

Total Quality Management for Improving Services of Information Technology Based Organizations: a case study

Abstract

This paper applies TQM theories to facilitate improving IT products/services. A TQM-business framework is proposed based on business performance factors in IT organizations. The framework key elements are transformed to a proposed AHP model for further evaluation through a cases study while using the expected values of the collected data.

Keywords

Total Quality Management, Information Technology, Analytical Hierarchical Process

1. Introduction

Quality is the overall experience which a customer perceives through interacting a product and services. Quality has a long term impact on the satisfaction of customers (Omachonu et. al. 2008). Customer's satisfaction and service quality are interlinked and these create value for customer and help him/her to make decision whether the services justify the service cost. All elements of customer satisfaction have direct bearing on customer satisfaction and value of service (Chau & Kao, 2009). Researchers on quality have strongly emphasized on continuous improvement of products and processes and have set a broad set of tools and organizational mechanisms for the purpose.

It is frequently argued that IT investments are very important elements in increasing productivity and reducing costs (Bessen, 2002). Accordingly, Various means for improving quality and increasing productivity for IT services are being sought and implemented by service providers seeking continuous improvements in business performance. They include TQM, total productive maintenance, business process re-engineering and management, manufacturing resources planning, just-in-time, and self-directed work teams. Hence, TQM can be considered also as a facilitator, which adapt the quality principles and practices towards the application in IT promises in order to reduce wasteful investments in technology for the sake of technology only. On the other hand, IT companies may not necessarily totally

support all the TQM philosophies and its ideals towards IT services. Many IT based companies are concerned with providing good IT service to gain competitive advantage and TQM is set of customer oriented practices for delivering quality.

In this study, the TQM principles of customer focus, continuous improvement, employee empowerment are taken into account for IT service/product quality improvement such as the software development process. In particular, the research question-“What is the current status of the proposed TQM-business model implementation in IT company A?”- is investigated to explore the current situation of the proposed TQM implementation and its impact on the IT business performance. Accordingly, IT professionals as well as employees and customers are asked to identify measure and design the software/hardware product/service attributes that customer cares about and continuously monitor customer satisfaction in order to successfully apply TQM to an IT organization.

2 IT Business performance

TQM has been applied by many organizations in order to attain customer satisfaction, improved quality of services or products, productivity and profits; however, there are some mixed results of TQM effect on performance, some authors found that effectively implementation of TQM improved Financial performance (Hendirkc and Singhal, 2001), operational performance (Shah and Ward, 2003) and customer satisfaction and company performance. In this study, three elements of business performance variables will be adopted: customer satisfaction, employee satisfaction, and product and service quality.

2.1 Customer satisfaction

The customer’s opinions and perception of products and services particularly in the IT field may keep changing due to changing of business needs, the change toward a negative direction occurring considerably faster and more easily than increasing customer satisfaction. A great deal of work must be done in order to increase customer satisfaction, but only one failure may cause dissatisfaction.

2.2 Employee satisfaction

Employee satisfaction is a major driver towards adoption of a customer orientation by any organization and the educational system is no exception. Organizations strongly desire job satisfaction from their employees (Oshagbemi, 2003). Employee satisfaction can improve productivity, reduce staff turnover and enhance creativity and commitment. In IT

organizations like other organisations, some employees may be satisfied and others may not. Individuals differ in how they respond to work conditions. Many factors may affect employee job satisfaction such as working environment, relationships with supervisors and colleagues, promotion opportunities, pay, equality, job characteristics, compensation and reward systems.

2.3 IT Product/service quality

Most services, particularly IT software service is person-person oriented and consist of interactions and social affairs which require distinct skills and techniques of employee. Product/service quality can be also considered as performance. The IT service quality elements could be signified as follows:

Features – the additional attributes that enhances the basic use of IT service or performance such as speed online available services

Reliability – ability of IT service to consistently perform over time

Conformance –exactness in match with specifications

Durability –degree to which an IT service can endure under continuous function over time without failure

Serviceability -eases of update, maintenance and repair for hardware/software when needed

Aesthetics –tangible characteristics such as appearance, user friendly feeling, and visual/audio environment.

