

TQM Implementation: A Case Study Analysis of an Indian Automobile Industry

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Abstract

Purpose- TQM as a never-ending drive in pursuit of a delighted customer and needs to be assimilated into everything the business does. It comprises different aspects such as use, availability, efficiency, service and delivery for customer satisfaction. An insufficient understanding of TQM creates an environment for failure of implementation of TQM framework. Indian industries started realizing the TQM outcomes in early 1990s and a satisfying TQM culture has been rooted in Indian industrial sector. So an attempt has been with a case study analysis within an Indian automobile industry with the use of an effective questionnaire survey which was prepared after a prolonged literature survey, field visits and expert interviews.

Research Methodology- After a detailed analysis of literature a questionnaire was prepared which was sent to different industries. A brief study of respondents was made where a Non-TQM Indian automobile industry was selected at random to implement TQM as well as to get optimum benefits after its implementation.

Findings: Results concluded with seven core benefits to the industry which mainly comprises of corrected Layout and adequate scheduling, enhanced employee involvement and recognition, better supplier quality. The final results suggested a increase of Rs. 30,470 in revenue and new job distribution on seven machines were suggested to continue the same.

Research Implications- The study is subject to the regular restrictions of survey investigations. The case study implies only in an Indian automobile industry. To get better findings it can be applied to different type of industries simultaneously.

Originality/Value- The study is supportive in portraying the benefits of TQM implementation in India which might be taken seriously by Non-TQM industries.

Keywords: TQM, implementation, case study, automobile.

I. INTRODUCTION

Although quality is the core of survival for any business but has become a misunderstood issue today. Quality is characterized by the customer, so it is no longer a company's issue as they have to follow the footprints of their almighty (customer). With rapid turn in quality management, managers find it hard and challenging to guarantee efficient operations (Choi and Behling 1997, Vouzas and Psychogios 2007). A true competitiveness lies beneath continuous relationship with customers and value to customer approach (Dervitsiotis 2007). In early years of manufacturing, one operator was placed in industries to inspect and to make a decision to accept or reject a product. But today, as business is becoming larger day by day, a separate quality and inspection department has been established by every single globally participating industry (Chong and Rundus 2004). The early tradition of bringing quality was more focused on emphasizing technical operations and strong standards with timely reporting to top management. This scenario changes from

management of quality in 20th century to quality of management in 21st century with hard efforts of top management leadership who implemented it (Yarrow et al. 2004). As the ritual of accepting quality management approaches by organizations is from 1930s, the entrance of TQM in the late 1980s unlocked a new era in the quality interest groups (Dahlgaard-Park, 2000). The versatility of TQM permits its application in different business nature around the entire globe (Powell 1995). TQM is such a philosophy which has capability and potential to transform the approach and ethnicity regarding quality along with customer gratification (Black and Porter 1996). Over the years TQM has garnered as an innovative concept with has a sculpture of continuous improvement for attaining customer satisfaction (Krajewski et al. 2013). Organizations such as Apple, Ford, Mercedes Benz, Motorola, Toyota etc. have initiated fundamental changes over the years (Sinha et al. 2016) such as 5-S practices such as structurize, systematize, sanitize, standardize and self-discipline (Ho 1999). TQM was limited to private sector earlier but has spread into public sector since

1990's (Carr and Littman 1991) and in academic research also (Milakovich 1990). Apart from these basic questions, TQM has created a work friendly environment for employees by specifying the need of employee involvement and empowerment also (Lawler III 1994). Many organizations across world have affirmed that an effective TQM implementation is helpful in achieving competitive advantage (Anderson et al. 1994a). TQM adoption has allowed firms to compete globally (Handfield 1993). Approximately 90% improvement rate in employee's relations, customer satisfaction and financial performance is attained due to TQM implementation (Rategan 1992). Its implementation has brought outstanding benefits for different organizations across the world. As after liberalization and globalization of Indian economy in 1990's (Wali et al. 2003), Indian organizations also have implemented this novel approach (Motwani et al. 1997). TQM implementation has answered different queries (Vinzant and Vinzant 1996) which were floating in the mind of Indian organizations over the years, such as:

- Whether such organizations will succeed
- What if, TQM phenomenon will fade
- Will TQM benefit in building a world-class Indian organization

So, TQM has a journey of more than 25 years in Indian market and its implementation has glorified the pace of Indian industries in different manners and they are competing well internationally (Parvadavardini et al. 2016).

