7th INTERNATIONAL SYMPOSIUM ON INDUSTRIAL ENGINEERING

INDUSTRIAL ENGINEERING DEPARTMENT, FACULTY OF MECHANICAL ENGINEERING, UNIVERSITY OF BELGRADE, SERBIA

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PROCEEDINGS

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PREFACE

Since the first symposium in Belgrade, Serbia more than two decades ago, in 1996, International Symposium on Industrial Engineering - SIE has been held regularly every 3 years. It represents an opportunity for researchers in the Industrial Engineering community to review and evaluate their scientific achievements over the period since the previous SIE, share their most recent results and ideas, and discuss possibilities for new directions in research, joint experiments and observing campaigns.

The aim of the 7th International Symposium on Industrial Engineering – SIE 2018 is to contribute to a better comprehension of the role and importance of Industrial Engineering and to point out to the future trends in the field of Industrial Engineering. The Symposium is also expected to foster networking, collaboration and joint effort among the conference participants to advance the theory and practice as well as to identify major trends in Industrial Engineering today. According to these goals the Symposium addresses itself to all experts in all fields of Industrial Engineering to make their contribution to success and show capabilities achieved in the work that has been done are very welcomed. SIE 2018 provides an international forum for the dissemination and exchange of scientific information in industrial engineering fields through the large number of multidisciplinary topics.

The book brought together 58 papers and more than 170 authors from 12 countries, namely from Serbia, Portugal, Finland, Switzerland, FR Macedonia, Italy, United Kingdom, Thailand, Slovakia, Canada, Poland and Bosnia and Herzegovina. The submitted full length manuscripts were peer-reviewed, and selected for publication by experts in their respective fields. The authors ranged from senior and renowned scientists to young researchers. Only unpublished papers were accepted and the first author is responsible for the originality of the paper. All papers are classified into six chapters, including opening and closing plenary lectures.

We expect that papers and discussions will contribute to better comprehension the role and importance of Industrial Engineering in this and other countries, both in domain of scientific work and everyday practice.

Our efforts in organizing would not succeed without the considerable help of the members of Scientific Program and the financial help of Ministry of Education, Science and Technological Development was greatly supportive for the success of the entire project.

At the end, the editors hope, and would like, that this book to be useful, meeting the expectation of the authors and wider readership and to incentive further scientific development and creation of new papers in the field of Industrial Engineering.

Welcome to the 7th International Symposium on Industrial Engineering – SIE 2018! We wish to all participants a pleasant stay in Belgrade and are looking forward to seeing you all together at the 8th Symposium on Industrial Engineering – SIE 2021.

Belgrade, September 2018

EDITORS

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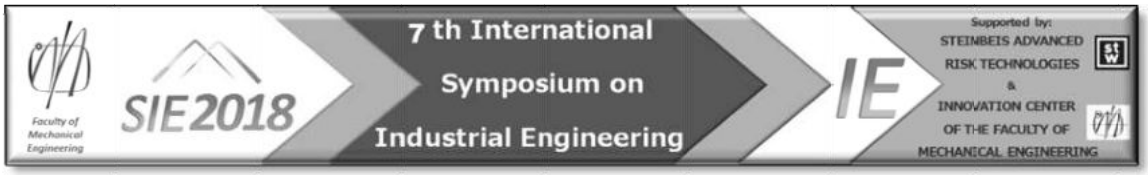

A SYSTEMATIC LITERATURE REVIEW IN THE DOMAIN OF ISO 9001 CERTIFICATION AND BUSINESS IMPROVEMENT

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Abstract. *In this systematic review the impact of ISO 9001 certification on business performance is addressed. A total of thirty (n=30) scientific articles in the domain of ISO 9001 certification are thoroughly analysed. The sum of samples of each analysed article is 9280. The findings indicate that almost half of the total sample size reported positive impact of certification. It is evident that ISO 9001 positively affects business performance. This paper can be used for further research as it provides a concise review on the effectiveness of quality management systems.*

Key words: *quality management systems, ISO 9001 certification, business performance, improvement*

1.INTRODUCTION

In this article the impact of ISO 9001 certification on business performance will be addressed. A thorough systematic literature review is conducted in the domain of ISO 9001 certification. In addition, business performance metrics will be analysed.ISO 9001 certification improves financial performance, and contributes to higher organizational efficiency [12]. This efficiency is the result of improved processes throughout the organization.It was suggested that ISO 9001 implementation positively affects customer satisfaction, operational performance, and financial performance [11]. This is manifested in the form stronger customer loyalty, and higher profit margins. Higher operational performance is achieved through more efficient processes. However, in other articles it was argued that ISO 9001 certified companies didn't acquire benefits from certification, and there was no evidence of financial, and business performance improvement [13]. In addition, it was described that ISO 9001implementationbrought noimprovements in business performance [3].

