Volume 2, Number 1, 2013

International Journal of Research in Industrial Engineering

journal homepage: www.nvlscience.com/index.php/ijrie

The Impact of Total Quality Management on Organizational Innovation

H. Zandhessami*, A. Jalili

Department of Industrial Management, Islamic Azad University, Qazvin branch, Qazvin, Iran.

ARTICLE INFO

Article history :
Received:
October 12, 2012
Revised:
December 23, 2012
Accepted:
February 10, 2013

Keywords :
Total quality management, Innovation, DEMATEL method.

ABSTRACT

Many organizations are facing competitive challenges due to the rapid pace of technological change. Management theorists and practitioners alike have called for more creativity and innovation in product lines, management practices and production processes. On one hand, Total quality management (TQM) has long been a major management practice. Recognition of TQM as a competitive advantage is widespread around the world, and few companies can afford to ignore TQM.

Therefore the purpose of this paper is to identify and extraction TQM & Innovation dimensions. In first part have been recognized four dimensions for TQM and two dimensions of Innovation, The four TQM dimensions in this study include Leadership, Employee relations, Customer focus , Continuous improvement and the two Innovation dimensions are Product innovation and Process innovation. Also, in this paper used a DEMATEL Method to examining the Causal relations these factors.

Inattention to results, the most influential factor is Leadership and more affected factor is Process innovation. As a result Leadership has more influence on Innovation.

1. Introduction

The introduction of total quality management (TQM) has played an important role in the development of contemporary management practices. Quality is considered as a key strategic factor in achieving business success. In order to enhance the competitive position and improve business performance, companies worldwide, large and small, manufacturing and service, have applied the principles of total quality [1]. Also, Total quality management (TQM) has been regarded as one of the most predominant sources of competitive advantage in the last two decades. Numerous studies have shown a positive relationship between TQM and organizational performance [2]. The critical factors of TQM can be described as best practices or ways in which “firms and their employees undertake business activities in all key processes: leadership, planning, customers, suppliers, community relations, production and supply of products and services, and the use of benchmarking [3]. TQM encompasses and facilitates all functional areas, processes, and systems of businesses, including design, development, production, distribution, and customer support. This holistic approach aims to maximize customer satisfaction based upon incessant endeavors for innovation and

*Corresponding author
E-mail address: h.zand@qiau.ac.ir

advancement [4]. On one hand Innovation is a core renewal process within organizations and a cornerstone of competitive strategy. It is defined as the development and implementation of a new idea, be it a new technology, product, organizational process, or arrangement. [5] Innovation is a main strategic tool to have a competitive advantage in such complex environments and it is a necessity for long-term success, growth, sustainable performance, and to survive as the firm's industry. For this reason, firms accept that innovation is a strategic necessity, not a strategic choice, and innovation is generally introduced as the key factor for competition in various markets [6].
Therefore this paper identifies and extraction TQM & Innovation dimensions then examining Causal relationship TQM & Innovation with DEMATEL (Decision Making Trial and Evaluation Laboratory) method.

2. Literature Review

2.1.Total quality management

TQM comprises a group of ideas and techniques for enhancing competitive performance by improving the quality of products and processes' TQM is a company-wide philosophy of quality improvement. This philosophy contends that the firm's primary goal is to meet customer requirements better by improving the quality of products and processes [7]. Also, TQM is a management process and a set of disciplines that are co-ordinated to ensure that the organization consistently meets and exceeds customer requirements. TQM engages all divisions, departments and levels of the organization. Senior management organizes all of its strategy and operations around customer needs and develops a culture with high employee participation. Companies with TQM are focused on the systematic management of data in all processes and practices to eliminate waste, and pursue continuous improvement [8]. And it has been implemented in many countries over the world to improve organizational performance in areas such as increasing profits, productivity and market share [9].

