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APPROACHES TO BUSINESS PROCESSES IMPROVEMENT IN A GRAPHIC PRODUCTION COMPANY

The aim of this research paper is the determination of the existing business processes in a company that deals with graphic activity with the possibility of their improvement by applying the TQM methodology. During the research several management methods were applied, including check list and benchmarking. Analysis of the current state allowed making suggestions on the improvement through TQM application. TQM philosophy is the continuous improvement of all processes in organization through small changes in short periods of time including all organizational members regardless their hierarchical level without making large capital investments.

Keywords: TQM; quality; business processes; benchmarking; printing facilities.

JEL classification: C15; C52; O32; L15; L16; L23; D23.

Єлізабета Мітрева, Нако Ташков, Мілан Ангелескі ПІДХОДИ ДО ОПТИМІЗАЦІЇ БІЗНЕС-ПРОЦЕСІВ У ПОЛІГРАФІЧНІЙ КОМПАНІЇ

У статті проаналізовано бізнес-процеси поліграфічної компанії з точки зору методології покращення якості виробництва. У процесі дослідження та аналізу було використано низку класичних управлінських інструментів, включаючи листок самоконтролю та бенчмаркінг. За результатами аналізу та бенчмаркінгу розроблено рекомендації відносно підвищення якості роботи. Ці рекомендації дозволять провести необхідні корекційні заходи протягом відносно короткого часу із залученням усіх членів колективу, незалежно від рівня ієрархії, при цьому без суттєвих додаткових інвестицій у реформування.

Ключові слова: якість; бізнес-процеси; бенчмаркінг; поліграфічні потужності.

Рис. 5. Табл. 4. Літ. 20.

Елизабета Митрева, Нако Ташков, Милан Ангелески ПОДХОДЫ К ОПТИМИЗАЦИИ БИЗНЕС-ПРОЦЕССОВ В ПОЛИГРАФИЧЕСКОЙ КОМПАНИИ

В статье проанализирован бизнес-процессы полиграфической компании с точки зрения методологии по улучшению качества производства. В процессе исследования и анализа был использован ряд классических управленческих инструментов, включая перечень для самоконтроля и бенчмаркинг. По результатам анализа и бенчмаркинга разработаны рекомендации касательно повышения качества работы. Данные рекомендации позволят провести необходимые коррекционные мероприятия в течение относительно короткого промежутка времени с вовлечением всех членов коллектива, независимо от уровня иерархии, при этом без существенных дополнительных инвестиций в реформирование.

Ключевые слова: качество; бизнес-процессы; бенчмаркинг; полиграфические мощности.

Introduction. In order to achieve success in the application of TQM (Total Quality Management) strategy, managers responsible for its successful implementation must choose a methodology supported by a variety of methods and quality techniques. In its selection and application, factors of organizational and technical nature influence the choosing process and depending on the organizational structure of the quality system, one makes his/her choice.

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Methods for quality improvement are (Mitreva, 2009): concepts, techniques, methods, studies, in other words, all efforts directed at improving quality according to defined policies, objectives and responsibilities of a company (Pareto diagram, regression analysis, checklists, cause and effect method, study of precision, accuracy and stability of the process as an integral part of quality management). The role and importance of the methods and techniques for quality improvement activities are addressed in the ISO 9004-4 standard, noting that the application of any of these methods will give some improvement to the quality of business processes, products/services (Shiba and Walden, 2002).

Literature review. In many companies there is no clear picture of what exactly should be perfected. The policy is clear, but the strategy to reach the goal for many managers presents a problem (Mitreva, 2009; Кос, 2007). New strategy on quality called integrated quality management or total quality management (TQM), answers the questions: What do customers want? What should be done? What processes should be used? The situation is analyzed, the problem is formulated and multiple methods are used to solve the issue (Nakata, 2002).

If top management decides just to redesign business processes, which means making small improvements or modifying the existing processes, then a methodology for reactive improvement of business processes which ensures identification, problem solving and standards setting, is used (Nair et al., 2008; Svensson, 2006). The methodology for reactive improvement of business processes is based on different approaches to improving quality by using methods and techniques beginning with PDCA (Plan, Do, Check, Act) cycle. There are two stages in the application of this methodology:

Phase 1: Diagnosing and determining the current situation.