Furthermore, a more recent research suggested that ISO 9001 certified companies for more than three years are less prone to risks of failure [7]. In the same research it was noted that the certification process brought improvement to business performance. The metrics for business performance included productivity, cost-savings, customer satisfaction, process efficiency, and competitive market position.

It is evident that there are contradictions in the existing literature in the domain of ISO 9001 certification. The main objective of this systematic review is to concisely present various scientific articles in this domain, in order to determine the impact of ISO 9001 on financial performance, operational performance, and overall business performance. In the next section, a brief theoretical background is given. Further, the methodology is described,and the results are presented. Based on the findings, conclusions are drawn, and future research is recommended.

2. THEORETICAL BACKGROUND

The ISO 9001 defines the requirements for an effective quality management system. This standard has a positive impact on business performance, and brings improvements such as higher product quality; higher customer satisfaction; improved employee communication; improved internal, and external

processes; higher rates of employee training, and new skill learning; achieving economic goals; and improving financial performance. SMEs have to focus on internal organizational processes in order to effectively implement ISO 9001. This includes quality culture, reduction of risky behaviour towards the successful implementation of ISO 9001, readiness analysis, and a dynamic business environment [2]. It is evident that in order to maximize the potential of the ISO 9001 standard, the internal processes of an organization, have to be intensely supervised, and effectively managed. Management has to address the commitment, and awareness of workers regarding quality management systems, and its benefits to the organization. Employees play a key role in the implementation process.The main elements of ISO 9001 implementation include [4]:

- customer relationship development (developing strong relationships with customers is important for re-purchase of products and services, and overall for developing customer loyalty);
- research, and design of products, processes, and procedures (implementation of ISO 9001 often requires the redesign of processes, and procedures in order to synchronize them with the requirements of the quality management system);
- resource management(without adequate, and efficient resource allocation, the implementation process can be jeopardized);
- security of processes (the new ISO 9001:2015 standard focuses on risk management, and the security of processes play an important role in maintaining a safe environment where security risks are minimal).

The literature in the domain of ISO 9001 certification is dynamic, and the findings are often contradictory between each other. ISO 9001:2000 was described as a standard that improves business performance[10]**.**Contradictory to these findings it was argued that ISO 9001 certification didn't bring improvement to business performance or other business processes [1].When addressing business performance, it often means an integrated group of performance metrics that includes productivity, cost reduction, customer satisfaction, innovation intensity, waste reduction, and higher product quality. It was argued that the ISO 9001 certificate fulfils only 40% of the requirements of thehighly respected quality achievement, the Baldrige award. The reasons are the following [6]:

- certification is easy to achieve if only the certificate is the goal, and not overall organic quality improvement in the organization;
- the ISO 9001 standard focuses on less important, minor problems rather than cardinal processes and procedures;
- often the quality of products before and after certification is similar, and companies don't see the point of certification;
- the total quality management concept bring better improvements in opposite to ISO 9001, thus certification is not conducted.

Some findings showed that implementing a quality management system doesn't affect business performance if the majority of the competitors on the market are also ISO 9001 certified. However, if the competitors are not ISO 9001 certified, then there is an advantage if a company possesses a certificate [8].Dynamic markets with volatile trends, are prone to higher risks when it comes to ISO 9001 certification. On markets where trends dictate product demand, and where customer loyalty is not developed, the percentage of ISO 9001 implementation failure, is higher. During the implementation process, companies often choose simple quality tools, while the more complex tools are used only in special situations. Human resources are often the main influential factor in quality tool usage. If the workers, or even worse, the managers, are not committed to the certification process, the advanced quality tools will not be used, thus the benefits of these tools will not be utilized. This way, a significant portion of the positive benefits of quality management systems, is excluded. It is important to address these issues before the implementation process. The commitment aspect of quality management systems is crucial for a successful certification [5].

This systematic review focuses on thorough analysis of various literature in order to determine the effect of ISO 9001 on overall business performance. In the next section the methodology of this research will be defined.

