

Varazdin Development and Entrepreneurship Agency
in cooperation with
Azerbaijan State University of Economics (UNEC)
University North
Faculty of Management University of Warsaw
Faculty of Law, Economics and Social Sciences Sale - Mohammed V University in Rabat



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37th International Scientific Conference on Economic and Social Development –
"Socio Economic Problems of Sustainable Development"

Book of Proceedings

Editors:

Muslim Ibrahimov, Ana Aleksic, Darko Dukic



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INTEGRATION OF ISO 9001 AND SIX SIGMA IN TERMS OF CONTINUOUSLY IMPROVING QUALITY MANAGEMENT

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ABSTRACT

Purpose: ISO 9001 is an international standard prepared for quality management systems in various industries. Six Sigma is a widely used methodology for improving processes. However, when looking at the ISO 9001 standard and the Six Sigma methodology, they have general requirements. This article deals with the possible application of ISO 9001 and Six Sigma, which are used for different purposes at the enterprise.

Design: Different literature on the subject has been studied and compared to ISO 9001 and Six Sigma and their integration is analyzed.

Finding: With the integration of ISO 9001 and Six Sigma, it is possible to reduce the inconsistency at the enterprise and to ensure sustainable quality improvement by improving the quality of the product. This article provides the theoretical basis for the integration of Six Sigma and ISO 9001.

Research limitations / implications: The article presents the integration model of ISO 9001 and Six Sigma. However, these models can be expanded by incorporating normativ references and other standards.

Practical conclusions: The aim of this study is to examine the advantages and benefits of Six Sigma integration with ISO quality management system.

Originality / value: The paper structure is based on the analysis of various ideas related to the application of ISO 9001 Integration with Six Sigma in Literature. In addition, this theme provides a useful framework for the development, implementation, maintenance and improvement of QMS in parallel with the Six Sigma program.

Keywords: *Continuous Improvement, ISO 9001, Integration, Quality Management System, Six Sigma*

1. INTRODUCTION

Quality is the most important factor distinguishing enterprises from competitors. Qualitative steps create quality products and provide quality services. This will increase customer profits and productivity by meeting customer needs. There are various systems, methodologies and tools that help to improve quality, including Six Sigma and ISO 9001. They can be used individually or at the same time to achieve the desired level of quality. Six Sigma is an approach to improving the process. The main goal here is to improve the performance of a particular process in the form of a project every time. Businesses have implemented Six Sigma as a continuous improvement methodology. Companies such as IBM, General Electric and Ford have adopted Six Sigma as a requirement to achieve a high level of performance and increase

employee skills. ISO 9001 is a quality management system that requires a continuous process of development based on the overall control of production operations. ISO 9001 is a control system that requires documentation of all activities. It uses the ISO 9001 Plan-Do-Check-Act (PDCA) model in all systems to apply all the processes, but also improvements to the process. The above suggests that ISO 9001 and Six Sigma serve two different purposes. ISO 9001 is a system for quality management, the methodology for improving the Six Sigma process. There is a logical connection between the ISO 9001 quality management system and Six Sigma, and these relationships and their integration allow for mutual benefit. The purpose of this article is to provide an idea and value by linking Six Sigma with ISO 9001. The topic is to analyze ISO and Six Sigma separately, to identify the relationships between them and to learn the advantages of their integration.

2. LITERATURE RESEARCH

2.1. Six Sigma

Six sigma is a process improvement method used by companies such as AlliedSignal and General Electric in the mid-1980s, which was widely used by Motorola in the mid-1980s. Nakhai and Neves (2009) state that Six Sigma is a scientific, systematic and statistical approach to improving the business process. Six Sigma is a defect rate of 3.4 per million or less. The whole process is not required at the Six Sigma level, because the quality of performance depends on its strategic value and improvement costs. (Kumar et al., 2007, pp 849-866). Six Sigma has five implementation cycles: "Identify," "Measure," "Analysis," "Improve," and "Control" (DMAIC) (Antony, 2006, pp 20-27).

- Determine: Processes, customer requirements and expectations of stakeholders.
- Measurement: The actual performance of the process is determined. Data is collected for actual measurement.
- Analysis: statistical data and process data are analyzed in detail to determine the causes of deviations in the performance of the processes.
- Improvement: solutions aimed at improving the performance of the process are applied.
- Control: The current state of the process is monitored continuously

Six sigma companies are used as projects to improve a certain portion of the process. The key issue is the sustainability of the Six Sigma project results.

2.1.1. Six Sigma Problems and Problems

The Successful Six Sigma project saves financial costs while reducing defects. Management's attitudes, beliefs, are critical to the successful application of Six Sigma (Abel 2015, 94-111) Large expense and knowledgeable human resources are factors that limit the implementation of Six Sigma projects. It is also a difficult task to select and apply the right Six Sigma project in production. Sambhe,(2012) argued that most of the selection criteria depend on the quality of the product, delivery, and the product's usefulness. If the selection criteria do not meet the requirements of the enterprise, the company's goals will not be compatible with the company's human, capital and time resources. The Six Sigma project can take a long time and a bigger stock if it's too big and multifunctional. When the project is small, sometimes the management does not want to invest it.