Phase 2: Solving the problem and improving the quality of the overall operation.

The methodology for quality improvement supported by PDCA cycle takes place in several steps (Table 1).

Table 1. The methodology for quality improvement supported by PDCA cycle (Mitreva, 2011)

<i>PDCA cycle</i>	<i>Step</i>	<i>Activity</i>
<i>Plan – Planning</i>	<i>1</i>	<i>Initiative to start the improvement project</i>
	<i>2</i>	<i>Determining the subject of interest or defining the problem to be solved</i>
	<i>3</i>	<i>Collection and analysis of data, determining the severity of the problem</i>
	<i>4</i>	<i>Analysis of the cause of the problem</i>
<i>Do – Implementation</i>	<i>5</i>	<i>Choosing a solution to improve and establishing improvement plans</i>
	<i>6</i>	<i>Implementing the solution</i>
<i>Check – Control</i>	<i>7</i>	<i>Monitoring and evaluating the improvement plan results</i>
<i>Act – Corrective measures</i>	<i>8</i>	<i>Solution standardizing</i>
	<i>9</i>	<i>Closing the improvement project</i>

TQM is based on the notion that quality is not created at the service control, but it is generated in business processes of all organizational units and it must be controlled everywhere. Thus, all sectors are responsible for the quality of a product/service. With this strategy, control exits from within production processes expanding into

all aspects of organization and the quality gets new dimensions, not only the quality of products/services, but the quality of work and organization of work too. The message of this strategy is: "Do not control the quality in order to remove the error, but for the sake to remove the reason leading to that error. Repeating an error is shameful". Control deals with the consequences and management reasons (Nair et al., 2008; Svensson, 2006).

Methodology. The subject of the research in this paper is the analysis of the company dealing with graphics or printing newspapers, magazines, catalogs, brochures, books, business cards etc., with the goal of being improvement. The implementation of TQM methodology in a company that strives to be at the top of the printing industry is necessary for the removal of errors and problems that arise in its everyday work. The research was made by determining the existing business processes within the company and through diagnostics and analysis of all anomalies in its operations, appeals and complaints of customers, and by defining the "bottlenecks" in the implementation of its activities. Analysis of the current state allows making the suggestions on improvement through TQM methodology application. The goal of the research is to obtain a realistic picture of possibilities and potential of the company, effective use of its resourcing and propose corrective measures for improvement of business processes. Implementing them in practice would mean bringing the company level to the world class. It means having more focus on preventive measures, thus lowering the dispersion of business processes. For the research the methodology of improving business processes represented by the following steps was applied.

The realization of the research:

Step 1. Initiative for starting an improvement project.

The analysis is made based on observation and direct contact with some of the staff and top management and their willingness to adopt new knowledge and techniques in order to improve business processes. In conversation with employees it was diagnosed that the company has space for improvement and better use of business processes. Based on their initiative, a function bearer of the process was assigned, defining duties and responsibilities in terms of diagnosis and improvement of the current situation in the company.

Step 2. Define the problem to be solved.

In order to detect problems the analysis of several aspects that affect the success of business processes was carried out. To get a real picture of the situation in the printing facility the existing organizational structure of the business units and offices, production facilities, competence and training of the workers were analyzed.

The current staffing is insufficient for success in keeping the business processes although this company is characterized by verified quality products/services and qualified staff. The wish of the top management is to improve further the processes and strengthen the position of the company at the domestic and regional markets.

The analysis of the technical equipment of the company showed that it has a machine for news rotation Koenig and Bauer – Albert – KBA, C211, news rotation Solna Distributor 311, 8-page Revue rotation Heidelberg two-color machine MAN Roland Favorit, connection machine Mueller Martini, connection machine Sheridan, semi-automatic knife Volenberg, crease MBT – B2 format, roto-binder Volenberg 2 CTP (computer to plate) – ECRM Mako 4 and Screen.

Several regular products are being printed using this equipment:

- Daily in Macedonian language "Vëcer";
- Daily in Albanian language "Lajme";
- Daily in Albanian language "Journal";
- Weekly magazine "Focus";
- Betting bulletin "Bet City";
- Betting bulletin "Zlatna Kopacka".

