

Six Sigma –quality management model to improve process performance

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ABSTRACT: Quality assurance models are an essential factor for the successful completion of a process. There is a growing global interest in identifying quality models, both in general and in education. These models represent effective tools at the level of institution management, as well as at the level of educational institutions, provided that they are correctly implemented. Therefore, an analysis of representative models in terms of education quality management is appropriate. The analysis of the models is based on several coordinates: identifying the characteristic elements, exploring the ways of capitalizing on the models at the level of the institution, highlighting the advantages and disadvantages. A successful model of quality in the management of an organization emphasizes the relationships between employees, the internal environment of the organization, around which revolve the external influences of society, family, labor market requirements, the need for competence and lifelong learning.

KEYWORDS: Quality management, Models, Organization, Performance, Six Sigma.

I. INTRODUCTION

Six Sigma is a recently developed method, introduced by Bill Smith, one of Motorola's top experts, on January 15, 1987 (Tavakoli & Azizi, 2018). The term Six Sigma is derived from the field of statistics, because σ represents the standard deviation.

First, it referred to the possibility of manufacturing processes to produce a very high proportion according to specifications. In the field of quality management, σ represents the percentage of products without defects.

The level of the error-free production process in this method is determined by the number σ , which is the percentage of products without defects in percent at the exit of the process.

A process with a quality of 6σ at the output characterizes 99.99966% of cases without defects or at most 3.4 defects per 1 million operations.

Six Sigma is a quality management program for improving process performance, by reducing variations, for continuous and innovative improvement (Dehvari, 2014).

The goal of the Six Sigma strategy is to increase an organization's profit by eliminating variability, reducing the number of defects and eliminating losses, which removes the consumer and harms the organization. This model helps organizations improve the quality of their products and services to meet customer needs.

II. SIX SIGMA STRATEGY

The Six Sigma strategy can be perceived and understood in three different ways. Metrically, the Six Sigma level is assured when 3.4 defects are obtained per million opportunities. From a philosophical perspective, Six Sigma involves reducing the variation of the organization's processes, focusing on the consumer and making decisions based on data and facts. Methodologically, Six Sigma is based on the use of two methods, DMAIC and DMADV, which use different tools and techniques of quality management for their management.

The DMAIC process is an improvement system for processes that do not conform to the performance specifications required by the customer or managers. This process includes the following operations (**Figure 1.**): Defining the manufacturing processes in accordance with the customer's requests and establishing the strategy; measuring the main aspects of the current process and collecting the main data; data analysis and identification of causes and determination of relationships, to ensure that all factors have been taken into account; improving and optimizing the processes based on the analyzed data; control, to ensure that any deviation from the main purpose is corrected before they turn into defects.

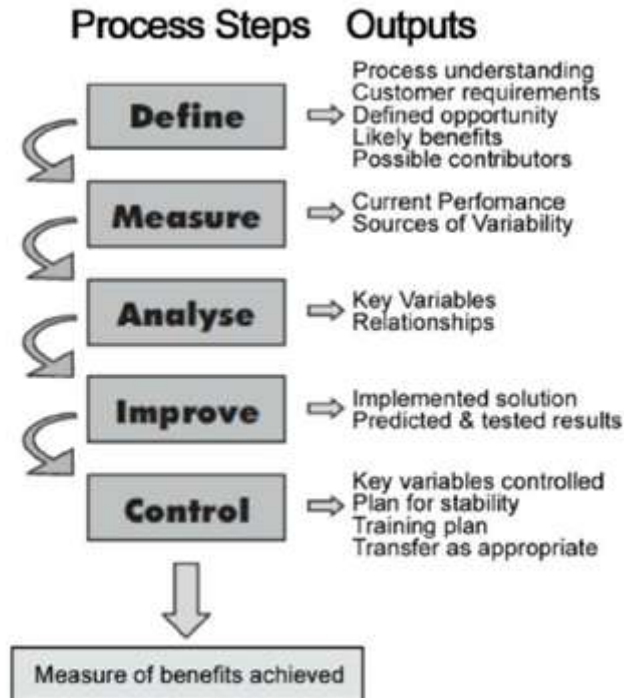


Figure 1. The Six Sigma DMAIC Process and Key Outputs

The DMADV process is an improved system for creating a new process or product that can reach the six sigma quality level (99% of opportunities are not mistakes).

This process includes the following operations (**Figure 2.**): defining goals that are relevant to customer requirements and adopting a

strategy; measurement to identify product capacity, production process capacity and risks; analysis of the project and design alternatives, in order to determine a high level of project design and evaluation, as well as to select the best project; design and implementation of the production process and project verification.