II. LITERATURE REVIEW

An enormous quantity of literature concerning TQM has been postulated worldwide through the decades (Sila 2007, Yusuf et al. 2007). TQM from an economic and organizational perception and stated that TQM is a science based technology which is not hierarchical and market based but actually is a team work, better work process and continuous improvement based. It forces the use of science in decision making and effective creation Boaden (1997). TQM is such an approach which eliminates discrepancy in production or delivering service thereby also permits to enhance competence, consistency and quality. Continuous improvement is the base to support TQM. It was reported that, US managers consider TQM as the only technique where Americans have to compete with European and Pacific Firms Steingard and Fitzgibbons (1993). Lakhe and Mohanty (1994) intended to discuss that the economic change and demand of better products originate the needed TQM. Hackman and Wageman (1995) stated that the thoughts about TQM flourished by the pioneers such as Deming, Juran and Ishikawa have garnered a social movement which has spread from industry to care management, public bodies and academic research. The authors concluded later on that the core of TQM lies within four assumptions namely: quality, people, organization and role of top management. Chaudary et al. (2015) found that TQM is decisive in fulfilling customer desires and attaining

business heights. TQM seems to be a journey of success of an industry with the devotion of managerial commitment. TQM not only attempts all employees to commit themselves but willing them to alter wastage and bring continuous improvement. Study done by Fu et al. (2015) was focused for examining the role of TQM organizational culture in achieving elevated heights of business excellence. Study considered Chen et al. (2013) approach to investigate seven Taiwanese industries. Carmona-Márquez et al. (2016) performed an empirical study in Spain to identify relationship of critical success factors of TQM and their application sequence during the TQM implementation. Structural equation models (SEM) was applied to evaluate the relation between constructs and the prognostic influence of the research model. Shafiq et al. (2017) performed confirmatory factor analysis to empirically test the effects of TQM on OP in textile industry of Pakistan. Results also maintained the vision of TQM gurus that TQM has an optimistic influence on business results. For SMEs, attentiveness and edification of the quality principles are essential for ascertaining effective knowledge and efficient appliance. Furthermore, the applications can be subdivided to divisions within the SMEs other than manufacturing (Sreedharan et al. 2017). The case study analysis done by Hoque and Alam (1999) concluded that a thoughtful dependency on TQM is judgmental in adopting it. A descriptive longitudinal case study done by Pimentel and Major (2014) concluded that a properly used TQM strategy is helpful in achieving better organizational efficiency and team work results. Arumugam et. A. (2009) performed a case study analysis to assess the level of TQM practices within a USA based manufacturing company in Malaysia. Results suggested that the core of quality management implementation strategy lie in customer focus and process management. Also, Bourne et al. (2000), in their case study analysis, suggested that the performance measurement systems should comprise of a process for sporadically reviewing and revising the whole set of measures in use. Another case study done by Bititci et al. (2000) stressed for employing dynamic performance measurement system. Welikala and Sohal (2008) performed a detailed case study analysis in an Australian organization here findings suggested that employee involvement found to be chief focus and it as implemented first in the company. This point lost its ground when company focused primarily more on outside. Their concluded with answering two questions that How crucial has employee involvement been in the sustainability of TQM in this organization and How did it benefit the organizations and the employees?

Rahman and Tannock (2005) performed three case studies done in Malaysian SMEs. It involves interviewing top management. Study elaborated that all three companies ere having different approaches while implementing TQM. Venkateswarlu and Nilakant (2005) performed a qualitative case study in five different organizations with in New Zealand. Only two organizations admitted of continuing with quality programmes whereas others were not continuing with

it. Nagpal and Twamley (1989) elaborated a case study analysis of SPC implementation in a small plastics manufacturing unit as a technique of starting a quality enhancement culture. They described the process from initial training to the application of control charts on the shop floor. Ghobadian and Gallear (1996) in their case study analysis in four SMEs suggested the grounds for adopting TQM, the major steps concerned in its implementation, the effects and changes resulted from TQM implementation. Final conclusion suggested that SMEs could implement TQM with substantial triumph and they also found the potentials inherent in SMEs. Brown (1993) in his case study analysis suggested that the main reason for adopting TQM by a small company was to initiate and inculcate a new culture and management's wish to earn more profitability to the company.