Besides the products that are regularly printed there is an agreement for printing many promotional materials and flyers for marketing activities of some important Macedonian companies. Analyzing the technical specifications of the machines, the main problem is that they have a huge, unused potential. The desire of top management is getting quality service at minimal operation costs by detecting and correcting problems.

Step 3. Collection and data analysis, determining the severity of the problem.

Results analyses. The determination of the problems we are facing in the printing company is the first of the five steps to be taken to implement successfully the concept of improving business processes. To this end, the research was conducted by separately examining the problems that come from top management, operational and tactical levels of the company. Although these problems are examined separately, the ultimate goal is finding a firm stance of top management to fully govern the quality processes.

The analysis of the problems that come from the top management is to define the arrangement of funds and whether they are used for investing or for necessary maintenance and servicing of printers and for necessary modernization driven by market requirements. To successfully implement the vision and the mission of the company it is necessary to invest in quality materials as the first pad of quality (quality printing plates, color, additional chemical materials etc.), to carry out regular services of printing and to invest in continuous education and training of employees through a well-designed system of incentives.

The goal in diagnosing the issues of managers from at the operational level is by doing things right the first time, optimizing business processes and creating space in the production process allowing for printing additional products which means additional profit and increased reputation.

The goal while diagnosing the issues for managers in the tactical level is the continuous improvement and reduction of delays that occur during the printing, accelerating preparatory activities and the time required for printing, as well as reducing wastes that could increase the costs for the company. To meet all these goals great patience is required and desire to succeed.

Step 4. Analysis of the problem causes in the printing company.

The analysis of the problem causes lasted for 4 weeks, with the greatest attention to the problems that the workers are facing. In examining the business processes and operations, the main focus is on the quality of the finished product (newspapers, journals, magazines, flyers, catalogs etc.), and meeting the deadlines because under high competition it is essential for a newspaper to come first and appear in evening sales to be soon available to readers. The most common causes for the problems are given in Table 2.

Table 2. A check list of the errors measured over the period of 4 weeks in printing, authors'

<i>Types of mistakes</i>	<i>Week one</i>	<i>Week two</i>	<i>Week three</i>	<i>Week four</i>
<i>Delay of newspapers – evening sale</i>	<i>II</i>	<i>I</i>	<i>III</i>	<i>II</i>
<i>Delay and deadline penetration for other products</i>	<i>I</i>	<i>/</i>	<i>II</i>	<i>I</i>
<i>Discontent of employees</i>	<i>III</i>	<i>II</i>	<i>III</i>	<i>III</i>
<i>Discontent of customers</i>	<i>I</i>	<i>/</i>	<i>I</i>	<i>I</i>
<i>Inconvenient working hours</i>	<i>I</i>	<i>II</i>	<i>I</i>	<i>I</i>

Based on the data collected from the check list form summary (Table 3) is created. Ranking by the frequency of errors (from the biggest to the smallest) is carried out as well as calculating the percentage share for each error in the total number of errors.

Table 3. Summing up the results of the check list made during the four-week research, authors'

<i>Types of mistakes</i>	<i>Total frequency (mistakes)</i>	<i>Percentage, %</i>	<i>Cumulative percentage, %</i>
<i>Discontent of employees</i>	<i>11</i>	<i>36</i>	<i>36</i>
<i>Delay of newspapers – evening sale</i>	<i>8</i>	<i>25</i>	<i>61</i>
<i>Inconvenient working hours</i>	<i>5</i>	<i>16</i>	<i>77</i>
<i>Delay and deadline penetration for other products</i>	<i>4</i>	<i>13</i>	<i>90</i>
<i>Discontent of customers</i>	<i>3</i>	<i>10</i>	<i>100</i>
<i>Total</i>		<i>100</i>	

The analysis of the survey showed the following causes of the problems:

- frequent delays and breaking the terms for daily newspapers in the evening sale, mostly for daily "Vecer", which arrives first for preparation, after which it is printed first and gets first to the evening sales;
- frequent delays and violation of deadlines for other products (flyers, magazines, journals etc.);
- frequent dissatisfaction of employees about the deadlines and great pressure to meet them;
- occasional dissatisfaction by customers, in terms of both quality of service and the ability to meet the established deadlines;
- reactions and dissatisfaction by employees due to frequent changes in working hours, and overload their duties.

