

Building Competitiveness through Improvement of Quality Process in Paper Industry Enterprises

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Abstract. Nowadays, organizations continuously compete with each other and other market competitors. It is clearly visible in paper production market in Poland which is constantly developing taking over even the plastic product market due to the regulation of the reduction of the impact of certain *plastic* products. Therefore, for a single company there is a need to search and take competitive advantage. In order to build competitiveness it is possible to refer to improvement of quality process which can lead to additional benefits for organizations or customers. It can concern various aspects of the company such as structures, processes, activities or products. The aim of this paper is to propose methods and tools of quality management at particular stages of paper production process to build or improve market competitiveness in paper industry.

Introduction

Competition is perceived as one of the exclusive components of a free market [2]. It is a phenomenon that describes mutual relations that appear in rivalry environment between entities that have been covered by this phenomenon. Enterprises that compete effectively and despite the obstacles created by competitors, achieve their goals, are called competitive [8]. Competitive advantage is limited by changes taking place in a given sector and actions taken by competitors. Presently, the enterprises in Polish paper industry are constantly looking for new sources of building a competitive advantage. It is important to identify the factors affecting market competitiveness that should be part of planned strategic goals. Despite strong foreign competition, Polish enterprises are characterized by intensive growth on the local and international market. This may be due to special features, modern technology, innovation or a high level of know-how [9].

Improvement of quality process may be one of the ideas of building competitiveness of paper industry enterprises. It consists of reducing its volatility through the optimal use of resources, the use of various concepts, methods, techniques and tools, the elimination of waste, shortening the production time and reducing costs. The aim of improvement is to obtain appropriate economic and production results, affecting the increase in quality and customer satisfaction [1]. Continuous improvement should be an integral part of the functioning of any organization, regardless of the stage it is in [4, 5, 6]. The process approach is used in management more and more often, due to the fact that identification and understanding of processes in organization has an impact on increasing overall efficiency [10, 3]. Chosen concepts, methods, techniques and tool implemented in the particular stages of production process in paper industry may help to improve of quality process and by this to build or improve the market competitiveness.



Dynamics of Polish Paper Industry

Polish paper market is one of the fastest growing branches of industrial processing in Poland. The production (that includes paper and cardboard) in 2017 was equal to 6 million tons. It gives an increase of 105% compared to 2000. Despite the changing environment, the sector is developing dynamically and has good perspectives. It may seem that in the world dominated by digitalization, there is no place for development of paper production. However, it may observe that that demand for packaging segment and sanitary products is growing rapidly, while less and less important are the graphics paper. The value of sold production of paper products is growing at 8% per year which is one of the best industry performances during recent years [11]. Each stage of paper production process takes place in Poland. From obtaining raw materials (pulp), waste paper, production of various types of paper and paper products. The first stage of production is performed mainly is only a few large enterprises in Poland.

The Polish paper market is characterized by high international competitiveness due to the high quality of products while maintaining low production costs. The introduction of new EU regulations, emphasizing the importance of ecology and caring for the natural environment, resulted in an increase in the importance of paper as a natural raw material with less harmful effects. The paper sector also developed during the COVID-19 pandemic, when the demand for household hygiene and sanitary products and various types of packaging paper increased. Paper sector, despite the crisis, recorded an increase in the value of sold production. It can be assumed that the paper industry will continue to develop along with the growing importance of e-commerce [11].

There are a lot of opportunities for development in paper industry, for instance to increase the range of manufactured products. Due to the huge problem regarding the amount of plastic in the world, the European Parliament has decided to implement The Single-Use Plastics Directive. The organizations are obliged to stop producing and using disposable plastics products such as polystyrene cups, food containers, cutlery, straws [7]. It may result in increasing the range of assortment of other sectors. According to forecasts, the role of the paper industry will continue to grow, especially in the context of domestic consumption and exports.

Material and Methods

Nowadays, many difficulties may be encountered when conducting empirical researches among entrepreneurs in Poland. These difficulties appear mainly due to entrepreneurs reluctance to participate in surveys, because of lack of time, lack of knowledge or fear of disclosing sensitive information. The main criterion qualifying for participation in the survey was the affiliation of enterprise to the paper sector which is defined in Polish Classification of Activities in Section C – Industrial processing and in Division 17 – Manufacturing of paper and paper products. The second qualifying criterion was the position of the respondent, defined as the director, the manager, the representative of Quality Management Systems or an employee of quality department. Another criterion to participate in the survey was the size of enterprise.

Quantitative research conducted by the author in February-December 2021 were part of a research project conducted at the Faculty of Management Engineering at Poznań University of Technology. The research was conducted by using CAWI (Computer-Assisted Web Interview) method which is a technique of collecting information in which the respondent is asked to complete a questionnaire in electronic form. The research was conducted mainly through the international social network LinkedIn, specializing in business contacts. The initial stage included pilot studies, which resulted in 15 completed questionnaires. A total of 686 employees were invited to participate in the study. As a result of the conducted research, 90 correctly completed questionnaires were received.

