UNIVERSITI PUTRA MALAYSIA

RANKING OF TOTAL QUALITY MANAGEMENT's CRITICAL TECHNIQUES IN THE MALAYSIAN AUTOMOTIVE INDUSTRY

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By

AMIR AZIZI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

May 2007

DEDICATION

To my dear father and mother

With gratitude and love

Abstract of thesis presented to the Senate of the Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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Chairman: Associate Professor Ir. Md. Yusof Ismail, PhD.

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Today all organizations around the world are trying to optimize the business process in the global market upon continuous improvement and total quality management in order to survive in a competitive market. Since there are huge costs to implement all tools and techniques of total quality management and it is not economical for any organization to apply all. Nine Total Quality Management's Critical Techniques (TQM's CTs) have been presented to implement in automotive industry. Each technique has a special application but on the other hand, some of them can be used for an assimilation objective and also some of them can be applied for more than one objective. The main objective of this study has been based on both internal and external customer satisfaction. In order to achieve the main objective, six significant criteria as decision making parameters have been proposed. The study has ranked the TQM's CTs as alternatives regarding to each criterion through one of the best and widely used decision making methods that is called Analytic Hierarchy Process (AHP) in ten selected Malaysia automotive companies. It has also determined an overall ranking of implementation of TQM's CTs with respect to all criteria and by considering their performance weight. The results of overall ranking of TQM's CTs

are listed as follows: (1) Advanced Product Quality Planning Process (APQP); (2) Quality Function Deployment (QFD); (3) Failure Mode and Effect Analysis (FMEA); (4) Production Part Approval Process (PPAP); (5) Statistical Process Control (SPC); (6) Measurement Systems Analysis (MSA); (7) Management and Planning (MP) tools; (8) Kaizen; (9) 5S.

It has also been found the weight of relationship of TQM's CTs. For example, FMEA and SPC, QFD and APQP, QFD and FMEA, and 5S and Kaizen have highest relationship rather than other critical techniques of TQM.

Finally, an integrated implementation framework of the TQM's CTs with respect to their both relationship and performance weight has been suggested to create awareness and to guide quality planning managers to have an effective implementation of theses critical techniques of TQM.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

PENGKELASAN KAEDAH DAN TEKNIK KRITIKAL PENGURUSAN KUALITI YANG MENYELURUH DALAM INDUSTRI AUTOMOTIF MALAYSIA

Oleh

AMIR AZIZI

Mei 2007

Pengerusi: **Profesor Madya Ir. Md. Yusof Ismail, PhD.**

Fakulti: **Kejuruteraan**

Pada hari ini organisasi-organisasi diseluruh dunia mencuba untuk mengoptimumkan proses perniagaan di dalam pasaran global melalui penambahbaikan berterusan dan pengurusan kualiti menyeluruh agar kekal bersaing dalam pasaran yang kompetitif. Memandangkan terdapat kos yang tinggi di dalam melaksanakan semua kaedah dan teknik pengurusan kualiti menyeluruh dan adalah tidak ekonomikal bagi mana-mana organisasi untuk mengaplikasikan kesemuanya. Sembilan Teknik-teknik Kritikal Pengurusan Kualiti Yang Menyeluruh (TQM's CTs) telah dibentangkan untuk dilaksanakan di dalam industri otomotif. Setiap teknik mempunyai aplikasi yang khusus tetapi pada masa yang sama teknik-teknik tersebut boleh digunakan untuk objektif asimilasi dan kebanyakannya boleh diaplikasikan untuk mencapai lebih daripada satu matlamat. Matlamat utama dalam kajian ini adalah berasaskan kepada kepada kepuasan pelanggan dalaman dan luaran. Bagi mencapai matlamat utama, enam kriteria penting sebagai parameter di dalam membuat keputusan telah dicadangkan. Kajian ini telah mengkelaskan TQM's CT's sebagai alternatif bagi setiap kriteria melalui kaedah yang terbaik membuat keputusan yang dinamakan Proses Hierarki Analitikal (AHP) kerana ianya memberi keutamaan pelbagai

alternatif bagi kriteria yang tertentu. Ianya juga boleh menentukan pengkelasan keseluruhan TQM's CT's yang mengambilkira kesemua kriteria dan menimbangkan prestasi pemberat bagi sepuluh kilang-kilang yang telah terpilih di dalam industri otomotif di Malaysia.

Hasilan-hasilan daripada pengkelasan menyeluruh TQM's CTs adalah disenaraikan sepertimana di bawah: (1) Proses Perancangan Lanjutan Kualiti Produk (APQP); (2) Pembahagian Fungsi Kualiti (QFD); (3) Analisa Kegagalan Mod dan Kesannya (FMEA); (4) Proses Kelulusan Bahagian Pengeluaran (PPAP); (5) Proses Kawalan Statistikal (SPC); (6) Analisa Sistem-Sistem Pengukuran (MSA); (7) Peralatan-Peralatan Pengurusan dan Perancangan (MP); (8) Kaizen dan; (9) 5S.

