

Perception of TQM Implementation and Perceived Cost of Poor Quality: A Case Study of Local Automotive Company's Supplier

Fakhruddin Esa, Yusri Yusof

Abstract—The confirmatory of Total Quality Management (TQM) implementation is most vital in quality management. This paper focuses on employees' perceptions towards TQM implementation in a local automotive company supplier. The objectives of this study are first and foremost to determine the perception of TQM implementation among the staff, and secondly to ascertain the correlation between the variables, and lastly to identify the relative influence of the 10 TQM variables on the cost of poor quality (COPQ). The TQM implementation is perceived to be moderate. All correlation is found to be significant and five variables having positively moderate to high correlation. Out of 10 variables, quality system improvement, reward and recognition and customer focus influence the perceived COPQ. This study extended a discussion on these three variables contribution to TQM in general and the human resource development in the organization. A significant recommendation to lowering costs of internal error, such as trouble shooting and scraps are also discussed. Certain components of further research that would add value to this study have also been suggested and perhaps could be implemented at policy-level initiatives.

Keywords—Cost of poor quality, correlation, total quality management, variables.

I. INTRODUCTION

QUALITY is a term that carries important meaning to both producers and customers. In the global marketplace today, many organizations realized that their survival in the business world depends greatly on providing high quality products and services to their customers. Due to ever increasing global competition, some companies have indeed stressed that quality has to be put in place and integrated into all aspects of products and services in their management system.

Reference [1] emphasized that implementing a quality culture through the execution of quality management activities in all aspects of the business by focusing on building a continual improvement initiatives based on all types of resources, as well as meeting the customer's specific requirements, are appropriate for business sustainability. Hence, TQM has become increasingly popular as a managerial approach to improve customer satisfaction and retention, to improve product or service quality, and to ensure continuous improvement.

Fakhruddin Esa and Yusri Yusof are with the Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia, Batu Pahat, Johor, Malaysia (e-mail: fakhruddin@hidsb.com, yusri@uthm.edu.my).

Increasingly, the government of Malaysia is focusing on ways of hastening the growth within the individual's organisations that structure the business sector, as a moving forward roadmap developing the economy sector-wide. Furthermore, global competition require a total improvement on productivity, quality, cost and delivery. Therefore, due diligence on improvising strategies, including emphasizing the TQM, is important [2].

The execution of TQM in the automotive industry is required as a strategy for continual improvement of product and service quality in order to meet customers' satisfaction. The meeting of customers' satisfaction depends significantly on the product performance, consistency, customers' requirements responsiveness and continual improvement.

A reengineering process has to be carried out in order to efficiently deliver products and services to customers, while at the same time, be able to improvise the companies supply operations responsiveness as well as meeting the speed and flexibility requirement. Integration from last tier suppliers to the end customers is important to extensively manage the coordination of all elements and stakeholders. All these elements are called supply chain management. Quality is an important subject in the entire supply chain management. The complexity of supply chains will then severely decrease within and between entities, otherwise it increases the COPQ. In these days of subcontracting, the general issue on controlling supply chain management, for instance, will be able to be assimilated, simplified and made manageable.

Professionalists in different sectors and quality practitioners have contributed rigorously towards the field of TQM [2]. Reference [3] indicated there are numerous definitions pertaining to TQM.

A lot of discussion can be found from various researches and discussions pertaining to the evolvement of TQM that inevitably contributes towards organizational performance. Reference [4] underlined the use of statistical techniques for quality control, and proposed 14 principles to improved quality in organizations including top management direction, an enhancement of ideas, do it right the first time concept, provision of training to all levels of personnel, internal communication in handling obstacles of getting a support and the suppression of meeting the key performance index. He defined 14 steps for quality improvement, including top and intermediate management commitment, quality measurement, evaluation of the COPQ, measures or action plan, provision of training, a zero defect philosophy, objective setting and

