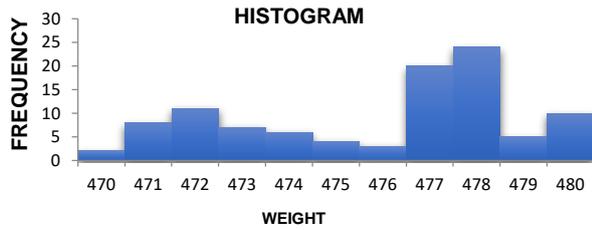


Fig. 3. Histogram for numerous values of bread weights

From the analysis made it can be concluded that in line three intended for the production of toast breads and duplex there was a loss in weight. The visual examination gives a clear picture that the measured values are lower than the prescribed ones. On the basis of the obtained results, the loss in weight is calculated and a report is submitted.

A Pareto Diagram was also used to determine the errors in the production of rye bread, Fig. 4. Pareto analysis is a metric for detecting reasons that cause defects in operation. The method of preparation of the dough is done by automatic addition of flour and water, and the remaining raw materials and premixes are added manually. The dough is prepared for a period of 1.8 – 2.0 minutes. It is a very short time interval and it is almost impossible to see the irregularities.

In order to improve the quality of the dough, a check list was prepared for detection of errors and irregularities in the production of rye bread in July in the period from 07/03/2017 - 07/07/2017. The results are shown in Table 1.

Table 1. Check list for detection of irregularities in the production of rye bread

Month	JULY					Σ
Irregularities	Monday	Tuesday	Wednesday	Thursday	Friday	
Ability to absorb water	///	/	///	//	////////	19

Development and stability of dough	/////	//	/	/	///	13
Stretch resistance of the dough	//	//	//	/	//	9
Reduced bread volume	////////	/////	///	////////	////////	40
Cellulose spillage (yeast extinction)	///	/	//	///	/	10
Hardening of adhesives (use of salt)	///	/////	//	///	//	15
<b>Total</b>	25	17	14	20	30	<b>106</b>

During the production of roasted bread, irregularities were detected in July after various operations. Most irregularities were observed in the operation of reduced bread volume, and the smallest number of irregularities was observed in the operation resistance to stretching the dough. Because bread volume is a key determinant that reflects the quality of the dough, the purpose of this analysis is to find the causes that have contributed to volume reduction and make the necessary corrections. For this purpose a Pareto Diagram is constructed which visually detects the defects (Figure 4.).

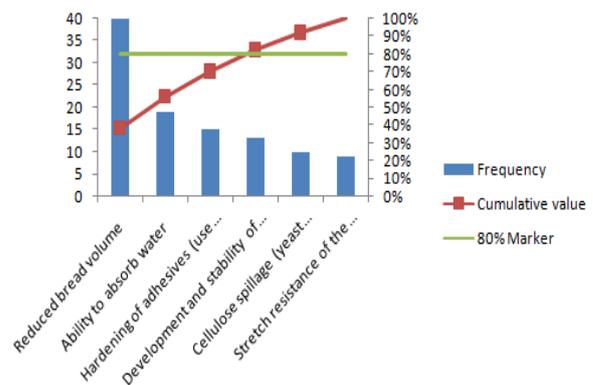


Fig. 4. Pareto diagram for determining irregularities in bread production

Figure 4. shows the analysis of irregularities that occurred during the production of rye bread. From their frequency can be concluded that most of the defects affecting the business process optimization (production of rye bread) were observed in the operation of reduced bread volume which is an important parameter for improving the quality of the product. The obtained section indicates that if more

attention is paid to the remaining operations, 80% of the irregularities will be solved.

In order to discover the reasons that led to a decrease in the bread volume, a diagram of causes - effects is applied, Fig. 5. The accent is placed on the main problem (reduced volume of bread) and the creation of this diagram requires special attention in the analysis of the factors by the employees and the overall management.

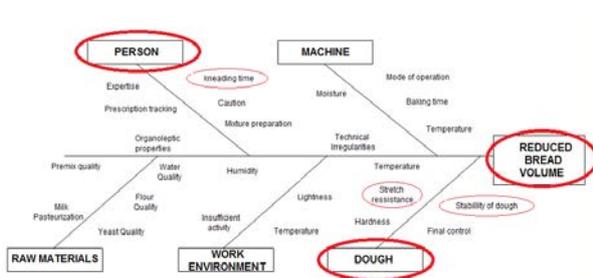


Fig.5. Ishikawa diagram for detecting possible causes of errors

Possible causes that can lead to a decrease in the volume of rye bread as a final product are shown in Figure 5. The same reasons are caused by a person, machine, dough which factors can lead to disruption of the production and technological process. In order to avoid these irregularities it is necessary for the employees to adhere to the prescribed recipes, to respect the time required for blending the dough, its stability, stretch resistance, as well as to check the temperature of the machine (the stove) and the time for bread baking. Based on the research results, this paper proposes the measures to improve business processes, to implement experience which is based on positive changes or simply to raise the eligibility of the process. In this way, a positive influence is achieved on the results by proactively conducting the business process for the preparation of dough, Fig. 6.

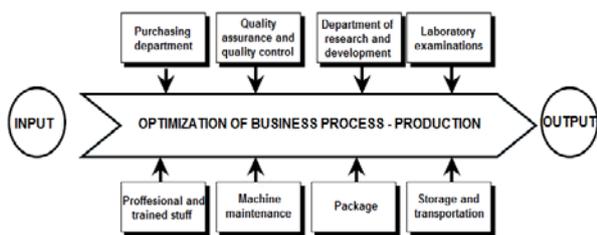


Fig. 6. A proactive business process for preparing the dough

The pro-active business process for preparing the dough (Figure 6.) not only leads to process optimization, but the company aligns two important parameters of operation: flexibility to changes and quality control. In this way, balancing and replenishment of processes is enabled because optimization literally implies the transition from one

process to another, a sector or an operation. Since quality is created in the business processes, the proactive promotion of the business process of bread and bakery production entails a series of operations that are interconnected. The process begins through the raw material procurement (input) sector, quality assurance and quality control of raw materials, dough preparation, laboratory testing, machine maintenance, packing and ending with storage and transport of final outputs.