Ianya juga telah menghasilkan perkaitan pemberat TQM's CT's. Sebagai contohnya FMEA dan SPC, QFD dan APQP, QFD dan FMEA, 5S dan Kaizen mempunyai perkaitan yang tinggi berbanding dengan teknik-teknik kritikal Pengurusan Kualiti Menyeluruh (TQM) yang lain.

Akhirnya, kerangka perlaksanaan bersepadu TQM's CT's yang merujuk kepada perkaitan dan pemberat prestasi telah dihuraikan bagi memberi kesedaran dan panduan kepada pengurus-pengurus perancangan kualiti bagi perlaksanaan teknik-teknik kritikal Pengurusan Kualiti Menyeluruh (TQM).

ACKNOWLEDGEMENTS

I would like to give greatest thanks to my father, Abolghasem Azizi, for his financial support, encourage, and guidance. Thanks from the bottom of my heart to my mother for her affection and compassion.

I would like also to express my deepest gratitude to Dr. Md. Yusof Ismail, the chairman of my supervisory committee. With all his encouragement, patience, expert advice, warm understanding, and coordination of my research. In addition, I would like to thank my other two supervisory committee members, Dr. Napsiah. Ismail, and Dr. Md. Sapuan Salit for their helpful recommendation.

This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee are as follows:

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Date: 17 July 2007

DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

AMIR AZIZI

Date: 04 June 2007

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LIST OF ABBREVIATIONS

5S	Sort, Systematize, Sweep, Standardization and Self-discipline
AHP	Analytical Hierarchy Process
AIAG	Automotive Industry Action Group
APQP	Advanced Product Quality Planning
BIC	Business Innovation Capability
Cpk	Process Capability
DMACI	Define-Measure-Analyze-Create-Implement
DIRFT	Do-It-Right-The-First-Time
DSS	Decision Support System
EFQM	European Foundation for Quality Management
FMEA	Failure Mode and Effect Analysis
FMM	Federation of Malaysian Manufacturers
HOQ	House Of Quality
IAOB	International Automotive Oversight Bureau
IATF	International Automotive Task Force
ISE	Industrial and Systems Engineering
ISO	International Organization for Standardization
JIT	Just In Time
MADMM	Multi-Attribute Decision Making Methods
MCCDM	Multiple Choice Criteria Decision Making
MP	Management Planning
MSA	Measurement Systems Analysis
NIC	Newly Industrializing Country
NPC	National Productivity Cooperation

PA	Productivity Award
PDCA	Plan-Do-Check-Act
PDPC	Process Decision Program Chart
PDSA	Plan-Do-Study-Act
PMQA	Prime Minister Quality Award
PPAP	Production Part Approval Process
QC	Quality Control
QMEA	Quality Management Excellence Award
QFD	Quality Function Deployment
QM	Quality Management
QMS	Quality Management Systems
QS	Quality Systems
RPN	Risk Priority Number
S.O.D	Severity, Occurrence, & Detection
SIRIM	Standards and Industrial Research Institute of Malaysia
SMEs	Small and Medium Enterprises
SPC	Statistical Process Control
SQA	Supplier Quality Assurance
TPM	Total Productive Maintenance
TPS	Toyota Production System
TQM's CTs	Total Quality Management's Critical Techniques
TQM	Total Quality Management
TS	Technical Specification
VOC	Voice of the Customer

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The concept of Total Quality Management (TQM) was introduced in some developed countries such as; Japan and United States and resulted from the work of American quality gurus like Joseph Juran, W Edwards Deming, and Armand Feigenbum and also Japanese quality gurus such as Kaoru Ishikawa, Genichi Taguchi, and Shigeo Shingo (Department of Trade and Industry, 2006). Chiefly TQM is classified into two categories; soft TQM (principles and concepts) and hard TQM (tools and techniques) (Wilkinson et al., 1998; Evans and Lindsay, 1999). More attention to TQM has been applied in the manufacturing sector especially in automotive industry (Shamsuddin and Masjuki, 2003). Indeed quality is a vital, critical and competitive factor in today's business world. Most of the companies are looking for higher quality and lower cost by implementing Quality Management Systems (QMS) such as ISO 9000 series, QS9000, and TS16949 to attain higher customer satisfaction.

1.1.1 What is Total Quality Management?

TQM is a philosophy that involves everyone in an organization and in a continual effort to improve quality and achieve customer satisfaction (Stevenson, 2005).

TQM is an approach to management that is characterized by the principles of customer focus, continuous improvement, and teamwork. It is broadly agreed that TQM is an integrated management philosophy aimed at continuously improving the performance of products, processes, and services to achieve and surpass customer expectations (Chin et al., 2002; Bayazit and Karpak, 2006). Berry (1991) defined TQM process as a total corporate focus on meeting and exceeding customers' expectations and significantly reducing costs resulting from poor quality by adopting a new management system and corporate culture. In other word, TQM is a customer-oriented approach which uses statistical tools and techniques, follows the plan-do-check-act scheme, implements the measures, and continues to improve procedures for smooth fulfillment of plans.