2.1.1. TQM practices

11 TQM practices are given below:
management commitment, the role of the quality department, training and education, employee involvement, continuous improvement, supplier partnership, product/service design, quality policies, quality [10]. In this study, TQM practices include Leadership, Customer focus, and Continuous improvement and Employee relations.
1-Leadership: Employees' performance enhancement is determined by top management's guidance with concrete and feasible vision. Top managements' leadership capabilities not only affect TQM implementation but also improve other organizational activities [4]. 2-Employee relations: In order to effectively participate in quality management, employees need to be adequately trained and explained about the benefits of the TQM practice. Management must ensure an organization-wide training program. Employee satisfaction and fulfillment in terms of benefit and compensation, together with better teamwork, may lead to

better performance [11]. 3-Customer focus: Customer focus, which is the most important part of production, means producing and delivering products and services that fulfill customers' present and future needs and expectations. Customer focus also refers to exceeding customers' expectations in order to ensure long-term organizational success and survival [12]. 4-Continuous improvement: Continuous improvement is the philosophy of improvement initiatives that increases success and reduces failure. Das et al. [13] defined continuous improvement as a company-wide process of focused and continuous incremental innovation. For continuous improvement, evaluation of current processes and quality management practices is necessary. Continuous improvement refers to searching for never-ending improvements and developing processes to find better methods in the process of converting inputs into outputs. By improving interlinked processes, a firm can do a better job of satisfying customers' needs and expectations [12].

2.1.2. Innovation

Samat et al. [10] suggested that innovation is equated with the adoption and application of new knowledge and practices, including the ability of an organization to adopt or create new ideas and implement these ideas in developing new and improved products, services, and work processes and procedures. Innovation, then, is considered an intangible resource that is very difficult to imitate. Such resources constitute an organizational capital, a source of competitive advantage. In the OECD Gunday et al. [14], four different innovation types are introduced. These are product innovation, process innovation, marketing innovation and organizational innovation. Product and process innovations are closely related to the concept of technological developments. In this study, Innovation types include Product and process innovations.

1-Product innovation: It is the development and introduction of a new product to the market or the modification of existing products in terms of function, quality consistency, or appearance 2- Process innovation: It involves creating and improving the method of production, and the adoption of new elements (e.g. Input materials, task specifications, information flow, and equipment) to the firm's production process [15].

3. TQM & Innovation relationship

In the past two decades, several scholars have claimed the positive relationship between TQM and innovation. The dimensions of TQM can assist an organization in creating a more innovative culture. Hence, TQM is not a hindrance towards innovation in providing new products, services, and processes, as new and improved methods can be used to attain more efficient and effective businesses [16]. Also, there are many common aspects of TQM and innovation. They both emerged as partial answers to the intense competitive pressure that manufacturing sector organizations are facing. Some elements of TQM and innovation are similar. For example, continuous improvement is a key feature of both TQM and innovation [17].

Therefore, in attention to the important role of TQM and Innovation in the Firm's performance, at first this paper examines the effect of Total quality management on Innovation Then examines the causal relations of TQM and Innovation dimensions with DEMATEL method.

4. Research method

In this section, the steps of work performance are explained (Figure 1).
After identifying and extraction TQM& Innovation dimensions, a questionnaire was planned to determine the interdependence between the factors. Therefore used by the DEMATEL technique to assess Causal relationship and the effects of factors to each other.