Through the analysis of the errors with most complaints the irregularities that cause defects should be removed. They may arise from several factors: human, machine tools and other.

The analysis of the problems in the company show they are the result of insufficient investment in the modernization of technology, and the lack of skilled labor.

For successful analysis of the situation in the company and getting accurate information on the improvement measures a benchmarking strategy was applied taking the best printing company at Macedonian market "Graphic Center Skopje" (GCS). This comparison was made with two parameters to show the shortcomings

and the reasons for the problems in business processes of the researched printing company:

- Comparison in terms of the process of preparing and printing of newspapers, timely exit from the printing process for the evening sale. This point is currently the primary one for the dailies due to strong competition and relatively small market.
- Comparison in the quality of the working potential which serves the machines used by these two companies.

A comparison of the preparing and printing process of newspapers was performed on 6 daily newspapers being printed in the research company ("Vecer", "Journal" and "Lyme"), to the 3 daily newspapers printed by GCS ("Dnevnik", "Utrinski Vesnik", "Makedonski sport"). These newspapers have the approximately same exit time and circulation. Circulation is taken as an example and arbitrary due to the editorial policy that circulation is a trade secret. A comparison of the processes of preparing and printing newspapers in both facilities is performed as follows:

- Preparation of daily newspapers in raw color studio.
- Printing newspapers.
- Distribution of daily newspapers.

Preparation of daily newspapers by editors is not taken into account because it is external to the facilities under study.

Preparation of papers in raw color printing in the researched company is done in a studio equipped with two PCs with i5 processor and software suited to the needs of employees for quality craftsmanship and preparation products. Personal computers are connected to the server and a CTP (Computer to Plate) – System (CTP MAKO 4 ECRM), produced in 2009, which works with laser ultraviolet rays, Figure 1.



Figure 1. The CTP system in the researched company

The capacity of the CTP system is maximally 18 plates per hour, which means that it takes 40 minutes to develop 12 plates, or the amount needed to print a news-

paper in 24 pages. This shows that the development of the total number of records (44 sheets for all newspapers) takes 2 hours 25 minutes.

The preparation of papers in raw color printing by GCS is done in a studio equipped with 4 PCs with i5 processor, with software tailored to the needs of employees and the printing company. Personal computers are connected to two CTP trendsetters Kodak Creo Lotem, whose maximum capacity is 24 sheets per hour of every trendsetter separately, meaning that both have the maximum capacity of 48 sheets per hour. Daily "Dnevnik" is being printed on 32 pages (which requires 20 sheets), and the daily newspapers "Utrinski" and "Makedonski sport" are being printed on 24 pages (which requires 12 boards), so according to the capacity of the two trendsetters, it takes 55 minutes to develop 44 plates.

Figure 2 is the comparison of the 3 daily newspapers from the research with the 3 daily newspapers from GCS in terms of time required for plates preparation. There is a perceptible difference in the total time required for the preparation of daily newspapers and the advantage of GCS from the start.

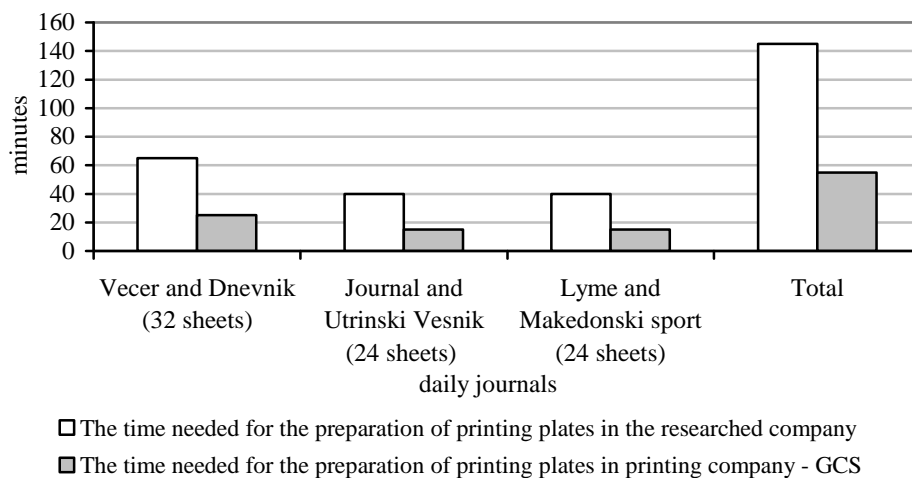


Figure 2. Comparison of the time needed for printing plates preparation in the researched company and the compared company GCS, authors'