In this paper, a few measures for optimization of business processes in the company are proposed.

In order to make the company progressive it is necessary to think proactively and strategically, which means adaptation and flexibility to changes through the implementation of new tools for improving business processes. This paper proposes measures for improving the quality of the company's operations.

**A proposal set of tools for tracking new product development activities using Gantt chart**

In order to achieve business success, it is necessary to define work activities in a timely manner. The Gantt chart is a diagram in which data, operations and work activities are visually displayed when developing a new product - rye bread, Fig. 7. During its preparation, a lot of mergers and separations of work tasks were performed in order to provide the best results.

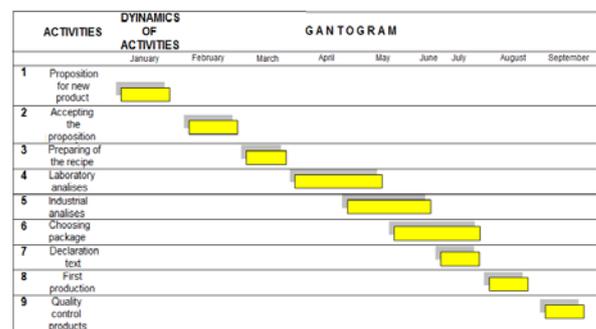


Fig. 7. Plan of product development activities - rye bread using Gantt chart

To produce quality products that will fulfil the wishes, needs and expectations of the buyers is a huge responsibility. For that purpose, it is necessary for the company to have adequately trained staff, appropriate technology, raw materials and maintain close relations with the suppliers.

Proposed measure for a mini mill construction shown by analyzing the balance between the cost-time categories

Optimization of business processes requires the rational use of resources, of costs at an acceptable level and proper planning of the time required to

carry out the activities. In order to meet the growing needs of its customers, it is necessary for the company to construct an additional smaller mill. For this purpose, a draft measure for analysis of direct and indirect costs was prepared. By reducing the construction time of the mill, costs are increased. It is envisaged that this mill will be completed in 8 weeks, and in that case the direct cost is 2 thousand euros. If this activity (A) is accelerated, or if it is assumed that the execution time of 8 weeks is reduced to 4 weeks, and at the same time the cost of 2 thousand euros has been increased to 5 thousand euros, a difference of 4 weeks and 3 thousand EUR cost of activity (B) i.e. 750 euros per week is obtained. In the case where activity (B) is accelerated in 2 weeks, a result of 6 weeks and 2000 euros + 2 (750 euros) = 3,500 euros is obtained, Fig. 8.

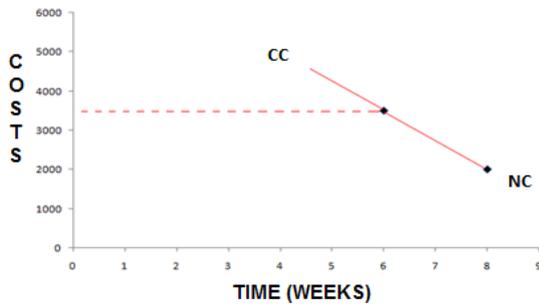


Fig. 8. Analysis of balancing between cost – time categories

Figure 8. shows the relationship between the cost and the time categories during the period the mill was built. The normal time NT for construction of this project is 8 weeks, and the normal cost (Normal Cost NC) is 2 thousand euros. However, the acceleration of this operation sets new values: speeding up or shortening the time required for construction (Crush Time CT) and the cost of the activity (Crush Cost CC). Buyers are satisfied when the expectations and the requirements for a particular product or service are fulfilled. Therefore they use the notion of quality to describe their level of satisfaction. However, users value the products which are delivered, but those that are subjected to assessment are the business processes that have created them.

#### 4. Conclusion

The optimization of the business processes in the bread and bakery company has achieved the application of the methodology of the TQM philosophy. The analysis in the business process of production was performed in all four divisions of operation in order to detect errors that could pose further threat to the company. Proactive promotion of business processes has led to an increase in the intensity of internal and external communication in the company and a decrease in the production costs.

By applying Histogram as one of the essential tools for collecting data, the loss in grams of toasted breads was determined at a certain time interval.

In order to detect errors in the production of special loaves, a Pareto Diagram was used, which allowed to perceive the problematic situation by emphasizing who, what, where, who, when has sinned, and the Ishikawa Diagram for determining the causes (human factor which contributed to reduced resistance and stability of the dough).

Furthermore, in order to serve the needs of buyers / users on time, a proposal was made for the construction of a mini mill based on an analysis of the balance between the categories of costs - time, and the proposed techniques for encouraging additional motivation among the employees to influence the valorisation of their labour and potential.

From all of the above, it can be concluded that the management of business processes is a serious obligation and is of crucial importance for the company. Optimization of business processes leads to the improvement of the quality of work as a prerequisite for a successful business perspective. The benefits of using this model are not only increasing the business results of the companies, which will further serve as the driving force for continuous improvements, but also increase the commitment of the top management and the employees to improve processes, customer satisfaction, employees, shareholders, suppliers and the community. By applying the TQM strategy, the quality care comes out of production, expands in all the pores of the company and the quality gets new dimensions, not only in quality products, but also in the quality of work and the organization of work [18],[19].

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