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ISO 9000, Six-Sigma or Toyota Production System: Are These TQM Methods Complementary or Contradictory to One Another?

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1 Introduction

The ISO 9000 standards, Six-Sigma/Six-Sigma Lean methodology and the Toyota Production Systems are all formalized Total Quality Management (TQM) methodologies for enabling the manufacturers to consistently design, produce and deliver quality products and services profitability [1].

2 ISO 9000

The ISO 9000 is a family of quality management standards that is implemented by over a million organizations in 176 countries. The ISO 9001:2008 is the standard that provides a set of standardized requirements for a quality management system [2]. It allows the organizations to be certified, although certification is not a compulsory requirement of the standard. The other standards in the family cover specific aspects such as fundamentals and vocabulary, performance improvements, documentation, training and financial and economic aspects. The ISO 9000 standards are based on eight quality management principles: Customer focus, Leadership, Involvement of people, Process approach, Systems approach to management, Continual improvement, Factual approach to decision making and Mutually beneficial supplier relationships.

3 Six Sigma

Six Sigma is a business management strategy originally developed by Motorola and is widely used in many sectors of industry. It seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors or any process or output that does not meet customer specifications) and minimizing variability [3].

Six Sigma unique quality improvement initiatives include: (a) a clear focus on achieving measurable and quantifiable financial returns from any Six Sigma project; (b) an increased emphasis on strong and passionate management leadership and support; (c) a special infrastructure of "Champions," "Master Black Belts," "Black Belts," "Green Belts", etc. to lead and implement the Six Sigma approach; (d) a clear commitment to making decisions on the basis of verifiable data, rather than assumptions and guesswork. Six Sigma is often combined with lean manufacturing to yield a methodology named Lean Six Sigma [4].

Six Sigma projects follow two project methodologies inspired by Deming's Plan-Do-Check-Act (PDCA) Cycle. These methodologies are: Define-Measure-Analyse - Improve-Control (DMAIC) for improving an existing business process and Define-Measure-Analyse -Design-Verify (DMADV) for new product or process designs [5].

4 Toyota Production System (TPS)

Developed by Taiichi Ohno, Shigeo Shingo and Eiji Toyoda, the Toyota Production System (TPS) is founded in the philosophy of the complete elimination of waste, incorporates all aspects of production and aims at the most efficient production method [6]. TPS is established based on two concepts: Just-In-Time in which each process produced only what is needed by the next process in a continuous flow, and Automation (Jidoka) with no defects, which means that when a problem occurs, the entire line stops immediately to solve the problem. This will prevent defective products from being produced.

The main objectives of the TPS are to design out inconsistency (mura) and overburden (muri), and to systematically identify and eliminate waste (muda). This adds value to the customer, allow flexibility without stress, and focus on the elimination of all types of waste: over-production, motion (of operator or machine), waiting (of operator or machine), conveyance, processing waste, inventory (raw material) and correction (rework and scrap).

The robustness of the TPS methodology is evidenced by Toyota's ability to face the challenges of the recession in 2008 and the recall in 2009 and to come out stronger in 2010 [7].

5 Conceptual Model or Framework

A review of the literature shows that there are mixed opinions on whether these methodologies are complementary or contradictory to one another. This paper aims to address the competing views on these concepts in an attempt to show that all these methodologies are neither complementary nor contradictory to one another, but instead they are alternative approaches to achieve the objectives of TQM.

The conceptual framework is shown in Fig. 1.

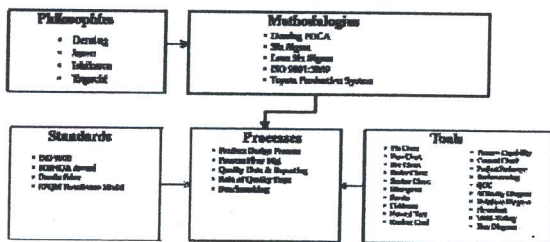


Figure 1: Conceptual Framework of ISO 9000, Six-Sigma and Toyota Production Method

6 Conclusions

The methodologies represent different approaches to the implementation of TQM. They are not contradictory to one another. However, in recent years, the evolvement of these methodologies seems to indicate a trend of convergence. This is particularly evident in the case of

ISO 9000, where the ISO 9004:2009 has adopted Deming's PDCA as the process model, which is also used by Six-Sigma. With the common objectives of achieving similar criteria of TQM success as dictated by MBMQA, EFQM and similar awards, and the use of common tools, there is an inclination for these methodologies to become complementary to one another

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