The TQM approaches are listed as follows: (Stevenson, 2005)

1. Find out what the customer wants
2. Design a product or service that meets or exceeds customer wants
3. Design processes that facilitates doing the job right at the first time
4. Keep track of results
5. Extend these concepts to suppliers.

1.2 Statement of Problem

Although TQM's tools and techniques have been recognized useful, in practice, there are many difficulties for people to implement them effectively and efficiently (Shamsuddin and Masjuki, 2003).

The previous studies have shown that some firms fail when they implement TQM (Boje and Winsor, 1993; Spector and Beer, 1994) because the implementation of TQM cannot be successfully done without the use of suitable quality management methods (Sitkin et al., 1994; Wilkinson et al., 1998; Zhang, 2000) such as tools and techniques of quality.

Bunney and Dale (1997) have concluded that the usage and selection of quality management's tools and techniques are vital to support and develop the quality improvement process. Shamsuddin and Masjuki (2003) also supported that TQM can not be ensured without the application of the appropriate tools and techniques.

Some disruptions when companies use unsuitable tools and techniques are dissatisfaction which is in opposite of the ultimate goal of TQM, wasted time and lose of money. Therefore, planning and selecting of the appropriate tools and techniques considering on their application, performance priority, and relationship can prevent these losses.

On the other hand, Tari and Sabater (2004) verified the necessary of implementation of quality tools and techniques for TQM improvement.

It seems that most researches focus on soft TQM (Samson and Terziovski, 1999), often they investigated on analyzing the relationships between the implementation of different elements and several types of performance (Huarng and Chen, 2002; Kaynak, 2003), and also some of them examined the effect of organizational environment on TQM performance (Fuentes et al., 2004). There are no proper investigations on TQM's

techniques and tools for a specific industry to identify which of them are critical to be implemented or which of them have a more performance to achieve higher customer satisfaction. Also the other problem is that the firms do not know exactly which of tools and techniques have more relationship and interrelationship to implement to each other.

The most literatures (Clinton et al., 1994; Perdomo-Ortiz et al., 2005) on TQM are focused on the elements of TQM and the approaches taken to assure a successful implementation (McQuater et al., 1995). However, less attention has been devoted to identify critical factors or significant criteria for evaluating and offering a reasonable priority of implementation of TQM tools and techniques.

There have been numerous studies on analyzing critical factors for implementing the quality management's concepts successfully and its influence upon performance (Saraph et al., 1989; Badri et al., 1995; Black and Porter, 1996; Chin et al., 2002; Motwani, 2001), but there are few studies which have identified critical factors/criteria for assessing performance of TQM's tools and techniques. On the other hand, there are a lot of studies upon tools and techniques of quality separately (Akao, 1997) but about their relationship and performance priority; there is not any exact framework or proper guideline to aware quality manager how to implement them.

Establishing and implementing of the QMS need to use the tools and technique of TQM correctly and they should be economical. The importance of systematic and objective analysis and the need of quality management tools in TQM have been felt more and also a range of new tools has been developed (Shamsuddin and Masjuki, 2003).

Today the implementation management and planning are very critical for top manager in order to attain a higher revenue or satisfaction. It is necessary to offer the critical techniques and standardizing their implementation according to their importance and relationship weight. Quality Management (QM) cannot be practiced effectively and efficiently without using a set of tools and techniques and also the choice of any tool is not just automatic, rather situation specific. Some tools and techniques are essential in any manufacturing firm – small, medium or large, if the management really wants to handle the business professionally (Shamsuddin and Masjuki, 2003). In fact, any tool or technique should not be taken in isolation for use without a strategic disposition.

1.3 Research Objectives

The main objectives of this research are:

1. To determine the distributive weight of TQM's CTs with respect to their performance to fulfill both internal and external customer's satisfaction
2. To determine the relationship and interrelationship between TQM's CTs

1.4 Benefit and Significance of the Study

Today companies in order to survive in a competitive market, need to re-engineering business process and measuring performance systems. It is very significant to accurately apply the TQM's tools and techniques to fulfill customer needs because customers expectations are always changing at a fast pace. On the other hand, the integrated model is a valuable method for achieving this goal.

Some benefits of this study are listed in the following:

1. Improve management decision making
2. Optimize the sequencing and ranking of usage of TQM tools and techniques
3. Institutionalize implementation of TQM tools and techniques
4. Identify the weaknesses especially in training of TQM's CTs and the strengths by regarding to TQM's CTs applications.

This study has recognized the urgency of grading of TQM's CTs with respect to their performance weight. The study has identified the usage and implementation of TQM's CTs with respect to each factor that the factors have been selected according to both internal and external customers values. On the other hand, Priority and relationship between the TQM's CTs have a significant role to increase customer satisfaction.

Mainly the study has focused on hard TQM especially critical techniques of TQM. According to Chin et al., (2002) "tools and techniques" is one of the critical sub-factors of "systems and techniques". On the other hand, "systems and techniques" is one of the critical factors of TQM implementation. This study has examined the possibility of designing an integrated implementation framework for showing the interrelationship and performance weight of critical techniques in implementing of Total Quality Management (TQM) that can be used as a benchmarking model for other automotive companies.