employee recognition. Reference [5] pointed to the importance of both technical and managerial aspects, and identified the basic functions of the quality management process: planning, organizing and controlling – as the stages for quality improvement. Reference [6] and his contribution were in respect of leadership and quality improvement, commitment to incorporate quality in the firm's practice, and reduction of total quality costs, through participation of the entire workforce. Lastly, reference [7] emphasized the importance of training, the usage of cause-effect diagrams for problem-solving, and quality circles as the moving forward strategies to achieve continual improvement. Reference [4] observed that, however, none of them offers a solution to all the issues and problems encountered by organizations. Nevertheless, he noted that some issues could be examined, such as employees' participation, planning and quality measures for continual improvement. He mentioned that there are standardized quality models used by firms in practice as a guide for their implementation, or to implement self-evaluations of their quality procedures. The key models are the Malcolm Baldrige National Quality Award (MBNQA) in the USA, the European Foundation for Quality Management (EFQM) in Europe and the Deming Application Prize (DAP) in Japan. Indeed, TQM becomes an important issue of discussion for organizations to compete in today's business environment. It is an element of providing competitive advantage towards fulfilling customer's expectations and organizational performance [8], [9] and it is importance for long-term success, [10], [11] and [1] emphasized the importance of the implementation of TQM practices that can lead to better financial performance, improved communication, increased customer satisfaction and teamwork.

Studies on the implementation of TQM on organizations have been extensively discussed. Reference [12] stated that organizations need to compete, in spite of their size, by producing quality products and services. Past literatures have looked into the implementation of TQM in big organizations such as Xerox [13], Procter and Gamble, American Telephone and Telegraph and the New York Times [14]. These organizations, they observed, have been applying the concept of quality management based on Deming's philosophy aimed at customer satisfaction and commitments, and it has proven successful.

Reference [15] stated that multinational companies from Japan, USA and Europe have played a pertinent role in the industrial development of ASEAN countries, through technological transfer and management practices. They argued that the different cultures, languages and geographical diversity are some of the causes of the difficult implementation of quality management in ASEAN countries. Reference [16] discovered that quality management practices are more extensive in the eastern, rather than the western region, due to teamwork and confidence among employees, customers and suppliers.

TQM could also be implemented in smaller organizations. Smaller firms, according to [17], should have a more difficult time competing directly with large firms in achieving the

quality standard because they lack adequate resources and cannot achieve economies of scale. Reference [18] found that the two most important factors in implementing quality management are firstly, the manager's experience, and secondly, the resources, financial and human. Reference [19] viewed that smaller companies have adopted TQM practices successfully, similar to the practice of the large companies in terms of its level of training, usage of quality tools and benchmarking.

It has been argued long enough that automobile industry creates significant employment opportunities. Reference [20] observed that this is due to the use of relatively labor-intensive production techniques. Reference [21] observed that many of the employees are those who do not have a high level of formal education.

Reference [22] emphasized that, activities within an organization become more efficient when the employees are directed towards the same objective. Reference [18] believed that small business has greater potential for achievement in employee involvement and continuous improvement through participation, teamwork and empowerment.

One of the barriers of implementing TQM is people. According to [23], 48% of the detected obstacles to TQM were people-related. Reference [24], who studied the soft elements affecting TQM which include culture, trust, teamwork, employment continuity, education and training, top management leadership for quality, continuous improvement, employee involvement and customer satisfaction, viewed these as important since people are relevant in business development and the difficulties in managing them.

TQM becomes popular now a day especially when an organization embrace the long term business planning for their sustainable competitive advantage while fulfilling customer's expectations through company's performance [1]. However, scant research has been done in terms of the implementation of TQM in Malaysia [25]. Reference [26], has indicated that the application of quality management in Malaysia has not reached a satisfactory level. Thus, it is with this in mind that this research to study the implementation of TQM was undertaken. The implementation of TQM in this company is needed as a strategy for continuous improvement of product and service quality in order to fulfill customers' satisfaction. The need to fulfill customers' satisfaction depends significantly on the product performance, reliability, responding to customers' needs and continuous improvement.

II.METHODOLOGY

This research has been designed prior to cross-sectional sample survey. Through this survey, it should provide a good picture of the perception of TQM implementation at different levels of employment. The cross-sectional sample survey through one single survey is adequate for obtaining information from the entire target population. Furthermore, the survey design is appropriate, since this study merely seeks the perception of the employee at a particular occasion and does not seek to prove the underlying effect [2].

A. Unit of Analysis

Since this research involves all the staff members (executive and non-executive employees) of the organization, the unit of analysis is the individual.

B. Sample Size

In order to obtain reliable results, the sample size should be at least 150 [2]. As far as employee profile is concerned, as of today, there are 600 employees in the entire organization. The majority, 520 or 87% are males. Females make up the remaining 13% or 80. In terms of race, the majority, 503 or 83% are Malays, followed by other races (Nepali, Bangladeshi and Indonesian) at 90 or 15%, followed by Indians at 4 or 0.7%. Chinese constitutes the smallest racial group at 0.3% (3). In terms of the occupational categories, 12% (70) of employees in the company are executives (engineers, managerial workers, chief operating officer, chief financial officer and chief executive officer). Technicians and trade workers constitute 12% (70), while machinery operators constitute 75% (450) of the workforce. The smallest category is that of the clerical, drivers and administrative workers constituting 1% (10).

