

THE INFLUENCE OF TQM PRACTICES ON MANUFACTURING PLANT PERFORMANCE AND COMPETITIVE ADVANTAGE

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ABSTRACT

Currently, organization facing global competition, characterized by increasing competition from local to multinational plants for customers in the domestic and global market. The global competition has forced many manufacturing plant to improve their competitiveness. Thus, organization have adopted many management models. Total Quality management (TQM) is one of the models that is known as a better way to improve organization competitiveness. Many study implicitly suggested the successful implementation of TQM improves the organization's performance.

However, there appears to be ambivalence surrounding this positive association. Conflicting reports have been published regarding the effectiveness of TQM programs. This research is aimed to examine the influence of TQM practices on manufacturing plant performance and competitive advantage. This research used data as part of a larger effort that measured TQM practices of 60 ISO registered manufacturing plants in Special Capital District of Jakarta, Bandung, Semarang, Yogyakarta, and Surabaya. Regression analysis (multiple and single regression) procedures were performed to measure the influence of TQM practices on performance and competitive advantage. The result of this research indicates TQM practices significantly improve organizations performance, which only three elements of TQM (management of process quality, human resources management, and information and analysis) significantly improve organizations performance. The result also showed that plant performance

significantly improves competitive advantage.

Keywords: TQM, Manufacturing Plant Performance , Competitive Advantage.

1. Introduction

Currently, organization is facing global competition, characterized by increasingly competition from local and multinational plant for domestic and global market customers. The global competition have forced many manufacturing plant to improve their competitiveness. Thus, organization have adopted many management models. Total Quality Management (TQM) is a model that is known as a better way to improve organization competitiveness. Sun (1999) suggested the seven causes triggering the implementations of TQM. The causes are: customer requirement, increased competition, need to reduce cost, concern decision, survival of company, joint venture, others. Arawati (2001) suggested that many studies on the successfulness of TQM implementation on organization can improve the product and services, reduce cost, increase of customer satisfaction, and financial performance.

Kanji (1996) suggested that the successful of TQM implementation can improve business performance of the organization. However, there appears to be ambivalence surrounding this positive association. Conflicting reports have been published regarding the effectiveness of TQM programs. For instance, Filippini., (1997) suggested that although TQM is

viewed as a tool for improving the quality and other performances, such as profit and market share, but the successfulness is relatively low. Choi and Eboch (1998) stated that although Rategan (1992) reported a 90% improvement rate in employee relations, operating procedures, customer satisfaction, and financial performance, Burrows (1992) reported a 95 % failure rate for initiated TQM programs (Choi and Eboch, 1998). Mc Kinsey (1992) also found that two-thirds of the TQM programs they examined were terminated, because these programs did not lead to expected results. (Choi and Eboch, 1998).

This paper is intended to contribute to a better understanding of TQM by empirically test weather TQM has an influence on manufacturing plant performance and competitive advantage because many conflicting reports have been published regarding the relationships between the implementation of TQM , organization performance and competitive advantage.

2. Literature Review and Hypotheses

2.1. The Influence of TQM Implementation on the Manufacturing plant performance.

Principally, TQM is an integrative philosophy of management for continuously improving the quality of products and processes to achieve customer satisfaction. Based on this concept, TQM requires the attitude changes of all workers accepting quality culture, the willingness to change and also continuous improvement. Ahire, Gupta, and Vuppapapati (1994) stated that continuous improvement and the achievement of better performance are implemented in the various phases of production: pre production stage, production stage and also post production stage. The pre production phase entails designing quality into products.

This includes activities covered by quality function deployment and various tools associated with it, for example, the house of quality. Manufacturing process quality assurance is accomplished primarily through the use of statistical process control,

worker centered quality control, self checking, successive checking, etc. Post production quality control entails activities associated with delivering the product to customers (logistics and distribution), and other activities which help serve existing and future customer (eg.customer service, accounts receivable, marketing, etc.). continuous improvement process at various phases is implemented on many activities or practical area of the organization. Choi and Eboch (1998) stated that according to Baldrige Award, there are four areas of management practices on TQM system for doing continuous improvement and achievement of better performance. The four areas of management practices within the TQM system to assess: management of process quality, human resources management, strategic quality planning, as well as information and analysis.