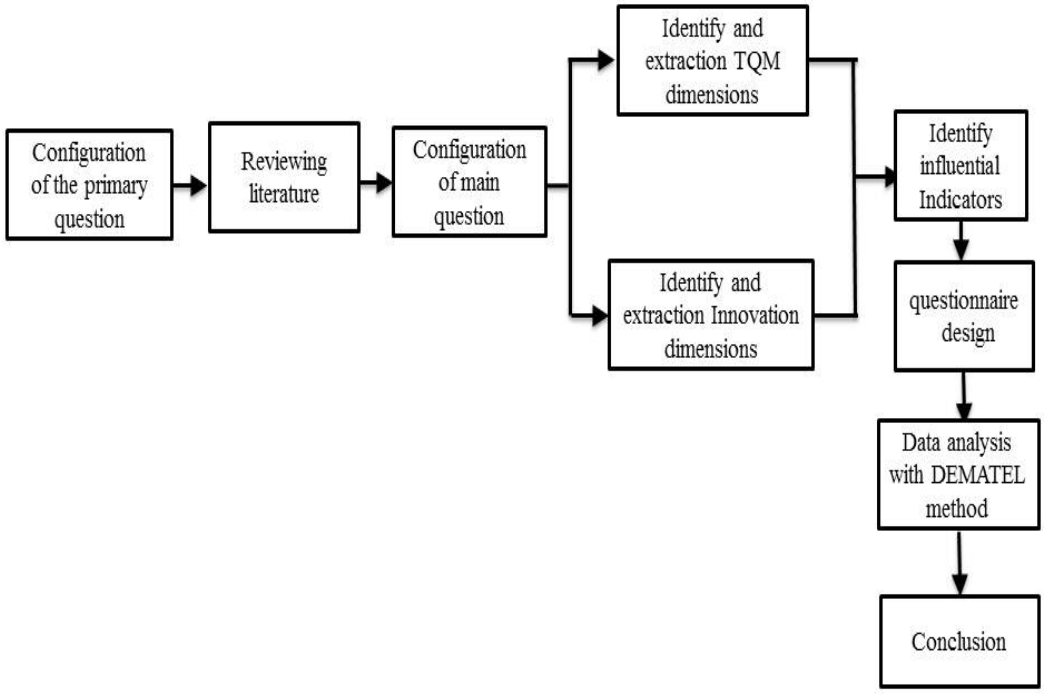

Figure1.Research method

5. Methodology

The DEMATEL method, developed by the Science and Human Affairs Program of the Battelle Memorial Institute of Geneva between 1972 and 1976, can convert the relationship between the causes and effects of criteria into an intelligible structural model of the system .The DEMATEL, used to research and solve complicated and intertwined problems, has been successfully applied in many situations, such as marketing strategies, R&D project, e-learning evaluation, managers' competencies, control systems and airline safety problems [18].

5.1.DEMATEL steps

Step 1: Generating the direct-relation matrix. We use four scales for measuring the relationship among different criteria: 0 (no influence), 1 (low influence), 2 (high influence),

and 3 (very high influence). Next, decision makers prepare sets of the pairwise comparisons in terms of effects and direction between criteria. Then the initial data can be obtained as the direct-relation matrix which is an $n \times n$ matrix A where each element of a_{ij} is denoted as the degree in which the criterion i affects the criterion j.

Step 2: Normalizing the direct-relation matrix. Normalization is performed using the following,

$$X = K. \quad .A \tag{1}$$

$$k = \frac{1}{\max_{1 \le i \le n} \sum_{j=1}^{n} a_{ij}}, \qquad i, j = 1,2,...,n \tag{2}$$

Step 3: Attaining the total-relation matrix. Once the normalized direct-relation matrix X is obtained, the total relation matrix T can be acquired by using Equation (3), where I is denoted as the identity matrix

$$T = X(1 - X)^{-1} \tag{3}$$

Step 4: Producing a causal diagram. The sum of rows and the sum of columns are separately denoted as vector D and vector R through Equations (4-6). Then, the horizontal axis vector $(D + R)$ named ‘‘Prominence’’ is made by adding D to R, which reveals the relative importance of each criterion. Similarly, the vertical axis $(D - R)$ named ‘‘Relation’’ is made by subtracting D from R, which may divide criteria into a cause and effect groups. Generally, when $(D - R)$ is positive, the criterion belongs to the cause group and when the $(D - R)$ is negative, the criterion represents the effect group. Therefore, the causal diagram can be obtained by mapping the dataset of the $(D + R, D - R)$, providing some insight for making decisions.

$$T = \left\lfloor t_{ij} \right\rfloor_{n \times n}, \qquad i, j = 1,2,...,n \tag{4}$$

$$D = \left[\sum_{j=1}^{n} t_{ij}\right]_{n\times 1} = [t_{i.}]_{n\times 1} \tag{5}$$

$$R = \left[\sum_{j=1}^{n} t_{ij}\right]_{1\times n} = [t_{.j}]_{1\times n} \tag{6}$$

where vector D and vector R, respectively denote the sum of rows and the sum of columns from total relation matrix $T = [t_{ij}]_{n\times n}$.

Step 5: Obtaining the inner dependence matrix. In this step, the sum of each column in the total-relation matrix is equal to 1 by the normalization method, and then the inner dependence matrix can be acquired [19].