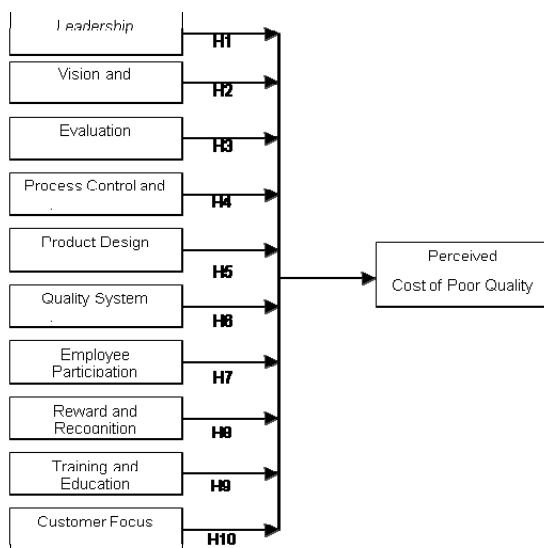


Fig. 1 Conceptual Framework

C. Sampling Technique

This study analyses the perceptions of the organization employees on the implementation of TQM. The employees of this company are chosen, as they are responsible ensuring provision high quality of products and services to the local and international car-manufacturers.

Through convenient sampling, 300 questionnaires were administered via the reception counter. However, only 100 respondents completed and returned the questionnaires back to the receptionist.

D. Conceptual Framework

The construction of the conceptual framework, based on the perspectives of [27] and [28], is as specified in Fig. 1.

The definition of key terms or terminologies is stated to ease the benefit of the readers and understanding.

E. Independent Variables

There are 10 independent variables adopted as [29] and the explanation in this section is based on his original measurement.

1. Leadership

Leadership is defined as a strong commitment from top management in forming the visions and missions statement, value creation and structures in the pursuit of continual improvement initiatives. An instrument developed, as in [29], is used in this study. The seven-item instrument is scored using a 1-5 Likert scale. The reliability and validity of the instrument is good, as attested as by [29]. The items are:

Participation of top management in quality management and improvement process is impressive.

- (1) Quality-related concepts and skills learnt by the top management.
- (2) Employee involvement in quality management and improvement activities is encouraged by the top management.
- (3) Employees are empowered by the top management to solve quality problems.
- (4) Adequate resources arranged by the top management for employee education and training.
- (5) Many quality-related issues discussed by the top management in top management meetings.
- (6) Product quality is focused more by the top management rather than yields.
- (7) Long-term business success pursued by the top management.

2. Vision and Plan Statement

A vision and plan statement is defined as the way a company describes the standards, values, and beliefs to move forward. The company's aims usually cascaded down from a vision statement right to the mission statements that details the departmental and individual aims. An instrument developed, as in [29], is used in this study. The eight-item instrument is scored using a 1-5 Likert scale. The reliability and validity of the instrument is more than meets the conventional standards. The items are:

- (1) The company has a clear long-term vision statement.
- (2) The vision effectively encourages employees' commitment to quality improvement.
- (3) The company has a clear short-term business plan.
- (4) The company has a clear quality policy.
- (5) The company has a detailed quality goal.
- (6) The effective quality improvement plan is in place.
- (7) Communication on various policies and plans are well administered to the employees.
- (8) Policies and plans making involves employees from different levels.

3. Evaluation

Evaluation is defined as the situation in an organization's quality management practices and provides an important base for organizations to improve their quality management practices. An instrument developed, as in [29], is used in this study. The nine-item instrument is scored using a 1-5 Likert scale. The reliability and validity of the instrument is acceptably good. The items are:

The company regularly audits various policies and strategies.

- (1) Quality audits are regularly conducted in the company.
- (2) Benchmarking is used extensively in the company.
- (3) The company uses quality-related costs extensively.
- (4) The company has detailed quality-related data such as defect rates and scraps.
- (5) Quality-related data are used to assess the management of the company.
- (6) Quality-related data are used to assess the performance of all departments.
- (7) Quality-related data are used to assess and appraise the performance of employees.
- (8) Quality-related information is visualized at the shop floor.
- (9) The objective of evaluation is for improvement, not for criticism.