Many studies suggested that TQM practices have a positive impact on quality result and organization productivity. For instances, Bounds et al., (1994) stated that the implementation of TQM practices should lead to decreased internal and external product reject rates and production down time. TQM leads to improvement in total production cycle time, level of inventories, productivity, and delivery lead time. The General Accounting Office (G.A.O) (1991) stated that there are relationships between the implementation of quality management and organization performance. The study conducted by Flynn et al., (1995) suggested that there was positive relationships between TQM implementation and plant operation (improvement of cycle time). Adam (1994) suggested that there was positive relation between quality improvement approach (statistical process control, reward, training) and performance quality (scrap, rework, inspection).

Many researches stated that the implementation of TQM serves the approach on improving economic position of product and services, in which company can obtain world manufacturing class when it can develop operational capabilities through TQM on supporting the company in obtaining a continuous performance. (Choi and Eboch, 1998). The study based on

survey by Kanji (1996) stated that the successfulness of a company in implementing TQM can make it has better business performance. The result of the study is the same as the study conducted by many researchers that suggested the successfulness of the implementation of TQM can improve the product and services, reduce cost, the customer becomes more satisfied, and increase financial performance. Ahire et al., (1996) based on the researches stated that the successful implementation of TQM not only have a potential increases the organizational effectiveness and competitiveness, but also increases the quality of product and organizational performance.

In this paper, the investigation of the influence of TQM on manufacturing plant performance is a function of four areas management practices within the TQM system to assess: management of process quality, human resources management, strategic quality planning, and information and analysis. Thus, the hypothesis offered for testing are:

Hypothesis 1 : The implementation of TQM has an influence on manufacturing plant performance.

Hypothesis 1a: Management of process quality has an influence on manufacturing plant performance.

Hypothesis 1b: Human resources management has an influence on manufacturing plant performance.

Hypothesis 1c: Strategic quality planning has an influence on manufacturing plant performance.

Hypothesis 1d: Information and analysis has an influence on manufacturing plant performance.

2.2. The Influence of Manufacturing Plant Performance on Competitive Advantage.

Organization performance is a measurement used in understanding how far organization organized all its aspect to achieve common goal. Porter (1985) stated that competitive advantage developed from values created by the company for its customers beyond costs of creating the values. If the company can maintain its

performance above industry average or can create values for its customers beyond cost of creating the values, the company will achieve competitive advantage. A study based on survey by Flynn, Schroeder, & Morris (1997) suggested that there was a relationship between plant performance and competitive advantage. The study also stated that the company that has high performance will be able to achieve competitive advantage.

Flynn et.al., (1995) stated that company's performance has a positive influence on competitive advantage. Company's performance on that research measured by perceived quality market outcomes which focus on management perspective toward quality of product and services for the customers relatively compared with its competitors.

Based on the empirical evidence, the hypothesis offered for testing are:

Hypothesis 2: The Manufacturing Plant Performance has an influence on Competitive Advantage

3. Research Method

3.1. Sample

The sample was comprised of data collected as a part of larger data collection effort, which measured TQM practices, manufacturing plant performance and competitive advantage of manufacturing plant in Indonesia. The sample was drawn from manufacturing plant that has ISO: 9001 or 14000 certification. The data of manufacturing industry plant was drawn from Trade and Industry Department, The Environmental Ministry and Profile & Directory of Indonesian Plant ISO Certificate. 6th Edition of 2006. Purposive sampling is used as the sampling method at this research.

3.2. Variables

3.2.1. TQM Practices

A set of questionnaire items was developed that correspond to the manufacturing plant. TQM Practices are measured by 31 questionnaires items which was developed by Choi and Eboch (1998). The items were scored by a five-point likert scale, where a value of 1 indicated strongly disagree and value of 5 indicated strongly

agree of the existing implementation of TQM.

3.2.2. Manufacturing Plant Performance

A set of questionnaire items was developed to correspond to the manufacturing plant. Manufacturing Plant Performance was measured by 7 questionnaires items as developed by Choi and Eboch (1998). The items were scored by a five-point likert scale, where a value of 1 indicated strongly disagree and value of 5 indicated strongly agree of the existing manufacturing plant performance.

3.2.3. Competitive Advantage

A set of questionnaire items was developed to correspond to the manufacturing plant. Competitive Advantage was measured by 5 questionnaire items as developed by Flynn, Schroeder, & Sakakibara (1995). The items were scored by a five-point likert scale, where a value of 1 indicated strongly disagree and value of 5 indicated strongly agree of the existing competitive advantage.