Shifting IT companies towards quality-based organization can be accomplished by the Chief Information Officers (CIOs) who would understand and support the TQM practices along with understanding the importance of top management commitment, leadership and customer focus.

3 IT Business-TQM hypothetical Framework

Based on the definitions and explanations of TQM elements and the business performance variables, the relevant hypotheses including a major hypothesis and four sets of hypotheses can be identified as follows:

Hypothesis major 1: IT business performance parameters are influenced by TQM elements

Hypothesis set 2: Customer satisfaction is influenced by customer focus, employee satisfaction, and product and service quality.

Hypothesis set 3: Employee satisfaction is affected by employee participation, recognition and reward, and education and training.

Hypothesis set 4: Product and service quality are influenced by quality system improvement, product and service design, employee satisfaction.

Hypothesis set 5: Service design is influenced by quality of product/service and education and training.

A theoretical model is hypothesized in which one major hypothesis is designed to integrate: all of the six TQM implementation elements into one distinct segment, and three business performance elements in one segment. The major hypothesis is used to test the relationship between TQM and business performance. The four sets of hypotheses are also defined to investigate the relationships between the six TQM implementation elements against each business performance element. The hypothesis framework is shown in Figure 1. The expected value of each element (box) will be used as to reflect the importance of the element with respect to TQM/business performance. The connecting line presents the possible correlation between the connected boxes (elements) to be examined in the case study. The questionnaires are then designed based on the hypothetical framework and would consist of the elements and their interconnections to be ranked by the responses.

4 The proposed AHP model

An AHP model is proposed to consider the influencing factors with regards to TQM and business performance in IT organizations. Figure 2 depicts the AHP structure built in Expert Choice software, and its hierarchy consists of five levels i.e. goal, actors, objectives, criteria, and sub-criteria as follows:

Level 1: goal: IT business performance with TQM

Level 2: actors: employee, customers and managers/IT professionals

Level 3: objectives: TQM and Business performance

Level 4: criteria of TQM and business performance e.g. training, participation, recognition and system quality

Level 5: sub-criteria of TQM and business performance e.g. job-related instruction, awareness, education and training : employee with respect to training..