III. CASE STUDY ON TQM IMPLEMENTATION

3.1 Introduction

To identify the reality of TQM implementation within a small automobile manufacturing industry, an attempt has been made with the help of a survey questionnaire. So, in this regard, a research instrument in the outlines of questionnaire was developed. Different sources were used to develop the questionnaire such as broad literature review, input from industries, field visits and academic management experts. The questionnaire was developed in three sections namely:

- Section A: Industry's General information
- Section B: Status of Total Quality Management (TQM) Elements
- Section C: Status of Total Quality Management (TQM) Implementation

After analyzing the different questionnaires which were responded by different industries, an XYZ automobile industry was selected at random which didn't have TQM implementation in it. The industry was manufacturing cam shafts for various automobiles namely: scooters, motor cycle, cars, trucks and also manufacturing gears for some automobile and had an annual turnover of more than Rs. 12 crores. Different suppliers were providing the raw material of different grades according to vehicle specifications for forging & machining and simultaneously the industry was receiving forged parts from different suppliers to machine them accordingly. Different operations performed on the products were turning, grinding, drilling, hardening, buffing, lapping, knurling and lastly inspection by quality control department.

3.2 TQM Implementation Methodology

TQM engages the entire organization to do efforts for customer satisfaction (Kanji 1990) which includes customer priorities, senior management, employee participation,

process & product design and employing quality tools etc. (Rahman 2001). In the beginning, survey questionnaire prepared for this research work was sent to industry authorities. The objective of sending this questionnaire was to have basic information's about industry in TQM context. After analyzing industry's response, some plant visits were made and meetings were held with executives of different departments. After meeting it was suggested to industry that an organized approach to TQM is required to make it competitive. Industry started TQM effort in November 2018. Under the first stage of preparation and awareness the management developed an innovative quality policy and displayed it at suitable places in the industry so that it could be readable to everybody in the industry.

In a statement, the Managing Director defined TQM as "a philosophy which emphasizes on team work, employee involvement at all levels and strategic alliance with suppliers as well as customer in order to reduce waste for achieving continuous quality improvement". Finally, management of the industry permitted to fabricate improvement in one production line with the help of quality management approach. Different operations performed in that production line on the products were turning, grinding, drilling, hardening, lapping, buffing and lastly inspection by quality control department.

3.3 TQM Implementation Process

When the idea of TQM implementation was hovered among the employees, they felt that such a schedule will need much educated, empowered and trained people. So, management thought to reinstate some of the employees. Then, top management foot stepped in and gave an undertaking that there would be no cutback. The dilemma was fully resolved when the workers were started to be trained for quality production.

A problem identification team was established in January, 2019 which included researcher, managing director, general manager, production engineer and eight workers. First meeting was held on 7th January, 2019. It was elucidated to members to identify the probable roadblocks in TQM implementation. A scheduled problem identification process (Figure 1) was followed by the team to find the potential system problems. The problems came out to be as follows:

- Poorer recognition of employees and lack of training to them
- Pitiable layout plan and inadequate scheduling
- Low supplier quality and lubricant deficiency
- Deprived working surroundings and lack of team work
- Inadequate inspection and lack of calibration
- Idle machines and insufficient maintenance