3. METHODOLOGY

Articles used in this systematic review were obtained through the Google Scholar, and KoBSON service. The main key words used to search for the adequate articles were the following: ISO 9001; ISO 9001 certification; ISO 9001 impact; ISO 9001,and business performance; ISO 9001, and

financial performance. Predatory conference papers and predatory journal articles were avoided. When a certain article was found it was downloaded and stored on the authors' personal computer. Duplicates were removed, and the eligible articles were further analysed. Irrelevant sources were excluded. Every article was thoroughly analysed, and key findings were noted. In every article the business performance metrics were addressed, and noted accordingly. This way, a useful insight is given regarding the type of positive, negative or neutral impact of ISO 9001.For the overall review process a defined protocol was used that included the following steps:

- Identifying, and obtaining articles through the Google Scholar and KoBSON services;
- Removing duplicates;
- First analysis of articles (ineligible articles were excluded);
- Second analysis of articles (articles excluded with reasons);
- Article selection for the systematic review, and qualitative analysis.

The review protocol was created according to the PRISMA protocol which was developed by Moher, Liberati, Tetzlaff, Altman, and the PRISMA Group, in 2010 [9]. This protocol is widely acknowledged as an effective tool for conducting systematic reviews in various scientific domains. The PRISMA protocol includes specific review steps that makes it easier, and more effective to analyse literature for a systematic review. In the next section the obtained results are presented.

4. RESULTS

Thirty (n=30) scientific articles in the domain of ISO 9001 certification were used for this systematic review. In Table 1, the sample size, and the impact of ISO 9001 certification on company performance (positive; negative; neutral), are presented. The labels in the "Impact of ISO 9001" column have the following meaning: Q-overall quality; FP-financial performance; PQ-product quality; OP-operational performance; PC- process control; CI-communication improvement; CS-customer satisfaction; IN-innovation; PM-process management; PR-production; BP-business performance; IE-internal efficiency; CP-competitiveness. The mentioned labels are the metrics that were analysed in individual articles. These metrics were used to determine the impact of ISO 9001 certification on overall business.

Table 1. Sample size, and impact of ISO 9001

Sample size	Impact of ISO 9001
131	Neutral
108	Positive – Q, BP
713	Negative – FP
872	Neutral
287	Positive – PQ, OP
120	Positive – PC
414	Neutral
239	Positive – IN
800	Neutral
133	Positive – PM, OP
20	Positive – CI
1000	Neutral
106	Positive – PR
27	Positive – FP
441	Positive – BP
352	Positive - PM
87	Positive – PQ, BP
168	Positive – FP, PQ, CS
143	Positive – FP, BP
209	Neutral
3	Positive – BP, FP, CS
N/A	Neutral
287	Positive – CS
138	Positive – CP
N/A	Positive – BP
255	Neutral
749	Positive – IE
200	Negative – IE
1150	Positive – OP
1000	Negative - FP

The sum of all samples of the analysed articles is 9280. The sum of samples where positive impact was reported is 3686 (39.72%). The sum of samples where negative impact was reported is 1913 (20.6%). Finally, the sum of samples where neutral impact of ISO 9001 certification was reported is 3681 (39.33%).It is important to note that these percentages are referred to the sum of samples in individual articles. Therefore the number of companies that reported positive, negative, or neutral ISO 9001 impact in each individual article is not presented.

To determine **apositive** impact of ISO 9001, the following metrics were analysed: improved business performance, financial performance, operational performance, improved quality, higher customer satisfaction, and increased productivity. For **the negative** impact, lower productivity, higher costs, difficulties in implementation, and lower financial performance were addressed.**Neutral** impact was noted where companies didn't report any improvement after ISO 9001 certification.

5. CONCLUSIONS

Based on the obtained results, it can be concluded that ISO 9001 certification can have a positive impact on business performance. However, the neutral impact also has a high percentage. Companies that had good business performance before ISO 9001 certification, didn't report dramatic improvement. Negative impact of ISO 9001 certification was reported when managers didn't get involved with the implementation process. This resulted in time miss-management, higher costs, and unachievable deadlines. Therefore, it is important for top managers to get involved, and to be committed to the implementation of the ISO 9001 standard. The results presented individual article samples sizes, and ISO 9001 impact on business performance. It is interesting to see the contradictory reports from companies regarding benefits, and improvements (if any) after ISO 9001 implementation.

Certainly, the findings of this research are moderately significant. It provides a solid base for future research in the domain of quality management systems. Practical implications of this paper may include use from companies, and managers who are thinking about ISO 9001 implementation. The limitation of this paper is the lack of detail in data presentation when it comes to individual articles. However, this could annul the concise nature of this paper, and could invite confusion to the readers. Therefore, for in-depth detail on this subject, it is recommended to conduct a similar research in the domain of ISO 9001, with the focus on specific business performance metrics, and statistical data.Additional conclusions can be drawn from the mentioned recommended research.

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