TQM Elements IT Business performance elements

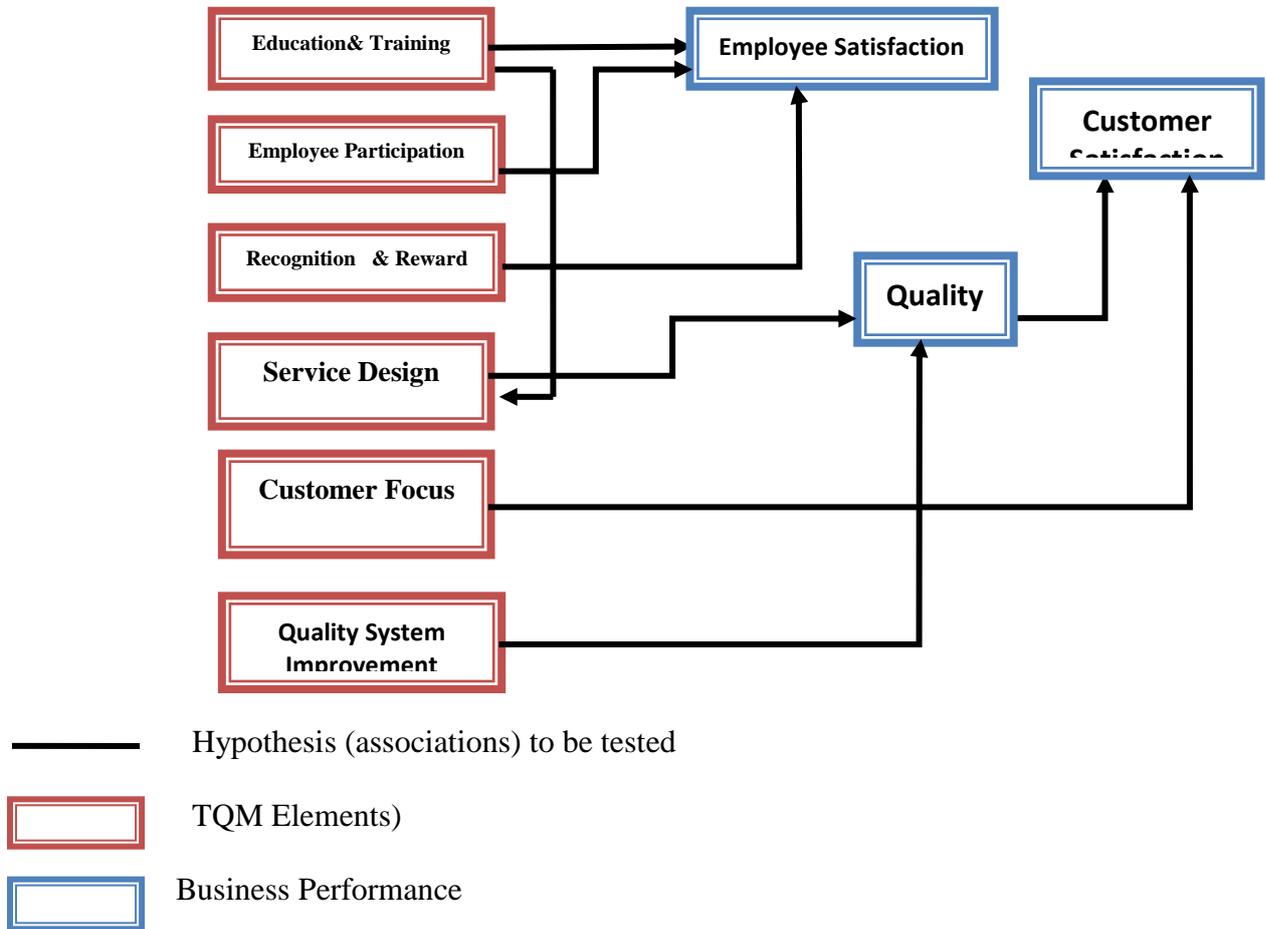


Figure 1 The overall view of the hypothetical framework

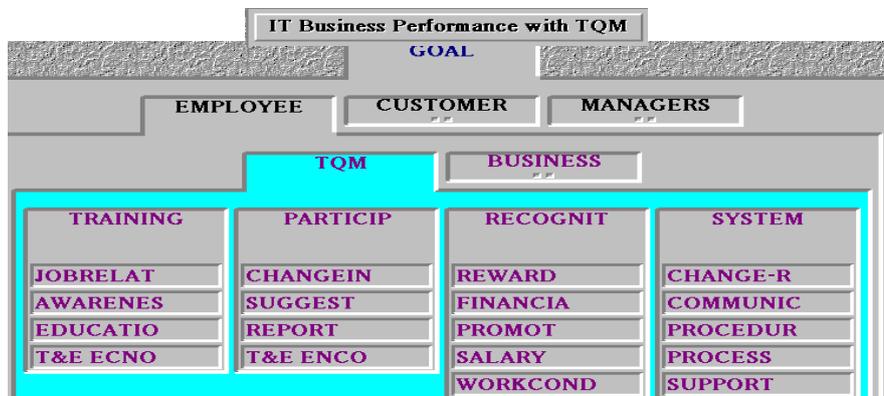


Figure 2 The AHP model of TQM-IT business performance

Data gathered in the survey are converted to the AHP model in terms of the expected values as the model input values. Expected values presents the means of sub-criteria to be evaluated against the goal, the actors and the criteria. The expected value of random variable x , written symbolically as $E(x)$, is computed as shown in Equation 1.

$$E(x) = \sum_{i=1}^n x_i P(x_i) \quad (1)$$

Where:

n : number of values for random variable $x = 5$

$x_i = i \quad \forall i = 1, 2, 3, 4 \text{ and } 5$

$p(x_i)$ = probability of x_i (cell value/100)

x_i represents the corresponding values in range of 1 to 5 for quantifying three different types of a set of five linguistic scales used in the questionnaire survey as shown in Table 1.

Type 1	Type 2	Type 3	Rate
Extremely unsatisfied	Strongly disagree	Worst	1
Unsatisfied	Disagree	Below average	2
Middle	Neutral	Average	3
Satisfied	Agree	Above average	4
Extremely satisfied	Strongly agree	Best	5

Table 1 Linguistic Scale types and quantitative rates

The proposed AHP model is generic in structure and can be reconfigured according to the nature of an IT organisation, key TQM elements, company strategic requirements, and decisive actors influencing in the organisation performance.

