

Integrated approach of Six Sigma and Knowledge Management

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Abstract: This paper sheds light on integrated approach of Six Sigma and Knowledge Management. Knowledge management (KM) is based on the premise that, just as human beings are unable to draw on the full potential of their brains, organizations are generally not able to fully utilize the knowledge that they possess. Through KM, organizations seek to acquire or create potentially useful knowledge and to make it available to those who can use it at a time and place that is appropriate for them to achieve maximum effective usage in order to positively influence organizational performance. In order to boost economy, improvement in manufacturing output is essential which requires implementing of various quality tools in particular COPQ, 5s, Kaizen, TPM, TQM, QFD and Lean Six Sigma. Knowledge Management can help achieve a lot more by integrating it into Six Sigma process as discussed in this paper.

1. Introduction

Knowledge Management (KM) is very important in this knowledge-based information society. If Six Sigma and KM are combined, it could become a very powerful management strategy. So Knowledge Based Six Sigma (KBSS) as the combination of Six Sigma and KM is going to serve the purpose.

KBSS can be defined as “A company-wide management strategy whose goal is to achieve process quality innovation corresponding to 6 sigma level and customer satisfaction through such activities as systematic generation/storage/dissemination of knowledge by utilizing the information technology of the Internet/intranet, data-bases and other devices.”

In the era of cut throat competition, especially in automobile sector, success achieved by market leaders may be attributed to their improvement initiatives which may be driven by powerful methodology or tools viz. Lean, Six Sigma, Knowledge Management which

ultimately help in cost reduction because of defect prevention & improved product and processes leading to increase in profitability and market share.

Utilizing the power of Knowledge Management Six Sigma can be achieved in this digital age.

2. Literature Review

A) Knowledge Management

Knowledge Management can be defined as the conscious strategy of putting tacit and explicit knowledge into action by creating context, an infrastructure, and learning cycles that enable people to find and use the collective knowledge of the enterprise. Organizations use many of these steps from the Road Map to Knowledge Management Results: Stages of Implementation in their Six Sigma process as well (e.g., developing key strategies, designing and launching initiatives, and making sure pilots work to expand and institutionalize a process).

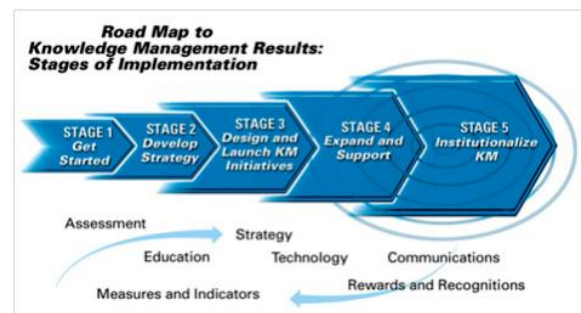


Fig. 1 Roadmap to Knowledge Management

B) Intersection of Approaches

Both KM and Six Sigma are quickly infiltrating business management systems with problem-solving and process-optimization methodologies. Six Sigma should not be viewed as a quality program that is commissioned to reduce defects but as a methodology that helps companies better meet the needs of their business. KM shares this goal.

The transfer of best practices, the replication that is supposed to happen in Six Sigma in the control phase, could be enabled and huge gains could be made if the tools of KM were applied.

CoPs are an intersecting point for Six Sigma and KM. By introducing Six Sigma findings into a community, newly-stabilized processes can be adjusted as needed. "It's going to move out of control if you don't have a community to help sustain it."

