

A Study of Quality Circle Concept: Its Tools and Techniques for Small Manufacturing Industries

Nishant, M.Tech Student, Ganga Institute of Technology & Management, Jhajjar.

Dr.Vivek Khokar, Supervisor, Ganga Institute of Technology & Management, Jhajjar.

Abstract

In manufacturing industry, successful implementation of Quality Circle Methodology has been carried out. Literature review has also not yielded any evidence of successful implementation of Quality Circle Methodology in Production improvement in any sort of industry. In the present study, an attempt has been made to implement Quality Circle Methodology in achieving zero defects in production in a small manufacturing industry. The results show that implementation of Quality Circle Methodology implementation has led to a remarkable profit by reducing the cost of quality by eliminating the production of not good products. This method recorded elimination of 80% major problem related to product by successful and effective implementation of concept of Quality Circle among the employees. This method improved work culture by providing opportunities to all employees work towards achieving objective of industry. It provided platform to manpower to give suggestions in improvement in concern areas. It found reliable and suitable in regards to reduce the cost of training to new or existing employees by providing permanent data that can be used in repetitive manner to understand training topics. It provided a comprehensive and flexible system for maximizing business success.

INTRODUCTION

A Quality Circle group is generated within an industry and analysis of all process and product is carried out for finding chance of development. The planned Kaizen are scrutinized for selection of fruitful Kaizen action. These thoughts are implemented by Quality Circle team which may assist in achieving efficient creation by improvement in various processes. It may in addition works in providing platform to individuals to execute self-suggestions for improvements in any concern area with an outstanding team helps in recuperating work and work culture. In this research work process, production and excellence may be enhanced through process elimination, achieving zero defect quality level and reduction of parts per million opportunities while running of Kaizen approaches through Quality Circle. Today, industry has to face many challenges due to increase in the product complexity, increased number of operations, stiff competition and customer awareness etc. To look these challenges and to stay alive for excellence; the liability for product quality has gradually shifted from operator to

foreman to inspector and soon after to quality control division. 'Quality Circles' is one of the quality control methods which have been broadly used by the organizations to achieve good quality and acceptability among the clients. The declaration 'quality' has been derived from Latin word 'Qualis' means, 'what type of'. With a range of meanings and connotations attached to it, 'quality' is a not easy and illusive term to define, having thus been referred to as a slippery model. It is slippery because it has a wild range of meanings. The word implies dissimilar things to different people. Much confusion over the meaning of quality exists, because it can be used both as absolute concept to convey status and potential advantage and a relative concept when measuring against a requirement.

Quality Circles: Concepts & Evolution

In our country quality circle was first initiated in an engineering business Bharat Heavy Electricals limited (BHEL). Preliminary from engineering workshops, quality circles spread in other service departments of BHEL such as personal, purchase, hospital, administrator, worker's canteen etc. presently, at national level quality circle in India have gradually spread to chemical, pharmaceutical and other processing plants together with even the more traditional jute and textile mills. Typical examples of the companies are BASF, Durgapur steel plant, Hindustan antibiotic etc. there are several other companies successfully operating quality circle in India together in public and private sector. QCFI was bent as a nonprofit national body in April 1982. Quality circles forum of India has element from various manufacturing and non-manufacturing organization in India. The forum has also available its booklets entitled quality circle at a glance in ten different languages, training for quality circles etc. All India association who have implemented quality circles are the members of QCFI starting the initiative from BHEL. QCFI has now been taken or the synchronization committee of the international convention of quality circles which holds its convention annually at different venues. Earlier it was organized in Japan, Korea and other countries in rotation. India and QCFI has hosted an international convention on quality Circle in December 1989 which was attended over 1200 delegates including 215 from sixteen other countries. The QFCI is the specialized body revolutionized the operational movement of Quality circles in India.

In India, few companies have in progress implementing quality circles concept for last 20 years. Factories and all other organizations must implemented quality circles in an successful manner so that the nation, as a whole, can reap the full benefits and gains economically. The quality circle organization shown in fig. 1.1 is an informal one with the formal organization, supporting each other to attain the business objectives.

Some special managers representing production, quality control, design and process planning from quality circle steering committee. This committee act as a policy making body for quality circles. The steering committee registers and review the quality circles in factories and organizations (Ramming and Blair 1982).