Figure 2. Specific operations at the DMADV process level

Similarities and Differences Between DMAIC & DMADV

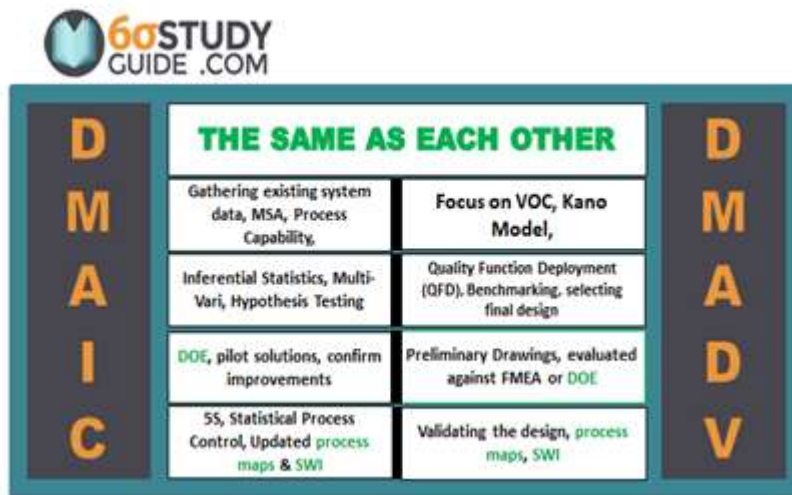


Figure 3. DMAIC VS. DMADV

There are differences between the Six Sigma model and other quality models, such as TQM, which are analyzed in **Table 1**.

Table 1. Comparative analysis of the characteristic elements of the Six Sigma and TQM models

The Six Sigma Model	The TQM Model
- the existence of a continuous effort to reduce the output deviations of the key processes of business success	- the organization's focus on understanding and responding to customer needs
- the commitment of the whole organization, in particular senior management, to the continuous improvement of quality	- the desire for continuous systematic improvement of all products, services and processes, as a result of the participation of all partners

The Six Sigma methodology was initially applied in production and is currently used in all business sectors, including financial services, marketing, sales, logistics, medicine, education, human resources and public services.

Educationally, the Six Sigma model has been applied in higher education to determine the root causes that lead to delays in approving the curriculum for new courses. With the help of this model, a US university established the main causes, which are the lack of standards, waste of time and complexity of the process.

The solution was established at the level of the improvement phase, which consisted in the exact definition of the purpose, the fluidization and clarification of the approval processes of the new courses, by eliminating the duplication of approvals and the introduction of visual management. Therefore, the time for defining and approving a new course has been shortened by 78%.

The Six Sigma model allows schools, universities and other educational institutions to improve the level of knowledge and skills, as well as the satisfaction of pupils and students in

improving process performance, both in the educational and administrative spheres.

One of the advantages of this model is that it examines all processes to eliminate variations that could contribute to malfunctions or defects of the final product. The model is also effective because it is applicable to all general processes and involves all employees to lead to the necessary changes.

Six Sigma is based on a strict method that constantly uses information and statistical data to measure and improve the organization's results. Quality management becomes effective with this model, as it focuses on identifying and preventing defects in the production phase, which leads to a high level of satisfaction, which exceeds the expectations of the parties involved. Six Sigma contributes to increasing the level of quality and optimizing the process, by eliminating defects and improving performance.

Six Sigma focuses on understanding, quantifying, improving and controlling those variables or causes that influence customer expectations. Six Sigma implementation is a complex, intensive process that requires resources and qualified and dedicated staff. Large organizations that have adopted Six Sigma have shown that a certain organizational infrastructure is needed, in terms of staff roles and responsibilities.

Along with the advantages, the model also has a number of disadvantages. The Six Sigma concept does not draw parallels between the quality and satisfaction of customers, on the one hand, and the duration and speed of processes, on the other hand. At the same time, the duration of the process is directly related to customer satisfaction in the provision of services and for production processes, frozen funds in the form of waiting stocks.

The Six Sigma toolkit limits the potential for problem solving. The improvement of the process within the Six Sigma methodology is achieved, mainly, by reducing the variability of the processes by statistical methods and the redesign of the processes using the DFSS method (Design for Six Sigma).

The Six Sigma methodology may eliminate opportunities to improve the process, such as reducing unproductive activities, reducing waiting times, reducing inventory and transportation costs, optimizing jobs, and so on.

The Six Sigma model has a profound impact on product quality, customer service [6].

performance and staff professional progress. This model can be used successfully in quality management at the school organization level, as a result of the methodology provided and the results already obtained in academia.

III. CONCLUSION

Successful achievement of quality management is conditioned by compliance with clear performance criteria. These criteria are determined by different reference models in the field, such as Total Quality Management, the Six Sigma model.

The quality models were analyzed based on several criteria: identifying the characteristic elements, exploring the ways to capitalize on the models at the level of the institution, highlighting the advantages and disadvantages.

The analysis of the representative models in the field of quality led to the elaboration of a new approach for conceptualizing the quality management in close connection with the novelty aspects of the standards related to the online environment.

An employee-centered culture is promoted, as the model will be adapted to the requirements and needs of the main beneficiaries, as well as in connection with the external environment.

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