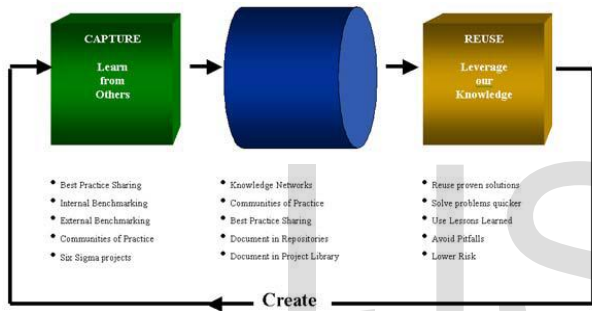


Fig.2 Knowledge Management Interactions

C) Knowledge based Six Sigma

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As shown in Figure there are some differences between Six Sigma and KM. However, there also exist some areas of intersections such as data acquisition and utilization, data analysis, generation of information and so on.

KBSS is a combination of KM and Six Sigma which can be developed as a new paradigm for management strategy in this digital society of the 21st century.

3. Methodology

Process flow of improvement activities in KM was proposed by Park (1999). A good process flow of improvement activities is the CSUE cycle as shown in Figure CSUE means Creating & Capturing, Storing & Sharing, Utilization and Evaluation. The well-known process flow of improvement activities in Six Sigma is MAIC.

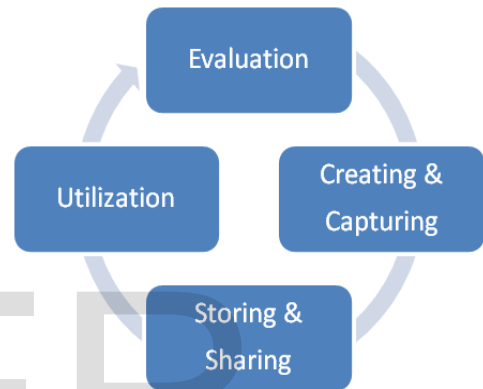


Fig.3 Flow in KM

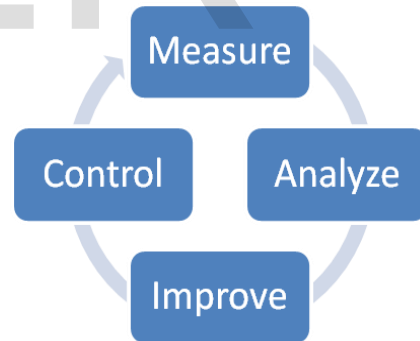


Fig. 4 Flow in Six Sigma

The CSUE and MAIC cycles can be intermixed in order to create an efficient cycle in KBSS. One way is to use the MAIC cycle in each step of CSUE, or to use the CSUE cycle in each step of the MAIC cycle. It is believed that CSUE and MAIC are both complementary to each other.

A) Project team activities

The project team activities by black belts and green belts for quality and productivity improvement are perhaps most important activities in Six Sigma. If the

concept of KM is added to these activities, more useful and profitable results could be made possible. These activities are called KBSS project team activities.

B) Education and training

Education and training is the most fundamental infrastructure in Six Sigma. A systematic training program for Green Belts, Black Belts, Master Black Belts and Champion levels is essential for the success of Six Sigma. Also KM, without proper training, creation/storage/sharing/utilization would not be easy, and the process flow of knowledge would not be possible. It is often mentioned that the optimal education and training time in Six Sigma is about 5–7% of total working hours, and in KM it is about 6–8%. This means that more education and training time is necessary in KM than in Six Sigma. However, there is a lot of duplication in Six Sigma and KM, so the optimal education and training time in KBSS would be 8–10% of total working hours.

C) Information management

Information on areas such as customer management, R&D, process management, quality inspection and reliability tests are essential elements in Six Sigma. In KM also, information management concerning storage, sharing and utilization of knowledge is the most important infrastructure. Information management is essential in KBSS.

D) Scientific tools

Basic QC and statistical tools such as 7 QC tools, process flowcharts, and quality function deployment, hypothesis testing, regression and design of experiments can be used in KBSS. Also some advanced Six Sigma tools such as FMEA, benchmarking and marketing surveys can be effectively used in KBSS. These tools are helpful in analyzing data, obtaining information, statistical process evaluation and generating knowledge. KBSS is based on these scientific and statistical methods.