• TOP management

Top administration must play an important role by attending the orientation courses on quality circles that must be personally design for them. They must inform all human resources of their decision to implementing the quality circle program in the company. Whenever quality circles projects are presented, the top management should invariably be present at those meetings. They must address the dissimilar training courses on quality circles organized for various lower levels of management and workmen. The top management must express verbally as well in writing their support and commitment to the quality circle curriculum.

• Steering committee

The managing executive or CEO of the factor or organization must be the chairman and all HODs are the members of the steering committee. It must have members for different relevant departments. The duties of quality circles steering committee are listed below.

1. To define the ultimate goal of the quality circles agenda.
2. To formulate long range plans for the program viz. organizing the circles, selection of departments formulating policy on quality circles promotion, evaluating , incentives, training etc.
3. To select the facilitator and make available support by allocating maximum assets.
4. To stimulate and control the quality circles meetings.
5. To attend the quality circles project presentations.

Thus, the function of steering committee is to formulate policy and put into practice these in the factories and organizations.

• Middle management

A committee middle management is essential for the success of quality circles program. They must establish the program in line with the steering committee program. Viz. deciding about the number of quality circles in each circles meeting time and facilities etc. their commitment must contain:

1. Attending some quality circle personal meetings through their elected members.
2. Personal follow up of quality circles activates and preparation programs.
3. Provisional of resources for quality activities.
4. Organization of supervisor's circles.

- **Facilitator**

The Facilitator serves as a link among top management, quality circles steering committee, middle management, circle leader and circle members. The work of the facilitator are given.

1. Organize the training courses.
2. Get the hold up from top management, steering committee, middle management, circle leaders and circle members.
3. Assistant circle leaders and deputy leaders in conducting circle activities.
4. Make available the natural resources.

- **Circle leader**

Each circle head is headed by a circle leader. We introducing the quality circle in a factory, supervisors can lead the circle initially. Later on, workmen can take over the quality circles leader. Each workman will get a chance to become quality circle leader in rotation. The leader should maintain the enthusiasm of the member of motivation them in circles activities. He must inform the status of the circle to the top management; he must conduct circle meetings regularly and monitor the circle activities with respect to formulated work program. In the absence of leader, deputy leader may conduct quality circles meetings.

- **Circle members**

The circle members must contribute actively in the circle activities such as meetings, discussion and expand the right attitude towards their work, supervisors etc. for quality improvements. A member must be conscious about efficiency, quality productivity, quality and improvement which can be brought out with the operation of quality circles in an organization. Some known members may also be invited to quality circles meetings.

There are following research objectives:

1. To provide a sound discussion on implementation of Kaizen approach using quality circle and see how this strategy fit in providing chance of improvement associated to quality improvement and operational excellence initiatives in manufacturing industries.
2. To analyze the tangible and intangible benefits of Kaizen implementation over mechanized industries.
3. To justify the major role of implementation of Kaizen approach for quality improvement and analyze shop floor results after implementation of Kaizen through Quality Circles.

In modern era, Development of new management techniques has taken place all over the world which led to formation of complex production management system. Thus industry has to face many challenges due to increase in the product complexity. To face these challenges the responsibility for product quality has gradually shifted from operator to quality control department. Before quality was checked with the help of quality control tools such as sampling plans, control charts and statistical quality control techniques, but now 'Quality Circles' is one of the quality control techniques which have been widely used by the organizations to achieve good quality and acceptability among the customers.

The word 'quality' has been derived from Latin word 'Qualis' means, 'what kind of'. With a variety of meanings and connotations attached to it, 'quality' is a difficult and illusive term to define, having thus been referred to as a slippery concept. It is slippery because it has a wide variety of meanings. The word implies different things to different people. Much confusion over the meaning of quality exists, because it can be used both as absolute concept to convey status and potential advantage and a relative concept when measuring against a specification.

Quality Definitions

- According to Juran, "Quality is fitness for use therefore quality products should meet or exceed customer requirements".
- According to Crosby, "Quality is conformance to requirement. Thus requirement must be clearly stated so that these cannot be misunderstood".
- According to Feigenbaum, "Quality is the total composite product and service characteristics of marketing, engineering, manufacturing and maintenance through which the product and service in use will meet the expectations of the customer".
- According to Karou Ishikawa, "Quality does not mean the quality of product but also of after sale service, quality of management, the company itself and the human life".
- According to G. Taguchi, "Quality is the loss imparted to society from time the product is shipped".
- According to ISO 9000:2000 "Quality is the degree to which a set of inherent characteristics, fulfill requirement and as the fitness for purpose meets requirement, delighting customer's right first time and all the time.