6. Proposed model

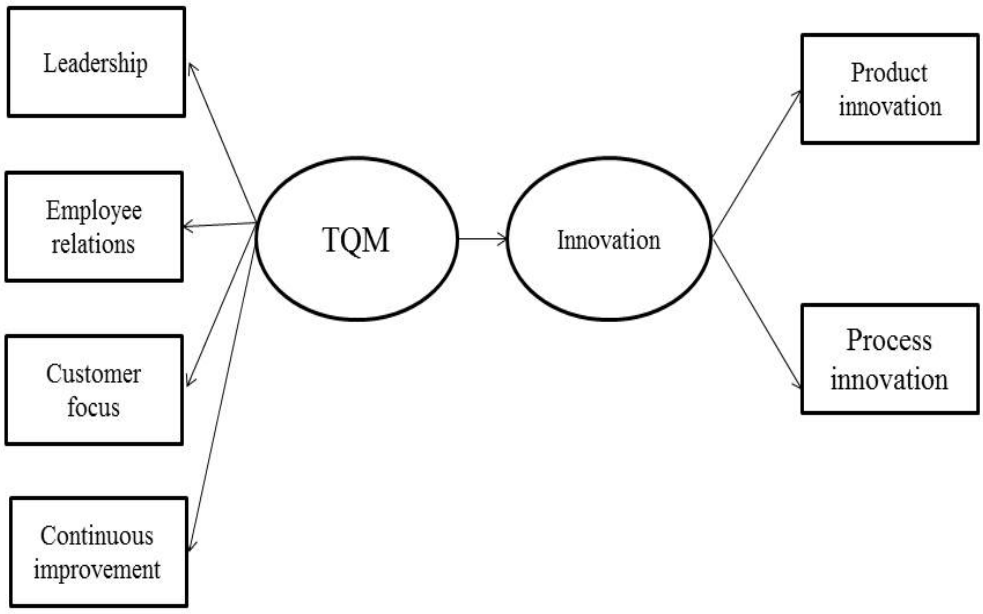

Figure2. The proposed model

7. Results

Table 1.Geometric average of Questionnaire's elements

	Leadership	Employee relations	Customer focus	Continuous improvement	Product innovation	Process innovation
Leadership	0.00	3.1	1.5	3.9	2.5	1.9
Employee relations	2.4	0.00	2.6	3.8	2.5	2.1
Customer focus	2.1	2.9	0.00	1.9	3.8	3.1
Continuous improvement	1.9	2.5	2.7	0.00	3.1	3.6
Product innovation	2.7	2.1	3.8	1.7	0.00	3.8
Process innovation	2.1	1.8	3.1	2.1	3.7	0.00

Table 2.The normalized direct-relation matrix

	Leadership	Employee relations	Customer focus	Continuous improvement	Product innovation	Process innovation
Leadership	0.00	0.22	0.10	0.27	0.17	0.13
Employee relations	0.17	0.00	0.18	0.27	0.17	0.15
Customer focus	0.15	0.20	0.00	0.13	0.27	0.25
Continuous improvement	0.13	0.17	0.19	0.00	0.22	0.25
Product innovation	0.19	0.15	0.27	0.12	0.00	0.27
Process innovation	0.15	0.13	0.22	0.15	0.26	0.00

Table3.Direct and Indirect (total) - Relationship Matrix

	Leadership	Employee relations	Customer focus	Continuous improvement	Product innovation	Process innovation
Leadership	2.54	2.91	3.17	3.10	3.54	3.42
Employee relations	2.81	2.87	3.39	3.23	3.72	3.60
Customer focus	2.95	3.19	3.41	3.29	3.97	3.87
Continuous improvement	2.84	3.07	3.46	3.06	3.81	3.75
Product innovation	2.97	3.15	3.62	3.28	3.76	3.87
Process innovation	2.74	2.92	3.34	3.07	3.70	3.40

Table4.The sum of influences given and received on criteria

	R		D		D+R		D-R
Product innovation	22.50	Customer focus	20.69	Product innovation	43.13	Leadership	1.84
Process innovation	21.92	Product innovation	20.64	Process innovation	41.08	Employee relations	1.51
Customer focus	20.39	Continuous improvement	19.99	Customer focus	41.08	Continuous improvement	0.97
Continuous improvement	19.02	Employee relations	19.62	Continuous improvement	39.01	Customer focus	0.30
Employee relations	18.11	Process innovation	19.16	Employee relations	37.73	Product innovation	-1.86
Leadership	16.85	Leadership	18.68	Leadership	35.53	Process innovation	-2.75