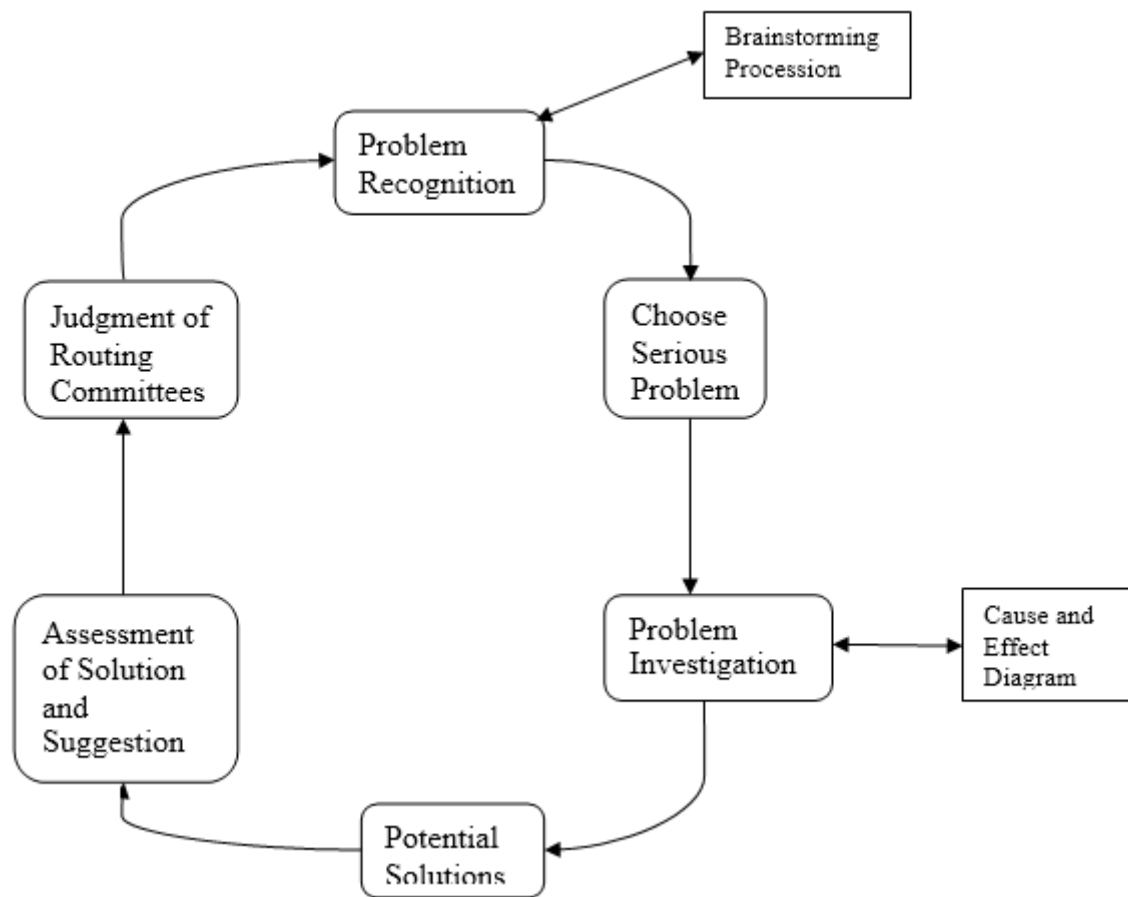


Figure 1: Problem Identification Process

The gathering helped to uncover promising grounds for fewer earnings and more wastage. The team decided to convene after one month. On 19th February, 2019 the second meeting was held where bringing optimum profit was its aim.

obvious from Table 1. Leadership and commitment, customer satisfaction and quality planning were being given maximum credence. Supplier's quality management, employee involvement & empowerment and evaluation & continuous improvement were given to be satisfactory credence. Product design and process management & control found not to be important from industry's point of view.

IV. TESTING AND OUTCOMES

Analysis of questionnaire has indicated that the industry was found to be giving good credence to TQM elements as

Table 1: Importance of TQM Elements in Industry

Elements	Importance
Leadership and Commitment, Customer Satisfaction, Quality Planning	Very important
Suppliers Quality Management, Employee Involvement and Empowerment, Evaluation and Continuous Improvement	Important
Product Design, Process Management and Control	Less important
No factor	Least important

In the third meeting, held on 8th April 2019, the March 2018 data was brought together for exhaustive study and improved results. Machines were entitled as Mc-I, Mc-II, Mc-III, Mc-IV, Mc-V, Mc-VI and Mc-VII and products were entitled as Job-1, Job-2, Job-3, Job-4, Job-5 and Job-6. Availability of

assorted machines and time taken by each job on each machine on production line for one month is shown in Table 2 in minutes. Table 3 shows the price (Rs/ unit) of each job after completion.