E) Key Deliverables of Knowledge Management

Knowledge management is a set of relatively new organizational activities that are aimed at improving knowledge, knowledge-related practices, organizational behaviors and decisions and organizational performance. KM focuses on knowledge processes – knowledge creation, acquisition, refinement, storage, transfer, sharing and utilization. These processes support organizational processes involving innovation, individual learning, collective learning and collaborative decision making.

The “intermediate outcomes” of KM are improved organizational behaviors, decisions, products, services, processes and relationships that enable the organization to improve its overall performance.

F) Applications and benefits of Six Sigma

Six Sigma is an “Industry Independent” methodology and has been successfully applied across:

- Manufacturing industry including Automotive, Aerospace, Health Equipment, FMCG, Electronic goods, Continuous process industries, Textiles, etc.
- Service industry including Telecom, Banking and Financial Services, Health care, Hotels, IT, ITES, Airlines, Cargo movement, Support Services, HR services, Marketing Services, etc.
- R&D organizations or in R&D functions of various organizations.

The following are the areas in the automotive industry where Six Sigma is applicable

Table 1 Applications of Six Sigma Methodology

Industry	Examples of Six Sigma Applicability
Automotive	<ul style="list-style-type: none"> ➤ Enhancing Supplier Quality. ➤ Improving Safety and Reliability of Finished Vehicles. ➤ Reducing Manufacturing defects at each stage. ➤ Using Design FMEA to understand and prevent any possible design failures. ➤ Reducing variation in all the critical parameters that impact the finished product. ➤ Improving the overall Incoming Material Quality or parts Quality. ➤ Optimizing Inventory levels for all major parts. ➤ Reducing time to manufacture. ➤ Reducing Design defects. ➤ Reducing Supplier Lead time i.e. the time taken by each supplier

to deliver goods.

- Improving First time yield and Efficiency of each step-in manufacturing assembly line.

There are numerous benefits of Six Sigma, which is used as a way to address issues and problems. Among the benefits of Six Sigma is the decrease in defects that are allowed to reach the customer. Other benefits of Six Sigma include-

Focus on customers, Improved customer loyalty, Reduced cycle time, Less waste, Data based decisions, Time management, Sustained gains and improvements, Systematic problem solving, Employee motivation, Data analysis before decision making, Faster to market, Team building, Improved customer relations, Assure strategic planning, Reductions of incidents, Measure value according to the customer, Better safety performance, Understanding of processes, Effective supply chain management, Design and redesign products/services, Knowledge of competition, competitors, Develop leadership skills, Break down barriers between departments and functions, Management training, Improve presentation skills, Integration of products, services and distribution, Use of standard operating procedures, Better decision making, Improving project management skills, Sustained improvements, Alignment with strategy vision and values, Increased margins, Greater market share, Supervisor training, Lower costs to provide goods and services, Fewer customer complaints.

G) Six Sigma, Lean, Cost of Quality and Knowledge Management Summary

Indian automobile industry is going through severe global competition and there are recalls, field failures, internal rejections, and internal rework. Cost and quality Cost are two very important aspects to be globally competitive. Six sigma methodology is powerful tool to solve complex chronic problems. Therefore, it is very important to study and investigate how Six Sigma Methodology is employed in Indian Automobile Industry for Process Improvement or designing the product and importance of six sigma methodology to reduce cost of quality. Also investigation of application of knowledge management is important aspect of study.

Concept of six sigma methodology, why six sigma, benefits of six sigma methodology, history of six sigma, globally well-known six sigma companies, process approach, measurement of process performance, standard deviation “sigma”, normal distribution, process variation,

mean, potential process capability (Cp), process capability index (Cpk), sigma quality level, relation of sigma level and Cp / Cpk, concept of defects per million opportunities (DPMO), parts per million (PPM), binomial distribution, Taguchi quality loss function (QLF), cost of poor quality (COPQ/ COQ), models of COPQ, lean, knowledge management illustrated in this chapter. Also how six sigma helps in reducing cost of quality and role of knowledge management and six sigma is explained.