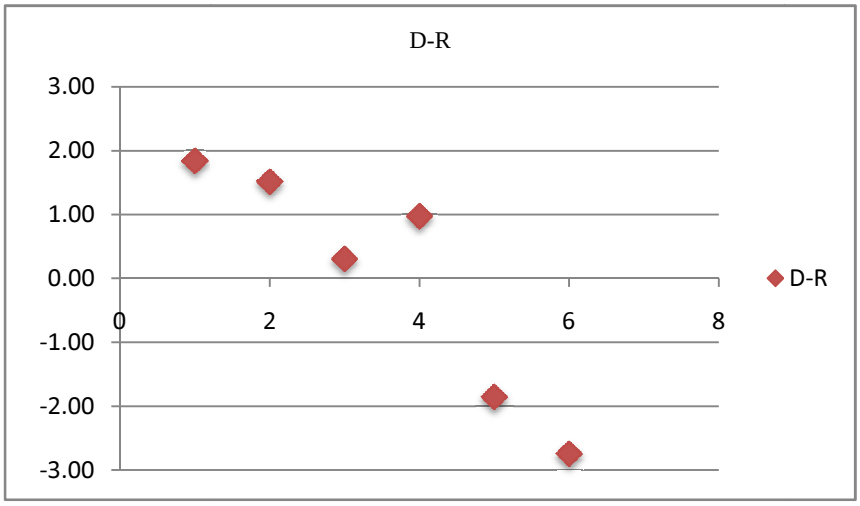

Figure 3. The priority of the factors on the basis of effective severity

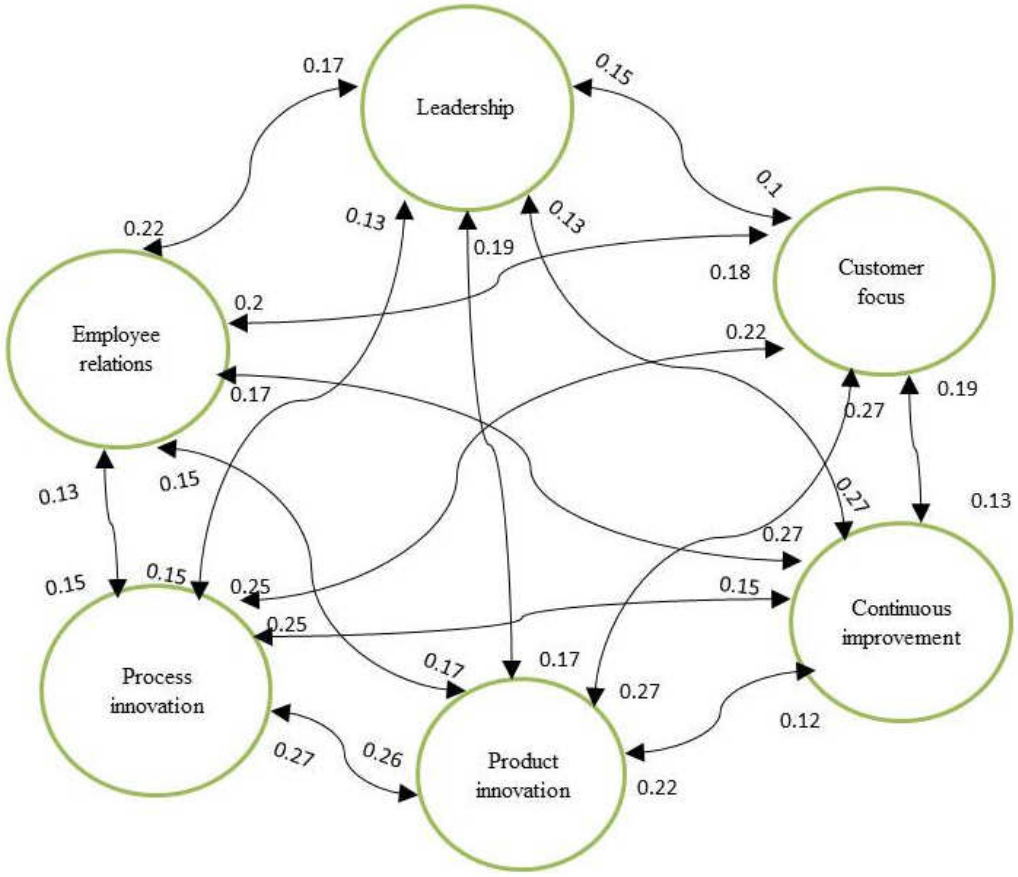

Figure 4. Relative severity of direct and indirect relations algorithms

8. Conclusions

Total quality management (TQM) is a business management strategy seeking to improve the quality of organizational management, and hence, can improve the competitiveness and value provided to customers. TQM provides a competitive edge for companies. Also, the current relationship between TQM in innovation performance and company performance have been established, research on the relationship between TQM practices and product innovation performance has not been conducted in detail. In this study a questionnaire has designed on the basis TQM & Innovation dimensions. Finally, the results of questionnaires were analyzed on the basis of DEMATEL technique. TQM included Leadership, Employee relations, Customer focus, Continuous improvement and the Innovation included Product innovation and Process innovation. According to the results, among the four criteria for TQM, Leadership is the most direct effectiveness. Also, among the two criteria for innovation process innovation is the most affected factor.