Table 2: Machine Availability (in minutes) and Time (in minutes) Taken by Each Job on Different Machines

	Time (minutes)	7025	12955	9710	11795	11615	9800	8255
S. No.	Job/ Mc	Mc-I	Mc-II	Mc-III	Mc-IV	Mc-V	Mc-VI	Mc-VII
1	Job-1	20	35	00	25	40	55	10
2	Job-2	35	50	25	80	35	45	25
3	Job-3	15	25	60	00	50	35	40
4	Job-4	30	15	50	10	65	30	00
5	Job-5	05	40	20	25	20	00	45
6	Job-6	10	45	35	15	00	25	20

Table 3: Price (Rs / Unit) of Each Job after Completion

S. No.	Job	Price (Rs / Unit) of job after completion
1	Job-1	520
2	Job-2	370
3	Job-3	550
4	Job-4	470
5	Job-5	380
6	Job-6	220

Job-1- Cam shaft for scooters
 Job-2- Cam shafts for motor cycle
 Job-3- Cam shafts for cars
 Job-4- Cam shafts for SUVs
 Job-5- Cam shafts for buses
 Job-6- Gears for trucks

Mc- I Turning
 Mc- II Grinding
 Mc- III Drilling
 Mc- IV Hardening
 Mc- V Lapping
 Mc- VI Buffing
 Mc- VII Knurling

