

Total Quality Management in Taiwan's Telecommunication Industry

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Abstract

Following the trend of global telecommunication liberalization, the telecommunication industry in Taiwan will be a star industry and grow up quickly in the future. This study uses questionnaires to survey the implementation issues of total quality management in Taiwan's telecommunication industry. Most of the thirty-nine telecommunication companies surveyed herein are medium-sized with fairly weak quality performance. Advanced quality management training programs (such as experimental design) are seldom implemented and decision-makers do not pay much attention to training programs related to TQM.

Key words: Telecommunication industry, Quality management, TQM, Taiwan

1. Introduction

In the 21st century, we are entering into an era of information technology. Companies must effectively master information technology to remain competitive in the increasingly competitive market. The recent trend towards liberalizing global

telecommunications has created tremendous potential business opportunities. Taiwan's telecommunication industry is expected to expand to over NT\$300 billion by 2005 with a 17.2% annual growth rate second only to the semiconductor manufacturing industry according to Taiwan Economic Research Institute's projection (Wu, 1999).

Corporations must offer high quality, low cost products to attract consumer attention and build a name brand to sustain their competitive advantage. Quality management is an essential part of internal corporate policy that not only determines product quality, but also impacts the corporations future development. Therefore, all companies should invest substantial effort into quality improvement to strengthen their competitive advantage. Ways to improve quality range from quality monitoring in the early days to most recent total quality management (TQM). The quality management system develops a management style that satisfies customer needs. This investigation will fill a void in the research by discussing Taiwanese telecommunication industry quality management by focusing on TQM. The Taiwanese telecommunication industry is divided into telecommunication services and the telecommunication production industry; this work focuses on the telecommunication production industry.

This work will present some practical conclusions for telecommunication manufacturers in Taiwan after discussing TQM theory and performing the practical analysis listed below:

1. The current use of TQM in the Taiwanese telecommunication production industry is detailed.
2. The correlation between the implementation

of total quality management and quality performance in Taiwan's telecommunication production industry is examined.

2. Literature review

TQM has received widespread attention from both researchers and practitioners since it has become an essential part of manufacturing and service organizations. Although TQM has been extensively studied, a universally accepted definition does not exist. According to the Department of Defense (1989), TQM integrates human resources and scientific methods to continuously improve an organization. Therefore, TQM can be viewed as a management operation philosophy.

Oakland (1994) defines TQM as an approach to improving effectiveness and flexibility of business as a whole. It is an essential way of organizing and involving the whole organization, every department, every activity, every person at every level.

Most researchers believe that TQM emphasizes leadership, customer satisfaction, employee involvement, continuous improvement supplier partnership and performance measures. Huq and Stolen (1998) developed a theoretical framework consisting of nineteen key TQM dimensions by extending the suggestions made by the quality sages

Crosby, Deming, Frigembaum, Ishikawa, Juran and Taguchi. Their analysis confirmed the hypotheses on the management, control and implementation dimensions of TQM in manufacturing and service companies.

Several recent studies have examined TQM implementation. For instance, Chen and Lu (1998) identified Taiwanese cultural issues, particularly Confucian tenets, as important factors in the implementation of TQM in a single local company.

Gunasekaran (1999) presented a framework for TQM implementation based on TQM implementation issues in a gas turbine company. Based on the literature and case experience, a framework for the implementation of TQM is presented. Krasachol and Tannock (1999) used case-study analysis to investigate how three Thai companies adopted TQM. Sun (1999) revealed that the components of a TQM program may vary from country to country. His study discovered that the TQM enablers such as quality leadership, human resource development, and quality information enhance customer satisfaction and business performance. However, none of these TQM enablers can guarantee better results. Sun's study also found that most of the sampled companies have not yet fully implemented TQM and it will be a long journey for them to continue the implementation. Longo and Cox (2000) investigated managers'

perceptions of the TQM programs applied in their organizations. Interviews were conducted with the managers responsible for 'quality initiatives' in the head offices of some of the largest companies in British financial services. Hides et al. (2000) investigated how certain projects are utilized to adopt total quality principles. Sohal and Terziovski (2000) discussed trends in the adoption of quality management practices in the Australian manufacturing industry and highlighted some of the barriers to the adoption of such practices. Furthermore, their paper discussed the factors that are considered to be critical to the adoption of TQM in Australian manufacturing.

Terziovski and Samsons (1999) examination of the strength of the relationship between TQM practice and organizational performance discovered that TQM tends to have mixed results when covaried for company size and industry type. Significant differences exist in relationship between TQM and organizational performance across industry sectors and different size companies (particularly on the effect of defect rate, warranty costs and innovation of new products) since the relationship between TQM and organizational performance was unaffected when covaried for ISO 9000 certification status. Parzinger and Nath (2000) investigated the relationship between TQM implementation factors and

measures of quality for software development.