2.2. ISO 9001

The ISO 9000 series is the standard that sets out requirements for quality management systems (9001) and rules (9004). For the first time in 1987, the ISO 9000 released by the International Organization for Standardization was revised in 1994 and 2000. ISO 9001 Quality Management Standard.

This Quality Management System is a system that describes the structure, processes, responsibilities, and resources required to identify minimum quality requirements. This standard is also used to evaluate enterprise quality assurance efforts. ISO 9001 bases the documentation of processes and hence serves as a basic training mechanism. Continuous improvement activities are standardized by reviewing or revising the newly developed procedures and guidelines.

2.2.1. ISO successful implementation terms

"Management Responsibility", "Resource Management", "Product Realization" and "Measurement, Analysis and Improvement" are key factors in the application of ISO to achieve customer satisfaction in the Quality Management System. In addition, the sustainable development of the QMS is an essential element for achieving customer satisfaction. It is important to apply the following steps to effectively apply the ISO 9001 standard in an enterprise:

- The first requirement is the quality management systems basics- the general requirements of the standard covering all activities in the documentation of the quality management system intended to achieve planned results.
- Management responsibility depends on the commitment of managers to the quality management system.
- The third requirement of the standard provides the criteria needed to manage resource management and to perform activities in a capable and safe environment. This section deals with human resources, infrastructure planning and working conditions.
- Product realization phases cover everything from product planning to the final delivery stage.
- Throughout the measurement, analysis and improvement phase, it is based on internal audit, customer satisfaction monitoring, inappropriate product monitoring, data analysis and monitoring, measuring, analyzing and improving quality management system by performing corrective and preventive activities.

2.3. Communication between Six Sigma and ISO 9001

In ISO 9001, the "process approach" is presented as one of the key parts of the Quality Management System. It is based on the popular Deming Circles (PDCA) in the world. Instead of providing quality, attention was focused on 'Improving Quality'. However, this standard does not provide any means or methodology. As a result, although quality improvement activities were important, quality managers and inspectors did not use the tools to improve quality. As a result, some enterprises consider the application of this standard useful, but some do not. Zeng and Tam say that ISO 9001 increases operational costs and reduces product quality. This is due to the fact that ISO has a paper business volume and a lack of focus on continuous improvement. (Chini and Valdez, 2003, pp 78-82) Therefore, enterprises implementing ISO 9001 need to integrate with QMS and Six Sigma in order to achieve full benefit. At the same time, the application of the Six Sigma in the environment used by the weaker QMS program also does not give a positive result. Therefore, enterprises have identified weaknesses of the current QMS and need to integrate and strengthen the Six Sigma methodology in order to ensure success of both approaches later.

Table following on the next page

Table 1: Comparison of ISO 9001 QMS and Six Sigma

Parameter	ISO 9001	Six Sigma
APPROACH	Quality management system	It is a strategy to improve your business performance
FRAMEWORK	Framework to create "the idea of improvement"	It is a framework for improving and combining it with earnings
AREA	Identifies the requirements for the quality management system	Uses some strategy, methodology, tools, and metrics to improve your business performance
INTENT	Contracts are used for certification and / or evaluation purposes	Used to optimize performance and increase profitability
PROBLEM SOLUTION	Provides solutions to the problem, but does not indicate how the process will take place	Provides the necessary improvement process
LEADERSHIP	Representative in quality management	Belt system
TOOLS	Non-specific	Statistical tools
TRAINING	Human resources	Belt system training
BENEFITS	Improve financial performance but is not quantifiable	Profit Oriented
METHOD OF IMPROVEMENT	PDCA model	DMAIC or DFSS roadmap
DOCUMENTATION	High level paperwork	No specific documentation available

3. SIX SIGMA AND ISO 9001 INTEGRATION

The best way to successfully integrate Six Sigma with ISO 9001 is to recognize it as a management system that covers all levels of enterprise. Six Sigma and ISO 9001 are both versatile and have many similar principles, but serve different purposes. (Snee & Hoerl, 2003). Six Sigma Integration with ISO Quality Management System is the key to quality management. Literature research focuses on obtaining general information about ISO and Six Sigma. In the second part, strong and weaknesses of both ISO and Six Sigma were studied. Based on the information obtained in this section, the issues of integration of ISO and Six Sigma have been analyzed. Six Sigma and ISO Integration are available in the following areas.