4. Analysis Model

The analysis model of this research was multiple linear regression method and linear regression method. The analysis model of multiple linear regression method was formulated as below (Gujarati, 2003):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \mu_i$$

Where:

Y= dependent variable

β_0 = constant

$\beta_1, \beta_2, \beta_3, \beta_n$ = regression coefficient

$X_1, X_2, X_3, \dots, X_i$ = independent variable

μ_i = Disturbance error

The analysis model of single regression method formulated in as below (Gujarati, 2003):

$$Y = \beta_0 + \beta_1 X_1 + \mu_i$$

Where:

Y= dependent variable

β_0 = Constant

β_1 = regression coefficient

X_1 = independent variable

μ_i = Disturbance error

5. Data Collection

The data collection in this research was done by mail survey through delivery of questionnaires to the operation manager at various manufacturing plant at the Industry Zone of Jakarta, Bandung, Semarang,

Yogyakarta, and Surabaya. All together, 100 questionnaires were distributed to operations manager in each of the plant surveyed. There was a high participation rate from the plant contacted (69%), with a total of 69 responses received from the 69 plant. Completed questionnaires were reviewed to identify responses that were incomplete for any of the key variables assessed. From the total questionnaires, it was found that there were 9 incomplete questionnaires that must be rejected from the analysis.

6. Reliability and validity of the survey instrument

The survey instrument was evaluated for reliability and validity. Reliability is frequently defined as the degree of consistency of a measure. The internal consistency of a set of measurement items therefore refers to the degree to which items in the set are homogenous. Reliability analysis is a correlation-based procedure. Internal consistency for the four elements was estimated using the reliability coefficient, cronbach alpha, ranging between the values 0.00 and 1.00 (Hair et al., 2006). Using the SPSS for windows reliability test program, an internal consistency analysis was performed separately for the items under each of the model elements shown in table 1. The reliability coefficient (cronbach's alpha) of the criteria ranged between 0.8275 and 0.9401 indicating that each of the items has a high degree of consistency.

A measure has construct validity if it measures the theoretical construct that it was designed to measure. The construct validity of a construct was evaluated by using principal components factor analysis (Hair et al., 2006). Items that had a loading factor less than 0.4 or don't measure the loading factor itself were eliminated. The results are shown in table 1.

Table 2. Multiple Regression Analysis between TQM Variables and Manufacturing plant performance.

Independent Variable	Coefficient		
	B	t	Sig
Constant	-0.328	-2.940	
Management of process quality	PQ 0.225	2.109	0.040
Human resources management	HR 0.297	2.324	0.024
Strategic Quality Planning	SQP 0.181	1.287	0.203
Information and Analysis	IA 0.319	2.716	0.009
Dependent Variable: Manufacturing plant performance			
F	4.688	Sig	0.003

Table 3. Single Regression Analysis between Manufacturing Plant Performance and Competitive Advantage

Independent Variable	Coefficient		
	B	t	Sig
Constant	2.552	3.683	.001
Manufacturing Plant Performance	0.367	2.074	.042
Dependent Variable: Competitive Advantage			
F	4.303	Sig	.042

7. Analysis and Result

7.1. The Influence of TQM Implementation on The Manufacturing Plant Performance.

Result of the multiple regression analysis toward manufacturing plant performance as the function of the implementation of Total Quality Management (TQM) showed $F= 4.668$, significant at the level $p = 0.003$. By using the significant level $\alpha = 0.05$, it means that four areas management practices within the TQM system (TQM variables) assessed management of process quality, human resources management, strategic quality planning, and information and analysis, have an influence to the manufacturing plant performance. In addition, hypothesis testing by statistically examining each of the areas management practices within the TQM system showed that of all areas management practices within the TQM system, only three areas management practices have significant influence on the manufacturing plant. The three areas of management practices are: management of process quality, human resources management, and information and analysis. Based on the result of hypothesis testing, hypothesis 1a, 1b, and 1d was supported, and hypothesis 1c was rejected. Complete results of the hypothesis testing of areas management practices toward manufacturing plant performance can be seen at the list below.