3. Research methodology

This study is based on a survey. The questionnaire used herein was based on the TQM dimensions developed by Huq and Stolen (1998). It contains ten management dimensions and nine control and implementation dimensions: the management dimensions are (1) quality mission statement, (2) customer focus, (3) management commitment, (4) work environment, (5) communications in the company, (6) performance appraisal system, (7) statistical evidence of quality, (8) familiarity with TQM, (9) measures of quality and (10) causes of quality variation while the control and implementation dimensions are (11) customer feedback vehicles used, (12) commitment for continual improvement, (13) problem solving approach, (14) activities to remove barriers for reaching consensus, (15) comparison of actual with planned performance, (16) education and training, (17) supplier development, (18) quality circles/quality improvement teams, etc. and (19) application of advanced analysis techniques.

A five-point Likert type scale was used to quantify the responses relating to the TQM

dimensions. The numbers represent the strength of agreement, correlation agreement, perception or opinion, concerning the question item. For example, if a question asks to what extent the company has trained the employees in TQM concepts and techniques, five represents the high end of the scale while one stands for the least. In addition, each company was asked to assess their quality performance (i.e. the defect rate) over the past three years and to indicate whether they have won any quality awards (Deming Prize, National Quality Award of Taiwan, etc.). Other background information included the: size of the company, number of employees, and company activities.

The survey population was selected from the Industrial Technology Information Services (Taiwan) database. One hundred and fifty firms were randomly selected from the approximately 300 telecommunication manufactures in Taiwan. The selected firms were contacted by telephone and mail while the question responses were obtained by repeat visits and interviews. Only the manager, supervisor, or senior engineer of the quality department were interviewed. The investigation was performed over a six-month period (from July to December 1999). Each company was visited between one to three times. In the end, a total of forty-five firms participated in this study.

Only thirty-nine of the forty-five questionnaires returned were deemed valid for further analysis. A variety of statistical methods, including SPSS and SAS, were utilized to analyze these data.

4. Results

The valid questionnaires returned for this research represented 13.59% of the telecommunication companies and 16.04% of total market capitalization of telecommunication companies in Taiwan. Most of the respondents were mid-sized companies with a four to twelve year history. Moreover, most (76.92%) of the companies engage in telecommunication equipment manufacturing.

Table 1 presents an analysis of the survey results on management dimensions while the control and implementation dimensions are illustrated in Table 2. The following hypotheses are based on the questionnaire analysis:

H1: There should not be any significant difference in the ten management dimensions as practiced by Taiwan's telecommunication manufactures.

H2: There should not be any significant difference in the nine control and implementation dimensions as practiced by Taiwan's telecommunication manufactures.

On manage $\chi^2(9) = 74.35$, $p < 0.01$. We

conclude that these ten management dimensions are significant different and can offer a comparative analysis of TQM issues in the telecommunication industry.ment dimensions, the research results indicate that the majority of respondents supported the statement that the companys quality mission statement is adequate for the company to sustain and grow in the current environment while the company has trained most of the employees in TQM concepts and techniques obtained less support. To realize whether these ten dimensions are significant different, we use Friedman rank test and obtain

On control and $\chi^2(8) = 81.80$, $p < 0.01$. We conclude that these nine control and implementation dimensions are significant different and can offer a comparative analysis of TQM issues in the telecommunication industry. implementation dimensions, research results indicate that most respondents agreed with the statement that the company has in continual process control and improvement; the goal is zero defects through development of foolproof methods while few concluded that the practice of the company has used advanced quality techniques (such as the Taguchi method and experimental design) to solve various quality problems. To realize whether these nine dimensions are significant

Table 1 Survey results (management dimensions)

| Question type | Description | Mean rank |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1. Quality mission statement | The company's quality mission statement is adequate for growth in the current environment. | 6.55 |
| 2. Customer focus | In addition to incorporating the external customer preferences in the products and services, the company believes that the internal customer must be satisfied. | 6.53 |
| 3. Communications in company | The company believes in team work and making decisions based on consensus. | 6.51 |
| 4. Worker empowerment | The company has made employees responsible for quality, they are encouraged to make suggestions, and in many cases allowed to take actions. | 6.09 |
| 5. Causes of quality variation | The company has identified the errors that are built into the system (common causes) and the errors that can be controlled by the workers (special causes). | 5.77 |
| 6. Performance appraisal system | The reward system is based on team performance. | 5.76 |
| 7. Management commitment | Top management is committed to implementing TQM by overhauling the company culture. | 5.51 |
| 8. Statistical evidence of quality | Process performance is monitored by the use of statistical tools, and suppliers are required to provide statistical evidence of quality. | 5.17 |
| 9. Measures of costs of quality | The company has developed measures of costs of prevention, inspections, appraisal (costs of conformance), and costs of scrap and rework, complaints, returns, etc. (costs of nonconformance) | 3.77 |
| 10. Familiarity with TQM | The company has trained most of its employees in TQM concepts and techniques. | 3.35 |

different, we use Friedman rank test and obtain on quality result, Taiwan telecommunication companies defect rate averages 5.72% while the standard deviation is 7.58%. These data indicate that there is room for improvement in Taiwan's