The respondents were asked to answer the questions:

Q1: Please indicate which concepts, methods, techniques and tools of quality management are used in your company?

The respondents had 25 different concepts, methods, techniques and tools of quality management to choose from. There was a possibility to mark more than one answer.

Q2: Please indicate to what extent the presented concepts, methods, techniques and tools of quality management are important for continuous improvement of production processes (where 1 means not important and 5 means very important)?

In this question the respondents were asked to assess each of concept, method, technique or tool of quality management in Likert scale (from 1 to 5).

Results and Discussion

As a result, in response to the question about the use of concepts, methods, techniques and tools for quality management, 2.2% of respondents did not indicate any of them. The rest gave from 1 to 17 answers. According to the respondents, the most frequently used in the company were:

- brainstorming – 77.8% of people,
- check sheet – 67.8% of people,
- 5S – 58.9% of people,
- 5WHY – 40.0% of people.

The results of the first question from the survey may be found in Fig.1.

However, according to the respondents, the most important concepts, methods, techniques and tools of continuous improvement of production processes in the company were:

- brainstorming – average 3.84,
- check sheet – average 3.40,
- 5S – average 3.14,
- 5WHY – average 2.80.

The results of the second question from the survey may be found in Fig.2.

Table 1. Proposition of implementation chosen concept, method, technique or tool of quality management at particular stages of paper production [Based on results from survey]

Concept, ethod, technique or tool	Description	Stage of production
FMEA QFD DoE	<ul style="list-style-type: none"> • elimination of weak points in the product design process, • improvement of the product design process, • determination of the influence of input parameters on the process output 	Production planning and design
Check sheet	<ul style="list-style-type: none"> • collecting and organizing data from measurements and observations 	Preparation of proof Preparation of ozalid
Matrix diagram	<ul style="list-style-type: none"> • determination of the dependencies of various analyzed objects 	Technical preparation of production
Matrix data analysis	<ul style="list-style-type: none"> • systematizing the priorities set in the matrix diagram 	Technical preparation of production
Brainstorming 5 WHY	<ul style="list-style-type: none"> • group analysis of solving the problems that may occur in production process 	Whole production process
5S	<ul style="list-style-type: none"> • elimination of non-value-added activities 	Whole production process
Statistical Process Control	<ul style="list-style-type: none"> • monitoring of production process 	Interior printing Folding Cover printing
Report 8D Ishikawa diagram	<ul style="list-style-type: none"> • identifying the causes of repetitive problems in the production process 	Whole production process
Statistical acceptance control	<ul style="list-style-type: none"> • declaration of compliance with technical standards 	Finished product

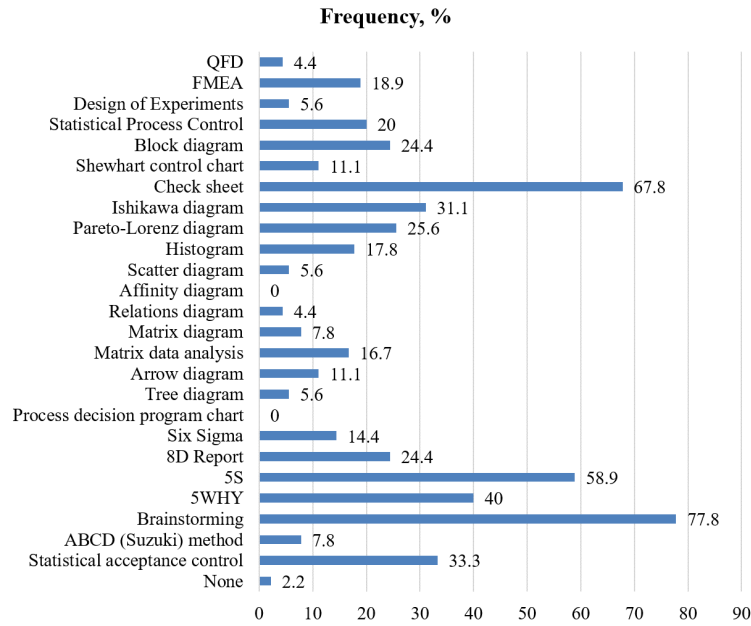


Fig. 1. Concepts, methods tools and techniques implemented in investigated paper enterprises (source: based on results from survey).