3.1. Integration of Six Sigma and ISO “Resource Management”

The Six Sigma Belt System can be integrated into the "Resource Management" of a process-based model in ISO 9001: 2008. (Karthi, 2011, pp 309-331). The human resources management process in ISO 9001 can be adapted to the Six Sigma belt system (Marques, 2013, 36-59). As a leader of the Six Sigma project, it is possible to select highly qualified staff. In addition, the training needs of the Six Sigma staff are determined by comparing the specific and required skills needed to achieve a higher level of skill (Pfeifer et al., 2004, pp 241-249). Six Sigma is useful for enterp-rise development, implementation, maintenance and improvement of ISO 9001 helping to identify possible means and methods. Pfeifer et al. (2004) recommends using SIPOC diagrams to fulfill specific ISO 9001 management requirements. Gupta (2004) recommends using the Six Sigma statistical tools to comply with the data analysis requirements included in the standard.

3.2. Integration of Six Sigma and ISO 9001 "Management responsibility"

ISO Quality Control Review can be reviewed with the Six Sigma Project. (Sambhe, 2012, pp). In this sense, along with management review activities, it may also recommend the Six Sigma project (Marques, 2013, pp 36-59) and also offers a solution to overcome the barrier during the implementation of the Six Sigma project. Top management's sense of responsibility and participation ensures the success of the Six Sigma project. (Anthony and Banuelas, 2002, pp 20-27).

3.3. Integration of Six Sigma and ISO 9001 "Product Realization"

Implementation of ISO product consists of planning process, operational control and product design. The Six Sigma DMAIC methodology is included in the product realization to improve the planning process. The statistical tools in Six Sigma determine the process change to ensure productivity in the pr-oduct realization and reduce the deficit rate (Thomas, 2010). Marques found that the Six Sigma measurement system analysis could increase stability and accuracy in the process of controlling the process.

3.4. Integration of Six Sigma and ISO 9001 "Measurement, Analysis and Refinement"

Six Sigma and ISO are the same as a sustainable improvement approach. Emphasizing the importance of sustainable development of the ISO process, he presented a broad model that sustained development to ensure customer satisfaction. ISO needed the systematic and scientifically sustainable improvement approach like the Six Sigma. (Nakhai & Neves, 2009, pp 26) Warnack notes that the Six Sigma project is one of the most important ways to ensure continuous improvement in the enterprise. Six Sigma is the ideal feature to help improve quality improvement in ISO because it has a feature that can reduce up to 3.4 million per million (Chakrabarty and Tan, 2007, pp 194-208).

4. EFFECTS OF ISO 9001 AND SIX SIGMA INTEGRATION ON THE ENTERPRISE

Relationships between Six Sigma and ISO 9001 QMS have a positive impact on on-premises culture. As a result of his research, Yeung has witnessed the need to integrate customer requirements and requirements into the Six Sigma program with improved internal culture. (2007) Documents produced by ISO 9001 and Six Sigma help systematize and standardize the performance. According to Snee and Hoer,(2003) ISO 9001 is the perfect tool for documenting and protecting process management systems included in the Six Sigma. ISO 9001 QMS documents as the systemicity and effectiveness of the Six Sigma programs increases, the documents received during the implementation of the Six Sigma projects can also provide a continuous improvement of the QMS. Since the responsibilities, responsibilities and mandate of the staff involved in the ISO 9001 QMS are to be determined, this information may be used to select the most competent participants in the Six Sigma project (Bewoor and Pawar, 2010, pp 105-131). ISO 9001 internal audits can be implemented in parallel with the Six Sigma DMAIC project. ISO 9001 may help sustain Six Sigma projects (Dey, 2002) In this sense, internal audit programs can cover not only the administrative capabilities of the Six Sigma initiative, but also individual control stages and related projects (Warnack, 2003, pp 42-49) . Both approaches are aimed at continually improving. The Six Sigma DMAIC is based on the PDCA's continuous development cycle, so it can be used to perform a continuous improvement of the standard from the DMAIC method. (Gupta, 2004). From this point of view, Six Sigma projects are used as a way to ensure continuous improvement in one enterprise (Warnack, 2003, pp 42-49). ISO 9001 requirements are consistent with the identification of potential Six Sigma projects. QMS audits serve as a source of information for potential improvement areas. Also, the ISO 9001 QMS can be based on customer satisfaction and satisfaction levels, and can also identify areas for Six Sigma projects.

5. CONCLUSION

Six Sigma and ISO quality management systems are well-known quality methodologies and can be applied in industry. When compared to the quality management system, Six Sigma is a more structured and effective sustainable development methodology with its own instrument and method. However, these methodologies are applied separately for different purposes and targets in the enterprise. Integration of Six Sigma and ISO 9001 is a further expansion of the methodology in the quality world. When integrating Six Sigma and ISO 9001, Six Sigma provides the following methodology to achieve quality-related objectives:

1. Prevention of defects at each stage, from design to customer delivery
2. Statistical methods required to establish, manage and verify the process's capability and product characteristics;
3. examine the reasons for defects in product, process and quality system;
4. continuous improvement of quality of products and services

Six Sigma supports ISO and helps an organization that provides ISO requirements. Additionally, ISO is an excellent tool for documenting and storing process management systems for Six Sigma. Detailed training is required for the successful implementation of both systems.

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