The printing of "Vecer", "Journal" and "Lajme" in the researched company is done on a KBA printing machine, composed of 4 Y and 1 I verg, the maximum that can be fitted is by 4 rolls of paper, placed on a machine and 3 semi-automatic gearboxes of rolls. The maximum speed of the machine is 50,000 copies per hour, but average speed at which the newspapers are printed is 18,000 copies per hour, Figure 3.

Printing of "Dnevnik", "Utrinski Vesnik" and "Macedonia sport" in GCS is done on the printing machine Manugraf (Indian production), which is composed of 8 H vergs connected in 4 printing towers that can be fitted with up to 5 rolls paper placed on 5 automatic changer rolls. The maximum speed of the machine is 30,000 copies per hour, the average speed at which the newspapers are printed is 20,000 copies per hour, Figure 4.

According to the displayed average speed of the newspapers printing that have the identical amount of copies (Figure 5), the comparison between the times and the

difference in newspapers printing shows a big competitive advantage between the two printing companies.



Figure 3. KBA printing machine in the researched company



Figure 4. Printing machine Manugraf in GCS

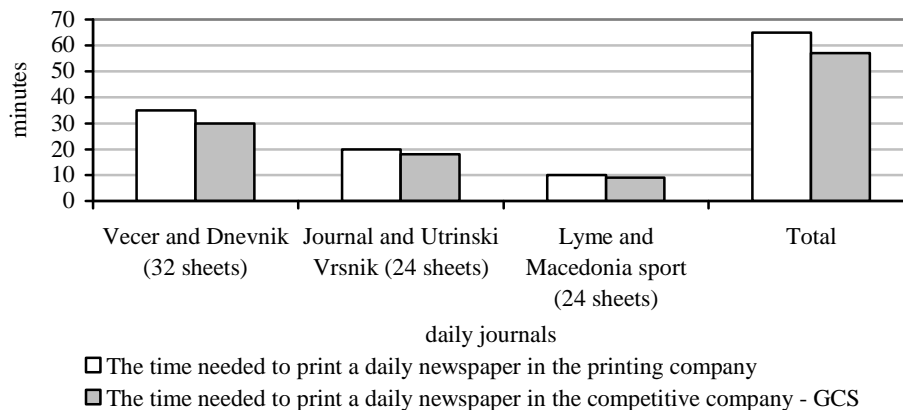


Figure 5. Comparison of the time needed to print a daily newspaper, authors'

Distribution of the newspapers printed in the research printing company is done through an outside company that specializes in distribution of newspapers and magazines. The company is equipped with 4 vehicles and covers the distribution in Skopje, which is crucial for evening sale of newspapers. The company also owns 3 vehicles that distribute newspapers in the rest of the country. Distribution of the newspapers printed by GCS is done by themselves. The company has the fleet of 8 vehicles to deliver newspapers for the evening sale in Skopje and 3 vehicles through Macedonia. Although in the area of Skopje daily newspapers are distributed with twice the number of vehicles, the difference in time in relation to the researched company is negligible because papers reach their readers as soon as possible.

The comparison in terms of skilled workers that serve the machines is important to give a more realistic picture of the situation in which the researched company is, related to the competitive company. For easier insight the comparative method is used (Table 4).

Table 4. Comparison in terms of skilled workers that serve the machines in both companies, authors'

<i>Qualified employment potential in the researched printing company</i>	<i>Qualified employment potential in GCS</i>
<i>Machine for printing newspapers KBA – 4 machinists</i>	<i>Machine for printing newspapers MAN Roland – Hromoset – 8 machinists</i>
<i>Revue printing machine Heidelberg – 2 machinists</i>	<i>Revue printing machine Harris 300 – 8 machinists</i>
<i>Bindery – 2 employees</i>	<i>Bindery – 14 employees</i>
<i>Expedition – 3 employees</i>	<i>Expedition – 8 employees</i>
<i>Service and maintenance – 1 employee</i>	<i>Service and maintenance – 4 employees</i>

From Table 4 we can notice an obvious difference in the number of employees who serve the same or similar machines in both companies and consequently this reveals the weakness of the researched company. Perhaps the workload and the number of machines in both printing companies is not comparable, but the difference in the number of employees for the same or similar machine is great and should not be at the level if the researched company wants to reach the top of Macedonian printing industry.