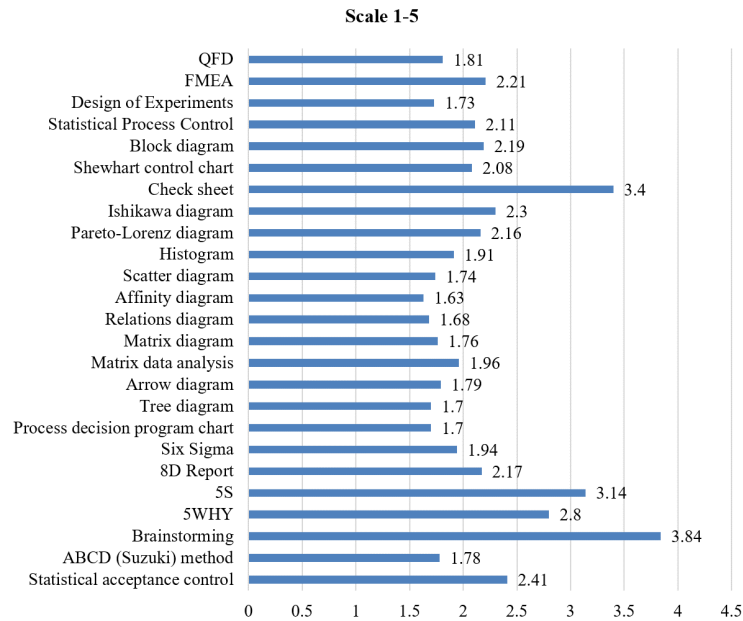


Fig.2. Concepts, methods, techniques and tools contributing to build competitiveness (source: based on results from survey)

On the basis of collected answers there was created a proposition of implementation chosen concept, method, technique or tool of quality management at the particular stages of paper production process which is presented in Table 1. There were chosen some elements of quality management that implemented may contribute to building competitiveness through improvement of quality process in paper industry enterprises.

Summary

Nowadays, the companies in Polish paper industry are continuously competing, so the new sources of competitive advantage are needed. It may be observed dynamic and steady increase of production every year. Paper products are perceived as very attractive and essential objects while paper itself as a key raw material in Polish economy today. Improvement of quality process may be one of the ideas of building competitiveness of paper industry enterprises. The research conducted with the representatives of paper industry showed that different concepts, methods, techniques and tools are widely used in enterprises of this sector. Respondents also perceived many of them as being useful in building competitiveness. Proposed solution of implementation specific concepts, methods, techniques and tools at particular stages of paper production process may contribute to improvement of quality process and building competitiveness.

References

- [1] A. Hamrol. Zarządzanie jakością z przykładami, Wydawnictwo Naukowe PWN, Warszawa, 2013. ISBN 978-83-01-17466-8
- [2] R. Kolman et al. Wybrane zagadnienia zarządzania jakością, Wyższa Szkoła Administracji i Biznesu w Gdyni, Gdynia, 1996.
- [3] M. Konieczna, B. Mrugalska, M. K. Wyrwicka. Application of Single Minute Exchange of Die in Production Process Improvement: A Review, *Logistics & Transport* 39 (2018).
<https://doi.org/10.26411/83-1734-2015-3-39-7-18>
- [4] M. Smętkowska, B. Mrugalska. Using Six Sigma DMAIC to Improve the Quality of the Production Process: A Case Study, *Procedia Soc. Behav. Sci.* 238 (2018) 590-596.
<https://doi.org/10.1016/j.sbspro.2018.04.039>
- [5] M. Konieczna. Quality Improvement in Production Enterprise: Case study, *Scientific Papers of Silesian University of Technology. Organization and Management Series* (2018) 151-162.
<http://doi.org/10.29119/1641-3466.2018.119.10>
- [6] M. Konieczna, B. Mrugalska, M. K. Wyrwicka. How to Improve Manufacturing Process Implementing 5S Practices: A Case Study, *IHSI 2020: Intelligent Human Systems Integration 2020* (2020) 1225–1232. http://doi.org/10.1007/978-3-030-39512-4_187
- [7] M. Niemir, B. Mrugalska. Identifying the Cognitive Gap in the Causes of Product Name Ambiguity in E-Commerce, *Logforum* 18 (2022) 257-364.
<https://doi.org/10.17270/J.LOG.2022.738>
- [8] M. Strużycki. Podstawy zarządzania przedsiębiorstwem, SGH, Warszawa, 1998. ISBN 8386689978
- [9] R. Śliwiński. Resource Based View and the Key Factors of International Competitiveness of Polish Fast-Growing Firms, *Studia Ekonomiczne/Uniwersytet Ekonomiczny w Katowicach* 116 (2012) 241-252.
- [10] M. Trenkner. Process Improvement – Social Perspective, *J. Manag. Finance* 14(2) (2016) 429-438.
- [11] Bank Pekao report: Polish paper industry and its role in the modern economy. [online] 2021 [Viewed: 31-01-2023] Available from: <https://media.pekao.com.pl/pr/659692/raport-banku-pekao-polski-przemysl-papierniczy-i-jego-rola-w-nowoczesnej-gospodarce>