5 Case Study

In this section, a case study is performed in IT company A, which has over 120 employees divided into 6 main functions: networking, operations, application, IT Management portfolio, strategy and planning, and enterprise architecture managed by chief information officer (CIO) as shown in Figure 3.

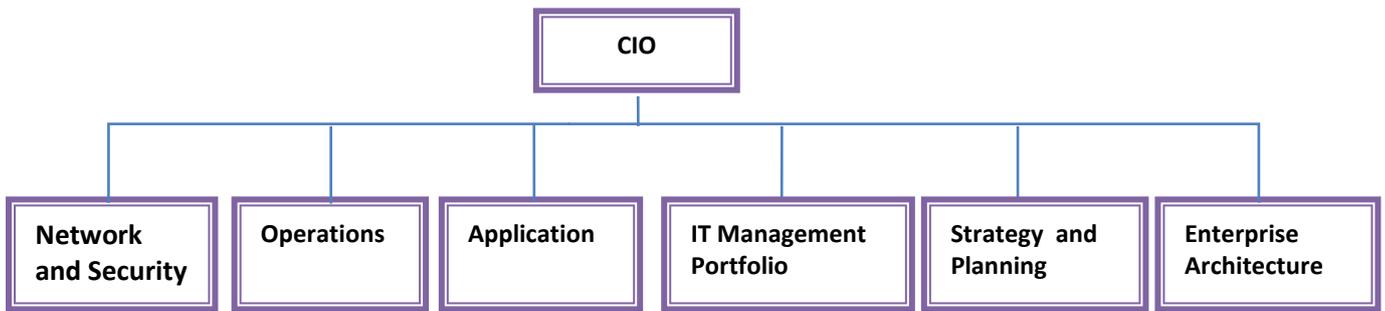


Figure 3. Organization chart for the IT company

The aim of the case study is to apply the concept of the TQM and to set number of relevant recommendations, suggestions and practices for delivering quality which consequently influence the customers' satisfaction encouragingly. In fact, obtaining competitive and satisfying services, which can be offered by TQM principles and techniques, would potentially be applied to all departments and functions within the company.

The main concern of the company is the quality of its services and products and the customer satisfaction. The company has already experienced various practices such as capability maturity model integration (CMMI) at levels 1 and 2; also it has formed various types of organization structure to improve its performance. The practices of the CMMI improved the quality of the documentation of the software product; however they had negative impact on the time of the product delivery as the practices are too long for every size of the task. The CMMI practices suggested some changes in the organization such as changing the organization structure from functional to project-oriented organization structure, and process improvements; however none of those practices addressed the employee participation, customer focus and the quality of the service or product, it was argued with the CMMI consultant that the practices had to address the needs and the concern of all the stakeholders of the company, particularly employees and customers. Trial and error approach used to be possible temporary solutions for solving the obstacles. However, the company has received numerous complaints via emails from the customers explaining the dissatisfaction of the business applications services.

6 Results

Figure 4 presents both values of the TQM elements and the business performance elements, which are around the overall average i.e. 3.00. It means that company performance regarding TQM and business seems to be contiguous. However, employee satisfaction, as a business performance element, gains the lowest rate among all the other elements.