Discussion. As a result of the research analysis the following disadvantages are found in the researched printing company:

- There is a big difference in the time required for preparation, or for making the printing plates for newspapers. In the researched printing company it takes 3 times longer, respectively for the 3 daily newspapers taken for the comparison and the ratio is 145 minutes to 55 minutes.

- The difference in the time required to print newspapers in both printers is minimal and insignificant.

There is an evident difference in the researched companies in terms of the maximum speed for printing relative to the average speed. The maximum speed is 50,000 copies per hour, while the average working speed is 18,000 copies per hour. The reasons why the average speed of printing newspapers is not greater, according to the staff, is irregular servicing of the machinery that causes defects and delays.

In the researched printing company the lack of skilled labor has been found, a phenomenon that negatively affects the quality of printed products and meeting the established deadlines. The lack of workforce creates pressure and additional work assignments, as well as overtime, leading to employees' dissatisfaction.

After the analysis a solution is necessary for improving, correcting and removing anomalies in operations.

Step 5. Choosing a solution to improve and establish a plan to improve the company.

Improvement of business process, or correcting and removing the detected problems and disadvantages depend solely on the commitment of the top management and the company's business policy. This stage proposes methods and techniques that would be useful for successful implementation. Proposals for improving of business processes in this paper would be successful if top management creates a management team within the company that will accept the data obtained from the survey and will be in charge of corrective measures implementation in all business processes, as well as in their monitoring. While naming a team leader for the activities in the direction of printing modernization, service and replacement of necessary spare parts, as well as planning the qualified potential should be taken into consideration. Before embarking on the activities there should be familiarization of staff and the solid attitude of top management and new company policy on reducing errors and additional costs concerning the satisfaction of all stakeholders.

The proposed solutions have been presented to the top management for further implementation, including:

- Matrix of obligations and responsibilities for solutions.
- Assessment of the effects of solving these problems in terms of improvement confirmation.

- Evaluation of the effects and activities in the process of improvement.
- Standardization of solutions.
- Closing this improvement project, and detection of new problems.

Employees will have the opportunity to continually provide ideas, comments, suggestions and opinions for improving the operations. This would also concern the possible problems and solutions.

Step 6. CONTROL – Control of changes in business processes in the printing company.

The control would include continuous monitoring of changes in business processes or constant supervision of production capacities and machinery maintenance, as well as of the engaged workforce. Optimization of control mechanisms will create new rules and procedures for employees and obligations and greater engagement of top management aimed at producing zero errors or production without defects.

Conclusion. The research has found that the company under study is relatively new to Macedonian market, and numerous problems and shortcomings are identified in its business processes affecting the quality of printed products and delivery deadlines. After the performed analysis it has been determined that there is lack of qualified staff and under-investment in maintenance of machines and their modernization. These shortages directly affect the quality of printed products and meeting the delivery deadlines.

Some suggestions were brought up that will contribute to problem solving, and thus improve business processes and reduce costs.

The commitment of top management to improving the processes and involvement of all employees are of great importance for the optimization of business processes by establishing a management team, with a leader be responsible for innovations introduction and their control in the application of the business process.

The proposed measures and solutions on business processes improvement in this paper suggest creating project groups and also corrective measures which would significantly reduce the production costs. Measures on improving business processes would mean monitoring, control and compulsory preventive work involving all employees into problem solving. Application of the proposed solutions in practice would increase the products competitiveness, and thus result in higher profits and better reputation.

Employees must be given full responsibility and power to correct their mistakes and account for any problems with quality. Inclusion of all employees in problem solving and eliminating errors in business process is necessary. Every day each employee should not only control operations, but employees must be trained to act proactively. This creates a complete care for quality. Since this process is a lengthy effort, commitment of top management is required.

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