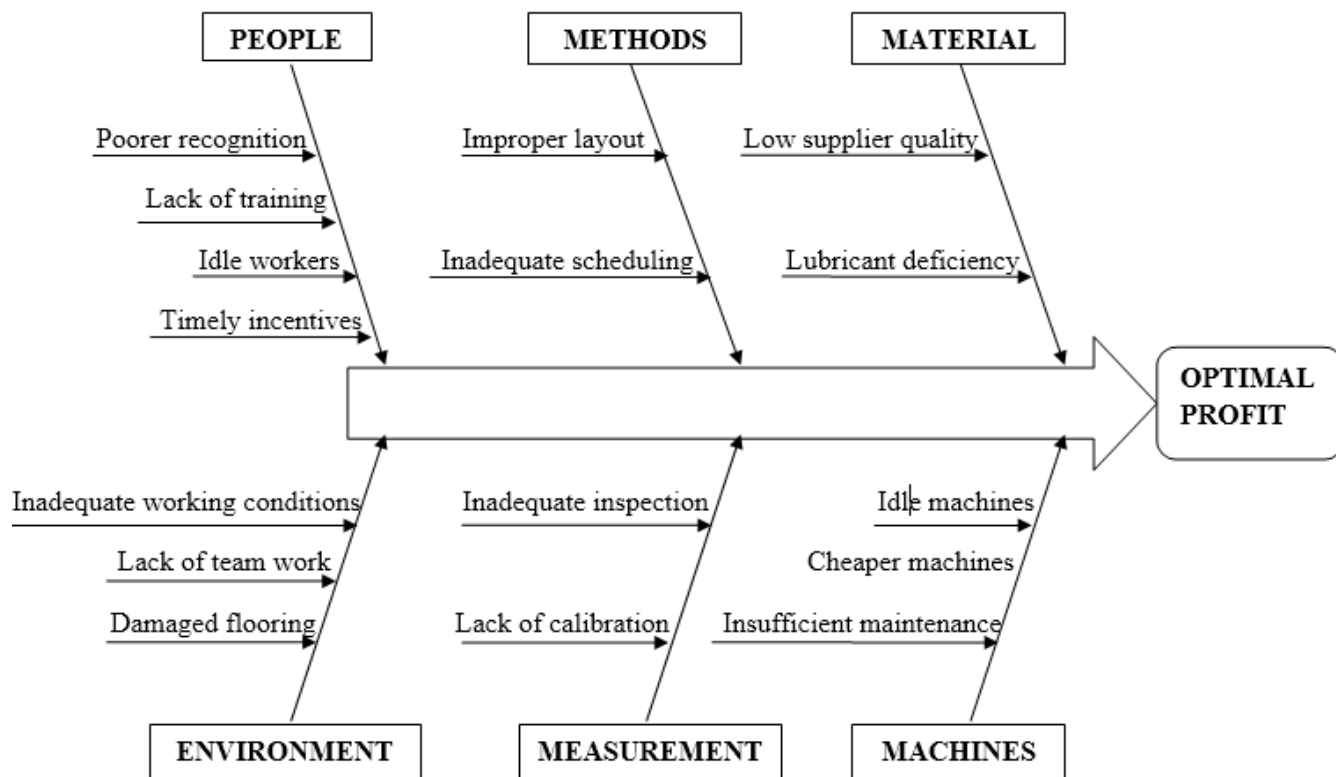


Figure 2: Cause and Effect Diagram (Ishikawa Diagram)

After examining every probable cause in second meeting, an Ishikawa diagram (Figure 2) was drawn and from the diagram it was apparent that basis of the problem were straightforward and can be resolved easily by generating a concept of quality product in between management and workers and it could be understandable to both after small training. There was a necessity of slightly supplementary commitment from management and additional commitment from workers which can be accomplished through problem identification process.

To get to the bottom of the problem for optimum profit, QC suggested to bring assist of optimization techniques, which help in obtaining the best results under agreed circumstances as it facilitates to make decisions such as reducing the effort required, enhancing desired benefits etc. Mathematical programming techniques which are most often studied in operation research are the best possible methods to do so. Linear-programming technique was used to unravel the problem. Data was congregated and transformed into the linear programming problem shown in Table 4.

Table 4: Data Formulation as Linear Programming Problem

Price (Rs.)	Time (Minutes)	7025	12955	9710	11795	11615	9800	8255
	Job/ Mc	Mc-I	Mc-II	Mc-III	Mc-IV	Mc-V	Mc-VI	Mc-VII
520	Job-1	20	35	00	25	40	55	10
370	Job-2	35	50	25	80	35	45	25
550	Job-3	15	25	60	00	50	35	40
470	Job-4	30	15	50	10	65	30	00
380	Job-5	05	40	20	25	20	00	45
220	Job-6	10	45	35	15	00	25	20

The 7 machines and 6 jobs were considered as a linear programming problem and the objective of maximizing the revenue is taken. The LPP problem was solved and maximized revenue was attained where a new job scheduling

on each machine was also suggested. Table 5 resulted about new job scheduling on each machine as well suggesting that profit has increased up to Rs. 30,470 per month on production line, with this TQM approach.

Table 5: Expected Increase in Revenues

Jobs	Price (Rs./ Unit)	Actual production in March	Actual revenue of March	Suggested production through LPP	Expected revenue of March
Job-1	520	75	39000	42	21840
Job-2	370	55	20350	88	32560
Job-3	550	20	11000	12	6600
Job-4	470	25	11750	67	31490
Job-5	380	30	11400	95	36100
Job-6	220	65	14300	44	9680
Total revenue			1,07,800		1,38,270
Expected increase in revenues in the month of March- Rs. 30470 /-					

V. CONCLUSION

It is evident from the case study that, A Non-TQM Indian automobile industry adopted all the recommendations given by problem identification team. There are seven (7) benefits achieved by the industry which are as follows: 1) Corrected Layout and adequate scheduling, 2) Enhanced employee involvement and recognition, 3) Better supplier quality, 4) Vigorous and liberated working environment, 5) Minimal wastage of machine hours, 6) Better inspection process and improved quality and 7) Optimum profit. The machines and jobs of production line were combined into a LPP production scheduling problem. The LPP problem was solved for maximizing the revenue. The final results suggested a increase of Rs. 30,470 in revenue and new job distribution on seven machines were suggested to continue the same. It has been found that the industry has been significantly benefited in many areas by implementing TQM and sustaining its competitiveness in market.

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