Telecommunication companies quality management. In this study, the impact of TQM implementation on the quality performance of an organization is investigated. A hypothesis regarding the relationship between TQM and quality

Table 2 Survey results (control and implementation dimensions)

| Question type | Description | Mean rank |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 11. Commitment for continual improvement | The company has in continual process control and improvement; the goal is "zero defects" through development of foolproof methods. | 6.55 |
| 12. Problem solving approach | The company uses a team approach that entails idea generation, alternative evaluation and consensus building to solve problems. | 6.00 |
| 13. Activities to remove barriers for reaching consensus | The company solicited the opinions of employees to remove barriers for reaching consensus. | 5.78 |
| 14. Education and training | The company has spent an enormous amount of time educating employees. | 5.62 |
| 15. Comparison of actual with planned performance | Cost is used to compare the actual and planned quality performance. | 5.51 |
| 16. Customer feedback-vehicles used | The company uses questionnaires or interviews to obtain the external customer requirements to enhance products/services quality. | 4.69 |
| 17. Supplier developmen | The number of suppliers has reduced since the company adopted TQM. The company works closely with them to develop long-term relationship. | 4.08 |
| 18. Quality circles, quality improvement teams, etc | The company periodically implements quality activities such as quality circles, quality improvement teams, or suggestion systems. | 3.92 |
| 19. Application of advanced analysis techniques | The company has used advanced quality techniques (such as the Taguchi method, experimental design, and regression analysis) to solve various quality problems. | 2.85 |

performance is formulated as follows: H3: TQM has a positive impact on quality performance. This work utilized the Pearson correlation analysis to demonstrate that telecommunication companies believe the better we can explain the causes of quality

variation, the more can be done to help improving defect rate (correlation coefficient = -0.371, p -value = 0.02).

Approximately 30% of Taiwanese telecommunication companies have adopted TQM. This study further investigated the

relationship between companies that have implemented or are implementing TQM and 11 companies that have obtained quality awards. The hypothesis is formulated as follows:

H4: Obtaining quality awards is directly related to implementing TQM.

Using a ϕ correlation analysis, the research results indicated that there is no conclusive relationship between companies implementing TQM and being awarded (correlation coefficient = 0.114, p -value = 0.478) probably because it is difficult to measure TQMs impact on quality. Moreover, companies are more inclined to implement ISO 9000 series quality systems and strong internal departmental selfishness within these companies may also have detracted from the overall quality of their product. These limitations restricted the improvement in overall quality and prevented these companies from winning awards.

5. Conclusions

Local telecommunication firms must be as competitive as possible to win customers in a very aggressive global industry. Companies must gain competitive edges by improving the quality of their products. This study investigated the total quality management status in Taiwan's telecommunication industry

by repeat visits using a questionnaire modified from Huq and Stolen (1998).

Our investigation found that most of the surveyed telecommunication manufacturers were medium-sized firms and there is room for improvement of quality performances. These manufactures generally did not provide inside training classes on advanced quality control technologies (such as experimental design, Taguchi methods and regression analysis) and most managers ignored TQM concept training. These trends should be reversed and it is recommended that companies invite related specialists and academicians and provide lectures regarding statistical methods and related advanced quality management technologies regularly to enhance their ability in data analysis and application. By doing so, it will also provide evidence for the managers to make decision and strategies.

This study also found that most companies have developed the vision and the mission statement for the organization, but they did not periodically implement quality activities such as quality circles, quality improvement teams, or suggestion systems. Once the direction and objective were developed, however, the TQM implementation approach should be modified to match the specific needs of each organization. The required quality activities

should be designed into the implementation procedure in order to provide a continuous improvement environment; this can further improve employee involvement. Also, based on this study, we found that many companies did not work closely with their suppliers. However, integrating the voice of the customer and supplier in order to improve the quality of products and processes is important. Probably, strategic alliances developed with key customers and suppliers can provide significant enhancement.

Since it is difficult to measure the effectiveness of TQM, most telecommunication manufactures are unwilling to implement it. Or if they do, they just do it by words. Some managers will pay attention to TQM only when the company is facing severe problems. Although TQM may be incapable of dramatically enhancing quality in the short-term, it will gradually enhance the overall quality of the company. Therefore, all employees should familiarize themselves with the TQM concept and applicable technology to enhance their firm's quality performance. In addition, this research studied the relation between quality performance (i.e. defect rate) and TQM. The results demonstrate that "the better we can explain the causes of quality variation, the more can be done to help improving defect rate." Finally, this study indicates that there is no conclusive relationship between

implementing TQM and winning quality awards.

This study does not address the ISO 9000. Future researchers can compare the effectiveness of the TQM and ISO9000 to study their respective strengths and weaknesses and use this result as reference for quality improvement.

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