4. Process Control and Improvement

Process control and improvement is defined as a process of management that is equipped with maintenance process capability to meet production requirements which ensures variation is kept within acceptable bounds, keeping the manufacturing process running smoothly. An instrument developed as [29] is used in this study. The eight-item instrument is scored using a 1-5 Likert scale. The reliability and validity of the instrument is appropriate. The items are:

- (1) The company is kept neat and clean at all times.
- (2) Process capability can meet production requirements.
- (3) Production equipment is maintained well according to a maintenance plan.
- (4) The company implements various inspections effectively (e.g., incoming, process, final products).
- (5) The processes are designed to be "fool proof" in order to minimize the chance of employee error.
- (6) The company uses the Seven QC tools extensively for process control and improvement.
- (7) The company uses SPC extensively for process control and improvement.
- (8) The company uses PDCA cycle extensively for process control and improvement.

5. Product Design

Product design is defined as product development management that thoroughly reviews new product design in order to avoid problems happening during mass production. An instrument developed, as in [29], is used in this study. The eleven-item instrument is scored using a 1-5 Likert scale. The reliability and validity of the instrument is good as attested as [29]. The items are:

- (1) Pre-requisite of the design engineers is to have some shop floor experiences.
- (2) Pre-requisite of the design engineers is to have some
- (3) Marketing experiences.
- (4) Consideration on customer requirements is thoroughly in place for a new product design.
- (5) Participation from various departments is in place for a new product development.
- (6) Review on a new product designs are thoroughly carry out before production.
- (7) Product design process emphasizes on cost.
- (8) The engineers extensively used experimental design in
- (9) Product design.
- (10) The engineers extensively used Quality function
- (11) Deployment (QFD) in product design.

6. Quality System Improvement

A quality system is defined as the organizational structure, procedures, processes and resources needed to implement quality management meant for improvement. The instrument in [29] is used in this study. The five-item instrument is scored using a 1-5 Likert scale. The reliability and validity of the instrument is good, as shown in [29]. The items are:

The quality system in the company is continuously improved.

- (1) The company uses ISO 9000 as a guideline for establishing our quality system.
- (2) The company has a clear quality manual.
- (3) The company has clear procedure documents.
- (4) The company has clear working instructions.

7. Employee Participation

Employee participation is defined as an individual's involvement in quality improvement activities and a sense of accomplishment experienced by solving quality problems. An instrument developed as [29] is used in this study. The seven-item instrument is scored using a 1-5 Likert scale. The reliability and validity of the instrument meet conventional standards. The items are:

- (1) Cross-functional teams are established in the company.
- (2) Several QC circles are available in the company (within one function).
- (3) Involvement of employee in quality-related activities is splendid.
- (4) The company executes employee suggestion schemes extensively.
- (5) Employees' suggestions are implemented after an evaluation accordingly.
- (6) Commitment of every employee to the success of the company is overwhelming.
- (7) Encouragement of fixing problems by the employees themselves is inspiring.
- (8) Reporting work abnormalities is encouraged in the company.

8. Reward and Recognition

Reward and recognition is defined as an employee compensation system that should effectively stimulate

employee commitment to quality improvement. An instrument developed as [29] is used in this study. The six-item instrument is scored using a 1-5 Likert scale. The reliability and validity of the instrument is good, as attested to in [29]. The items are:

- (1) The company improves working conditions in order to recognize employee quality improvement efforts.
- (2) The company has a salary promotion scheme for encouraging employee participation in quality improvement.
- (3) Position promotions are based on work quality in the company.
- (4) Excellent suggestions are financially rewarded.
- (5) Employees' rewards and penalties are clear.
- (6) Recognition and reward activities effectively stimulate employee commitment to quality improvement

9. Training and Education

Training and education is defined as a comprehensive training program that provides the employee with the capabilities to bring about the desired results. An instrument developed as [29] is used in this study. The six-item instrument is scored using a 1-5 Likert scale. The reliability and validity of the instrument is good, as attested to in [29]. The items are:

- (1) Employees are encouraged to pursue education and training in the company.
- (2) Resources are accessible for employee education and training in the company.
- (3) The company trained most of the employees on how to use quality management tools.
- (4) Education on quality awareness is given to employees.
- (5) Training on specific work skill is given to all employees.
- (6) Long-term resources are worthy on education and training throughout employees' careers as they are regarded as valuable.