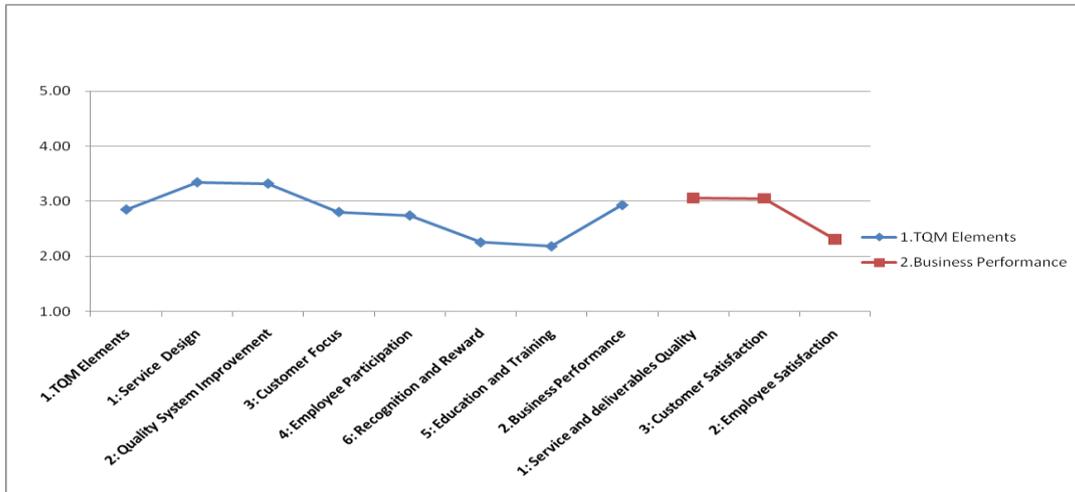


Figure 4 TQM elements and business performance variables

6.1 Criteria analysis using the proposed AHP model

As shown in Figure 5, from the managers viewpoints, system quality improvement is the most important element followed by the service design with respect to TQM and goal (IT business performance with TQM) with low inconsistency ratio of 0.04. Considering high priority of service quality, the most important sub-criteria of System will be process, changer request and procedures respectively with respect to TQM and customer (from customer viewpoints) with no inconsistency of judgments. Since the input data to the model come from the survey responses, a few judgments are missing that can be completed by some interview. However, the few missing judgments do not affect the model synthesis and inconsistency.

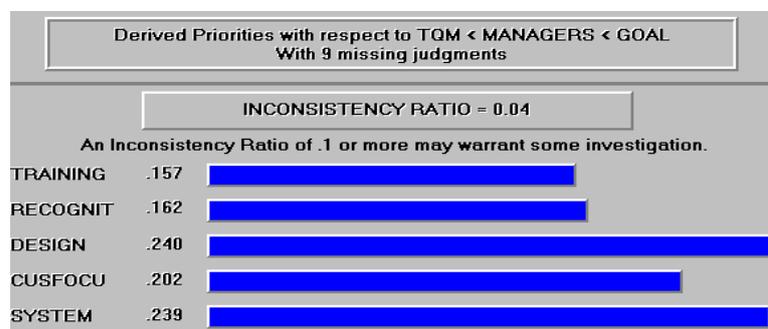


Figure 5 TQM elements from Managerial viewpoints

The quality system improvement could be recommended in two directions, one is the organization structure and the other is part of the process of support and application delivery

team. The purpose of the organization structure change is to ease the communications channels and the also to support the process flow among the employees and their superiors as follows:

- **Organization structure**

The total quality management is an integrated system among all departments in the organization, so management has to pursue it as an objective to be executed by all individuals inside the organizations. Arguably the first step that the strategic management should take in order to standardize the total quality management system, is to form an appropriate organization structure that would support the consistency of the total quality information flow amongst all departments and employees inside the organization.

As shown in Figure 6, the company management could reduce the middle part of Techno-Structure and increase the operating core. By doing this, the department will speed up the work process among the stockholders and provide the professionals with autonomy.