References

[1] Hoang, D.T., Igel, B. and Laosirihongthong, T. (2006), The impact of total quality management on innovation Findings from a developing country. *International Journal of Quality &Reliability Management*, Vol. 23, No. 9, pp. 1092-1117.

[2] Prajogo, D.I. and Cooper, B.K. (2010), The effect of people-related TQM practices on job satisfaction: a hierarchical model, *Production Planning & Control*, Vol. 21, No. 1, pp. 26-35.

[3] Sila, I. and Ebrahimpour, M. (2005), Critical linkages among TQM factors and business results, *International Journal of Operations &Production Management*, Vol. 25, No. 11, pp. 1123-1155.

[4] Jung, J., Su, X., Baeza M. and Hong, S. (2008), The effect of organizational culture stemming from national culture towards quality management deployment, *The TQM Magazine*, Vol. 20, No. 6, pp. 622-635.

[5] Krishnan, R.T. and Jha, S.K. (2011), Innovation Strategies in Emerging Markets: What Can We Learn from Indian Market Leaders. *ASCI Journal of Management*, Vol. 41, No. 1, pp. 21–45.

[6] Akman, G. and Yilmaz, C. (2008), Innovative capability, Innovation strategy and market orientation: An empirical analysis in Turkish software industry, *International Journal of Innovation Management*, Vol. 12, No. 1, pp. 69–111.

[7] Yu-Yuan Hunga, R., Ya-Hui Lienb, B., Fangc, S.C. and McLeand, G.N. (2010), Knowledge as a facilitator for enhancing innovation performance through total quality management, *Total Quality Management*, Vol. 21, No. 4, pp. 425–438.

[8] To¨remen, F., Karakus, M. and Yasan T. (2009), Total quality management practices in Turkish primary Schools, *Quality Assurance in Education*, Vol. 17, No. 1, pp. 30-44.

[9] Miyagawa, M. and Yoshida, K. (2010), TQM practices of Japanese-owned manufacturers in the USA and China, *International Journal of Quality & Reliability Management*, Vol. 27. No. 7, pp. 736-755.

[10] Samat, N., Ramayah, T. and Mat Saad, N. (2006), TQM practices, service quality, and market orientation Some empirical evidence from a developing country, *Management Research News*, Vol.29, No. 11, pp. 713-728.

[11] Jung, J.Y., Wang, Y.J. and Wu, S. (2009), Competitive strategy, TQM practice, and continuous improvement of international project management A contingency study, *International Journal of Quality & Reliability Management*, Vol. 26.

[12] Sadikoglu, E. and Zehir, C. (2010), Investigating the effects of innovation and employee performance on the relationship between total quality management practices and firm performance: An empirical study of Turkish firms, *Int. J. Production Economics*, Vol. 127, pp.13–26.

[13] Das, A., Paul, H. and Swierczek, F.W. (2008), Developing and validating total quality management (TQM) constructs in the context of Thailand's manufacturing industry, *Benchmarking: An International Journal*, Vol. 15, No. 1, pp. 52-72.

[14] Gunday, G., Ulusoy, G., Kilic, K. and Alpkan. L. Effects of innovation types of firm performance.

[15] Lin, R.J., Chen, R.H. and Kuan-Shun Chiu, K. (2010), Customer relationship management and innovation capability: an empirical study Conceptual framework, *Industrial Management & Data Systems*, Vol. 110, No. 1, pp. 111-133.

[16] Lee, V.H., Ooi, K.B., Tan, B.I. and Yee-Loong Chong, A. (2010), A structural analysis of the relationship between TQM practices and product innovation, *Asian Journal of Technology Innovation*, Vol. 18, No. 1, pp. 73-96.

[17] Singh, P.J. and Smith, A.J.R. (2004), Relationship between TQM and innovation: an empirical study, *Journal of Manufacturing Technology Management*, Vol. 15, No. 5, pp. 394–401.

[18] Aksakal E., Dağdeviren M. and Yüksel, I. A new hybrid approach to intern problems: AHP and DEMATEL.

[19] Amiri, M., Salehi Sadaghiyania J., Payanib, N. and Shafieezadeh, M. (2011), Developing a DEMATEL method to prioritize distribution centers in supply chain.*Management Science Letters*, Vol. 1, pp. 279–288.