Based on the result of the testing of hypothesis 1a, it was known that management of process quality had an influence on manufacturing plant performance. This result was relevant with the research conducted by Choi and Eboch (1998) that suggested there was a positive relationship between process quality and manufacturing plant performance. Research by Lee & Lee (2003) also suggested that there was a significant influence between process management and quality result. Prajogo (2003) stated that based on the research of Jack, Stephens, & Evans (2001), management of process quality will lead to how the process in the organization was

designed, managed, and improved in order to obtain performance improvement. The result of testing of hypothesis 1b stated that human resources management had an influence on manufacturing plant performance. It was relevant with the Choi and Eboch's research (1998) that stated there was a positive relationship between human resources management and manufacturing plant performance. Human Resources Management play an important role on the successfulness of TQM's implementation. Lee & Lee (2003) stated that based on many studies, the efforts for maintaining high quality was depending on the usage of best capability of human being in the organization.

Based on the result of testing of hypothesis 1d, it was known that information and analysis has an influence on manufacturing plant performance. This result was not relevant with the research conducted by Choi and Eboch (1998) that stated there was no positive relationship between information and analysis and manufacturing plant performance. Lee & Lee (2003) suggested that information and analysis play a role on evaluating how the organization convince the availability of real time data and information and high quality data for the user's interest. Sureshchandar et al., (2001) stated that information quality and information analysis was very useful or the company to monitor quality and organization activities.

Based on the overall testing hypothesis, it was known that hypothesis 1c was rejected. The result of that hypothesis testing means strategic quality planning doesn't have an influence on manufacturing plant performance. This result was relevant with the research conducted by Choi and Eboch (1998) that stated there was not positive relationship between strategic quality planning and manufacturing plant performance. Render & Haizer (2004) stated that the increasing quality of the organization was a long term quality strategy that requires the development of quality culture which involved long term process which at times make it fail. Jun et al., (2004) suggested that there were many

obstacles that caused failures of the implementation on TQM practices on the organization, so it cannot provide the benefits expected such as the improvement of the manufacturing plant performance. The obstacles are: there are not enough human resources to implement TQM program effectively, unclear quality planning, and strategic plans does not include quality objectives. Beer (2003) also stated that unclear strategy formulation and conflicts between priorities in the organization was an obstacle on TQM implementation that caused the TQM implementation failure.

7.2. The Influence of Manufacturing Plant Performance on The Competitive Advantage.

Result of the single regression analysis toward competitive advantage as the function of the manufacturing plant performance showed $F = 0.367$, significant at the level $p = 0.042$. By using the significant level $\alpha = 0.05$, it means that manufacturing plant performance has a positive influence on the competitive advantage. In addition,

8. Conclusions

TQM is an overall organizational phenomenon. Although this has been described in the conceptual literature and empirical research, there has been ambivalence surrounding the relationships between the implementation of TQM and organization performance. Conflicting reports have been published regarding the relationships between the implementation of TQM and organization performance. The present study attempts to fill the gap by identifying the elements of TQM that have an influence on organization performance. The central findings of this study are that the implementation of TQM has a positive influence on manufacturing plant performance. Three elements of TQM, management of process quality, human resources management, and information and analysis have a significant positive effect, but the other element in this study (strategic quality planning) does not. In addition, the other finding of this research is manufacturing plant performance has a positive influence on competitive advantage.

hypothesis testing by examining statistically manufacturing plant performance showed that regression coefficient of manufacturing (B) = 0.367, significant at the level $p = 0.042$. It means that manufacturing plant performance significantly has influence on competitive advantage. Completely results of the hypothesis testing of manufacturing plant performance can be seen at table 3. The result of the hypothesis testing was relevant with the research conducted by Flynn, Schroeder, & Sakakibara (1995) that suggested there was a positive relationship between plant performance and competitive advantage. The result of the research also stated that the company that has a high degree of performance has a competitive advantage. Porter (1985) stated that competitive advantage developed from values created by the company for its customers beyond costs of creating the values. If the company can maintain its performance above industry average or can create values for its customers beyond cost of creating the values, the company will achieve competitive advantage.

The research reported here is of a pure examination of the influence of TQM on manufacturing plant performances and the influence of manufacturing plant performance on competitive advantages. This research does not test the mediating effect of manufacturing plant performance on TQM and competitive advantage. For the future research, it is suggested to study the mediating effect of manufacturing plant performance on TQM and competitive advantage.

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