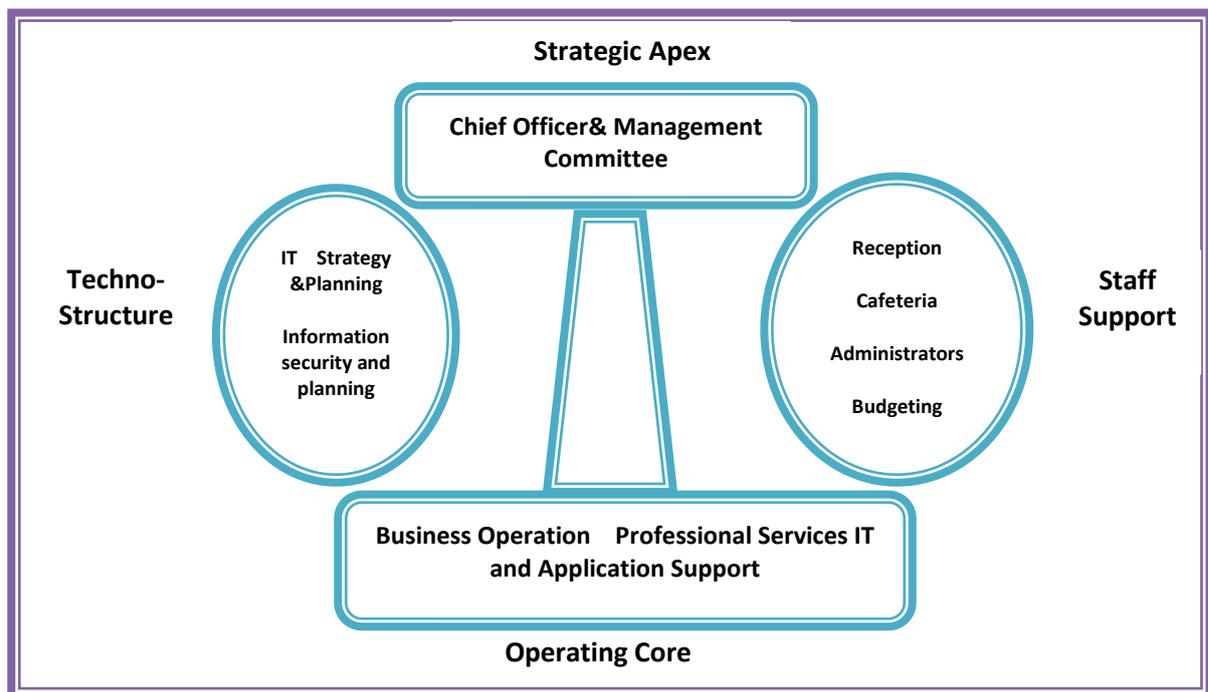


Figure 6. IT organisational professional structure.

- **Work instructions**

Work instructions consist of detailed work documents such as instructions for performing the job. The IT department should develop various work instructions so that all tasks can be conducted in a consistent manner. Work instructions are referred to the procedures and give precise details of how individual operations are to be carried out to enable them to be performed to the required quality. Work instructions should be easy to understand and not cause confusion. To achieve this, every department should be involved in drawing up relevant work instructions. Every activity in the department should be examined in greater detail before the work instructions are made. In fact, this study cannot provide a detailed process of work instruction due of the limitation of the words. It is recommended that the company can hire a management consultant for assistance of the strategy and planning department to setup a work instruction

- **Employee Participation**

Transferring the expected values and the feasible judgments, which are consequentially created by the software, system quality improvement gains the highest priority followed by employee participation and employee recognition with respect to employee and TQM with low consistency of 0.03 (see Figure 7). Since the input data to the model come from the survey responses, a few judgments are missing that can be completed by some interview. However, the few missing judgments do not affect the model synthesis and inconsistency.

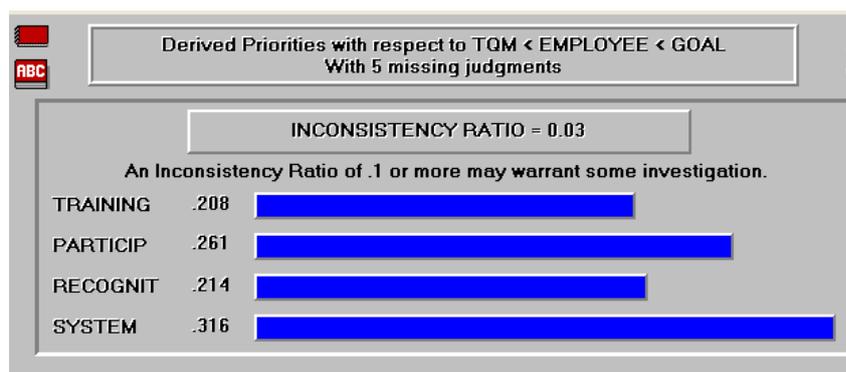


Figure 7 TQM elements from employees' viewpoint

- **Customer complaint information system**

Customer complaint information is valuable source for the department in pursuing quality improvement and customer satisfaction. The department needs to collect various types of

complaint information from customers extensively, as well as to create a central complaint registration system such as CRM system, which registers various complaints from customers. Customer complaints should be resolved effectively and promptly. All complaints received need to be aggregated and analyzed for use in improvement. The division that does not respond to customer complaints creates a negative image. Customers may share their negative experiences with other existing customers or potential customers. Bad news travels faster than good news! The department should see complaints as opportunities to improve the quality of products and services. After customer complaints are received, the firm needs to identify the serious complaints that demand in-depth study to discover their basic causes and to remedy those causes. Direct contact with customers is correlated with an emphasis on quality and customer service.