10. Customer Focus

Customer focus is defined as a way to achieve quality by knowing what customers want and to provide products or services that meet their requirements. An instrument developed as [29] is used in this study. The six-item instrument is scored using a 1-5 Likert scale. The reliability and validity of the instrument is good as attested as [29]. The items are;

- (1) The company collects extensive complaint information from customers.
- (2) Quality-related customer complaints are treated with top priority.
- (3) The company conducts a customer satisfaction survey every year.
- (4) The company always conducts market research in order to collect suggestions for improving our products.
- (5) The company provides warranty on the sold products to customers.
- (6) The company has been customer focused for a long time.

F. Dependent Variable

This dependent variable has been adapted from Harrington's original measurement. Harrington's measurement, as in [28], focuses on the quality impact at the organizational level. Since the unit of analysis of this study focuses on the individual, therefore the measurement is the perception of the direct COPQ, whereas the indirect cost is not appropriate.

1. Cost of Poor Quality (COPQ)

COPQ is defined as an internal error cost that is due to, in-process scrap and rework or troubleshooting and repairing. This variable is measured via a three-item positively worded perceptual tool.

- (1) Scrap cost has decreased with TQM implementation.
- (2) Rework cost has decreased with TQM implementation.
- (3) Trouble shooting and repairing cost has decreased with TQM implementation.

III. OUTCOMES AND FINDINGS

The overall regression model is significant ($F(10,89) = 9.031, p < 0.05$) (see Appendix H for complete information).

TABLE I
REGRESSION ANALYSIS

#	Variables	Standardized Coefficients	T value	P value
		Beta	t	Sig.
1	Leadership	-0.098	-1.002	0.319
2	Vision and plan statement	0.107	0.847	0.400
3	Evaluation	-0.022	-0.162	0.871
4	Process control and improvement	0.092	0.690	0.492
5	Product design	0.125	1.440	0.153
6	Quality system improvement	0.230	2.127	0.036
7	Employee participation	0.016	0.130	0.897
8	Reward and recognition	0.213	1.885	0.063
9	Training and education	-0.146	-1.366	0.175
10	Customer focus	0.388	3.818	0.000
	R-Square		0.504	
	F value		9.031	
	P value		0.000	

The variables in bold are significantly associated with dependent variable, $p < 0.05$. Dependent Variable: COPQ

The regression model with 10 variables explains about 50% of variance in the perceived COPQ. This level of R^2 is considered to be a high effect size [30]. However, in examining the independent variables, only three significantly predict the dependent variable. They are quality improvement system, rewards and customer focus. Out of the three variables, customer focus is the most strongly associated with the dependent variable (0.388, $p < 0.05$).

Although only three independent variables significantly predict the dependent variable, all variables are found to be moderately related to COPQ. These findings justified the hypotheses developed in the conceptual framework.

IV. CONCLUSION AND RECOMMENDATIONS

Out of 10 variables, three are significance. Quality system improvement, customer focus and reward and recognition, relatively influence the COPQ. Other variables, especially leadership, do not show good influence, and perhaps a proper management structure needs to be constructed prior to the reinforcement strategy across the board. The situation is quite alarming, as the TQM direction basically has to be rolled up from the top.

TQM should emphasize not only to the customers, as it needs supplier's cooperation. Feedback and views of the customers are used for the purpose of designing systems and work processes to ensure that the final output conforms to requirements. Suppliers are treated as business partners who are collectively responsible for producing quality outputs. Suppliers play an important role in supplying quality inputs to the organization. Therefore, the supplier quality management proposed in the original [29] work is also an important aspect of TQM since materials and purchased parts are often a major source of quality problems. Reference [31] also recognizes the importance of the SQM.

Reference [32] finds that organizations that manufacture the highest quality products have purchasing departments that rank quality rather cost minimization as their major objective. On the other hand, in organizations with the lowest quality performance, the primary objective of the purchasing department is to obtain a competitive price for purchase items. Poor quality of supplier products and/or services results in unnecessary of additional costs for the buyer [33]. Organizations that pursue good supplier quality management, should establish a supplier or vendor development program including a long-term relationship with their suppliers, giving guidance on supplier quality activities such as Innovative Control Circle (ICC) on the issues concerning supplier performance, provide feedback on the suppliers' performance, regularly conduct supplier quality audits, and regard product quality as the most important factor for selecting suppliers. Hence, for future research undertaking, it is strongly recommended that supplier quality management should not be ignored, as it is an important component that has to be considered in TQM implementation initiatives.

ACKNOWLEDGMENT

Financial supports from the Malaysian Government with the cooperation of Universiti Tun Hussein Onn Malaysia (UTHM) in the form of IGSP grant Vot U415 is gratefully acknowledged.

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