Quality Tools and Techniques

- Walter A. Shewhart was a statistician at Bell Labs during the 1920s and 1930s. Shewhart studied randomness and recognized that variability existed in all manufacturing processes. He developed quality control charts that are used to identify whether the variability in the process is random or due to an assignable cause, such as poor workers or non-calibrated machinery. He stressed that eliminating variability

improves quality. His work created the foundation for today's statistical process control, and he is often referred to as the "grandfather of quality control."

- W. Edwards Deming is often referred to as the "father of quality control." He was a statistics professor at New York University in the 1940s. After World War II he assisted many Japanese companies in improving quality. The Japanese regarded him so highly that in 1951 they established the *Deming Prize*, an annual award given to firms that demonstrate outstanding quality. It was almost 30 years later that American businesses began adopting Deming's philosophy. A number of elements of Deming's philosophy depart from traditional notions of quality. The first is the role management should play in a company's quality improvement effort. Historically, poor quality was blamed on workers on their lack of productivity, laziness, or carelessness. However, Deming pointed out that only 15 percent of quality problems are actually due to worker error. The remaining 85 percent are caused by processes and systems, including poor management. Deming said that it is up to management to correct system problems and create an environment that promotes quality and enables workers to achieve their full potential. He believed that managers should drive out any fear employees have of identifying quality problems, and that numerical quotas should be eliminated. Proper methods should be taught and detecting and eliminating poor quality should be everyone's responsibility.
- Deming outlined his philosophy on quality in his famous "14 Points." These points are principles that help guide companies in achieving quality improvement. The principles are founded on the idea that upper management must develop a commitment to quality and provide a system to support this commitment that involves all employees and suppliers. Deming stressed that quality improvements cannot happen without organizational change that comes from upper management. Dr. W. Edward Deming is best known for reminding management that most problems are systemic and that it is management's responsibility to improve the systems so that workers (management and non-management) can do their jobs more effectively. Deming argued that higher quality leads to higher productivity, which, in turn, leads to long-term competitive strength. The theory is that improvements in quality lead to lower costs and higher productivity because they result in less rework, fewer mistakes, fewer delays, and better use of time and materials. With better quality and lower prices, a firm can achieve a greater market share and thus stay in business, providing more and more jobs.
- When he died in December 1993 at the age of ninety-three, Deming had taught quality and productivity improvement for more than fifty years. His Fourteen Points, System of Profound Knowledge, and teachings on statistical control and process variability are studied by people all over the world. His books include: *Out of the Crisis* (1986), *The New Economics* (1993), and *Statistical Adjustment of Data* (1943).

- In emphasizing management's responsibility, Deming noted that workers are responsible for 10 to 20 percent of the quality problems in a factory, and that the remaining 80 to 90 percent is under management's control. Workers are responsible for communicating to management the information they possess regarding the system. Deming's approach requires an organization-wide cultural transformation.
- Deming's philosophy is summarized in his famous fourteen points, and it serves as a framework for quality and productivity improvement. Instead of relying on inspection at the end of the process to find flaws, Deming advocated a statistical analysis of the manufacturing process and emphasized cooperation of workers and management to achieve high-quality products.
- Deming's quality methods centered on systematically tallying product defects, analyzing their causes, correcting the causes, and recording the effects of the corrections on subsequent product quality as defects were prevented. He taught that it is less costly in the long-run to get things done right the first time than fix them later.
- After W. Edwards Deming, Dr. Joseph Juran is considered to have had the greatest impact on quality management. Juran originally worked in the quality program at Western Electric. He became better known in 1951, after the publication of his book *Quality Control Handbook*. In 1954 he went to Japan to work with manufacturers and teach classes on quality. Though his philosophy is similar to Deming's, there are some differences. Whereas Deming stressed the need for an organizational "transformation," Juran believes that implementing quality initiatives should not require such a dramatic change and that quality management should be embedded in the organization.
- One of Juran's significant contributions is his focus on the definition of quality and the cost of quality. Juran is credited with defining quality as fitness for use rather than simply conformance to specifications. As we have learned in this chapter, defining quality as fitness for use takes into account customer intentions for use of the product, instead of only focusing on technical specifications. Juran is also credited with developing the concept of cost of quality, which allows us to measure quality in dollar terms rather than on the basis of subjective evaluations.
- Juran is well known for originating the idea of the quality trilogy: quality planning, quality control, and quality improvement. The first part of the trilogy, *quality planning*, is necessary so that companies identify their customers, product requirements, and overriding business goals. Processes should be set up to ensure that the quality standards can be met. The second part of the trilogy, *quality control*, stresses the regular use of statistical control methods to ensure that quality standards are met and to identify variations from the