The figure below explains how six sigma, lean, Knowledge management and cost of quality are associated and supportive to each other. Lean principles you can apply while doing six sigma projects by doing value stream mapping and improve system efficiency by reducing the waste and non value added activities in the system and thereby reduce the cost of quality. Knowledge management and six sigma are supportive to each other. Six Sigma is structured and methodical approach right from training before start of project and during the project all knowledge mapped is documented. Thus helps in knowledge management. When you are taking new six sigma project part of the studies/ process observations/ process measurements/ MSA already done and stored systematically (KM) can save on time and resources and therefore, cost associated is saved or reduced. Thus knowledge management helps and supports six sigma and reduces cost of quality.

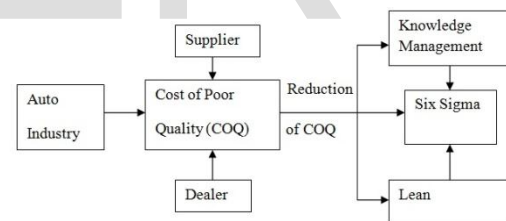


Fig.5 Integration of Lean, Six Sigma, Cost of Quality and KM.

This understanding has helped during the actual interaction with Indian automobile industries and suppliers / subcontractors of Indian automobile industry, and six sigma training institute for investigation of application of six sigma methodology for process improvement, design for six sigmas, role of lean, knowledge management and how it helps in reduction of defects and cost of quality. Work carried out has been explained from chapter-3 onwards.

- Knowledge management (KM) is based on the premise that, just as human beings are unable to draw on the full potential of their brains,

organizations are generally not able to fully utilize the knowledge that they possess. Through KM, organizations seek to acquire or create potentially useful knowledge and to make it available to those who can use it at a time and place that is appropriate for them to achieve maximum effective usage in order to positively influence organizational performance.

- The purpose of knowledge management is to help the right information and knowledge flow to the right people at the right time so they can make decisions.
- Explicit knowledge exists in the form of words, sentences, documents, organized data, computer programs and in other explicit forms.
- Knowledge flows comprise the set of processes, events and activities through which data, information, knowledge and meta-knowledge are transformed from one state to another. Knowledge flows into four primary activity areas: knowledge creation, retention, transfer and utilization
- Knowledge Management can be defined as the conscious strategy of putting tacit and explicit knowledge into action by creating context, an infrastructure, and learning cycles that enable people to find and use the collective knowledge of the enterprise.
- The automobile product development (PD) design space continually increases in size and complexity. In this dynamic environment, firms must identify competitive strategies that maintain or increase financial return. Firms can compete on several factors including price/cost, time-to-market, or differentiation (e.g., function or quality). Here, we envision that differentiation through expertise in integration can be a successful strategy in the automotive industry. Expertise in integration requires attention to knowledge management, which is crucial for competitive advantage [Drucker P. *The Atlantic Monthly*, 1994, 274(5): 53–80].
- A key component of the product development (PD) process is the acquisition of data about customers' responses to vehicle performance and the rapid use of that information in the development of new products.

- A system for collecting near real-time data about responses to vehicle performance and its integration with recent developments in design and analysis shall be developed. The proposed system would collect customer psychophysical response data, correlate it with vehicle parameter response data, and apply this information with feasible design automation to provide reduced cycle time, improved quality, and greater customer satisfaction.
- Knowledge management helps to know technological and legal constraints as regards product safety, and product liability which demand the stringent use of safety design tools viz. Preliminary Hazard Analysis (PHA), Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA).

Conclusion

This paper has presented the importance of Knowledge Management in successful implementation of Six Sigma in Industries. It has discussed integration of Knowledge Management in Six Sigma by use of various techniques thereby enabling better understanding of the concepts.

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