As shown in Figure.8, in the current views regarding the business objective, service quality and product quality have highest priorities, and the other elements (sub-criteria) such as conform, durability, reliability and product performance along with product fit, product specifications and requirement understanding are considered at close preferences. However, by an increase in priority of the business objective rather than TQM elements, the preference of product quality and service quality will increase. However, product fit, product specifications and requirement understanding decrease as a result of focus on business performance. The importance and attention to conformance, durability, reliability and performance would slightly increase (with lower trend).

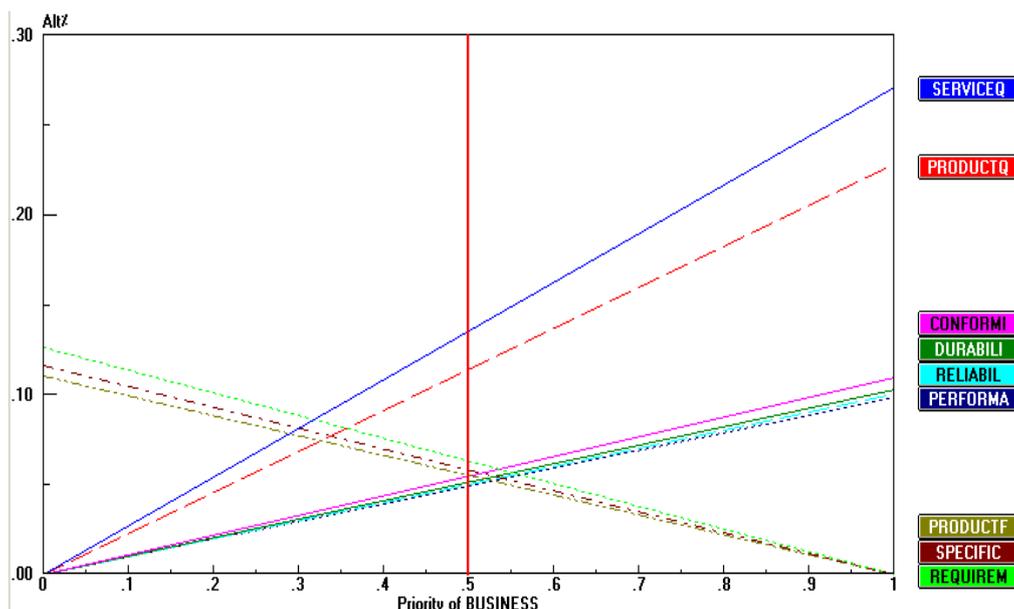


Figure 10 the business objective preference against its criteria and sub-criteria

Conclusion

TQM elements in IT industry are investigated through reviewing literature of knowledgeable gurus and scholars in the TQM and/or IT field. Accordingly, six TQM elements and three business performance elements are identified through a proposed TQM-IT in order to present the elements and their interrelations. The proposed framework is then transformed into an AHP model to get insight the criteria analysis considering influence of decisive actors of employees, customers, and managers/IT professionals.

- The results might be affected by the position of the respondents. These respondents' views might be different from those of other persons in the company.
- The results might be affected by the education and knowledge of the respondents.
- Some respondents might tend to answer questions in a way that would show a negative/positive situation

Although the proposed AHP model consists of different levels of various TQM and IT business performance elements and actors which assist proper trade-offs among elements, it suffers from a hierarchical order between two consecutive levels. The proposed model can be developed and remodelled using Analytical Network Process (ANP) which can allow all the elements can interact to each other before restrictions. However, the survey questions should also be redefined accordingly. In addition, as the influencing values might be vague in IT dynamic environments, the inner/outer dependencies can then be characterised by applying fuzzy sets. Consequently, the synthesised results can then be assessed in the predetermined fuzzy range of such elements.

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