standards. The third part of the quality trilogy is *quality improvement*. According to Juran, quality improvements should be continuous as well as breakthrough. Together with Deming, Juran stressed that to implement continuous improvement workers need to have training in proper methods on a regular basis.

- Another quality leader is Armand V. Feigenbaum, who introduced the concept of total quality control. In his 1961 book *Total Quality Control*, he outlined his quality principles in 40 steps. Feigenbaum took a total system approach to quality. He promoted the idea of a work environment where quality level.
- Philip B. Crosby is another recognized guru in the area of TQM. He worked in the area of quality for many years, first at Martin Marietta and then, in the 1970s, as the vice president for quality at ITT. He developed the phrase “Do it right the first time” and the notion of *zero defects*, arguing that no amount of defects should be considered acceptable. He scorned the idea that a small number of defects are a normal part of the operating process because systems and workers are imperfect.
- Instead, he stressed the idea of prevention. To promote his concepts, Crosby wrote a book titled *Quality Is Free*, which was published in 1979. He became famous for coining the phrase “quality is free” and for pointing out the many costs of quality, which include not only the costs of wasted labor, equipment time, scrap, rework, and lost sales, but also organizational costs that are hard to quantify. Crosby stressed those efforts to improve quality more than pay for them because these costs are prevented. Therefore, quality is free.
- Like Deming and Juran, Crosby stressed the role of management in the quality improvement effort and the use of statistical control tools in measuring and monitoring quality.
- Kaoru Ishikawa is best known for the development of quality tools called cause-and-effect diagrams, also called fishbone or Ishikawa diagrams. These diagrams are used for quality problem solving, and we will look at them in detail later in the chapter. He was the first quality guru to emphasize the importance of the “internal customer,” the next person in the production process. He was also one of the first to stress the importance of total company quality control, rather than just focusing on products and services.
- Dr. Ishikawa believed that everyone in the company needed to be united with a shared vision and a common goal. He stressed that quality initiatives should be pursued at every level of the organization and that all employees should be involved.

- Dr. Ishikawa was a proponent of implementation of *quality circles*, which are small teams of employees that volunteer to solve quality problems.
- Dr. Genichi Taguchi is a Japanese quality expert known for his work in the area of product design. He estimates that as much as 80 percent of all defective items are caused by poor product design. Taguchi stresses that companies should focus their quality efforts on the design stage, as it is much cheaper and easier to make changes during the product design stage than later during the production process.
- Taguchi is known for applying a concept called *design of experiment* to product design. This method is an engineering approach that is based on developing robust design, a design that results in products that can perform over a wide range of conditions.
- Taguchi's philosophy is based on the idea that it is easier to design a product that can perform over a wide range of environmental conditions than it is to control the environmental conditions. Taguchi has also had a large impact on today's view of the costs of quality.

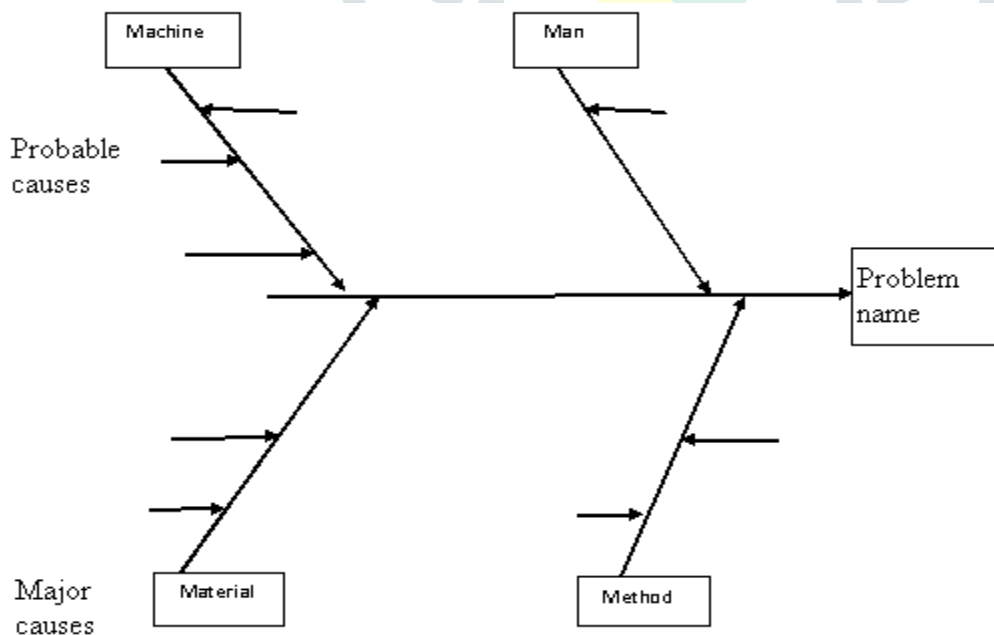


Figure Fishbone diagram

Brainstorming

Brainstorming is a process for generating ideas which works as creative solutions to problems. Brainstorming is a process in which discussion of relevant people is made to find the many possible solutions of a problem and select the best or realistic one among the many possible solutions. It is one of the effective techniques based on the employee participation and enhances team spirit among the employees of the organization. It also provides platform to the employee where they can produce their suggestion regarding any improvement or solution of a problem. There are four basic rules in brainstorming need to be implemented during the process of brainstorming among team members for stimulate idea generation, and increase overall creativity.

- A problem is discussed and possible solutions are asked to present by the team members. Any of ideas usual or unusual are welcome in the first stage.
- Larger the no. of ideas generated greater will be the chance of producing effective and efficient solution.
- There should be no criticism of ideas are withheld during the brainstorming session. This stage also allows the members to feel comfortable with the idea of generating unusual ideas.
- Criticism is reserved in the end stage i.e. evaluation stage of the process. In this stage the expensive, non-feasible ideas are eliminated.
- It is possible to combine some ideas to get the better solution of the problem. Thus combine the ideas in order to make them better solution.

Objectives of the study

The case study has following objectives:

To provide a sound discussion on quality circle implementation and see how this strategy fit in with quality improvement and operational excellence initiatives in manufacturing industries.

- To analyze the tangible and intangible benefits of quality circles implementation over manufacturing industries.
- To justifies the significant role of quality circles implementation for quality improvement and analyze shop floor results after implementation of quality circle.
- To improve production by brainstorming for reduction in non-value added work through implication of continuous improvement.
- To encourage and motivate company employee to provide valuable suggestion for improvement in any of the working area.

Application of Quality Circle Methodology

The study includes application of Improvement made by the Quality Circle Methodology (QCM) throughout various processes in industry which gives comparatively better results in form of quality improvements, cost reduction etc. The process is described by the method which is described as follows in form of Before QCM and After QCM activities.

Study before Implementation of Quality Circle Methodology

A study is done to understand the various processes to produce products of the industry before implementation of QCM. This data has worked as a data base for finding out ideas of improvements in various processes.

Conclusions

In the present research work, an initiative has been taken to apply Quality Circle Methodology in a small organization manufacturing of automobile industry. The results of the study showed that Quality Circle Methodology empower employee to achieve zero defects in all possible ways and has a lot of potential to pioneer quality system.

In manufacturing industry, successful implementation of Quality Circle Methodology has been carried out. Literature review has also not yielded any evidence of successful implementation of Quality Circle Methodology in Production improvement in any sort of industry. In the present study, an attempt has been made to implement Quality Circle Methodology in achieving zero defects in production in a small manufacturing industry.

The results show that implementation of Quality Circle Methodology implementation has led to a remarkable profit by reducing the cost of quality by eliminating the production of not good products. This method recorded elimination of 80% major problem related to product by successful and effective implementation of concept of Quality Circle among the employees. This method improved work culture by providing opportunities to all employees work towards achieving objective of industry. It provided platform to manpower to give suggestions in improvement in concern areas. It found reliable and suitable in regards to reduce the cost of training to new or existing employees by providing permanent data that can be used in repetitive manner to understand training topics. It provided a comprehensive and flexible system for maximizing business success.

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