A study on the effects of inter-organizational factors on the supply chain performance

Mohammad Mahdi Parhizgar and **Ahmad Javan Jafari**[*]

Department of Business, PayamNour University, P.O.Box 19395-3697,Tehran, Iran

A R T I C L E I N F O	A B S T R A C T
	In the current competitive environment, managers do their best to convert organizations under their supervision into competitive and responsive through creating capability of timely delivery of quality products and services. In the other word, they try to create value for their customers, which yield more profitability for stakeholders. In line with this, determining of inter-organizational factors and the relationships among these variables and supply chain performance plays an important role in achieving these objectives. The relationship modeling is a type of multiple criteria decision-making (MCDM) problem, which requires applying experts to determine the relationships. The Decision Making Trial and Evaluation Laboratory (DEMATEL) is an MCDM tool, which not only can convert the relationships among cause and effect criteria into a visual structural framework, but also it can be used as a technique to handle the inner dependences within a set of criteria. This paper proposes an effective solution based on DEMATEL approach to help managers evaluate the relationships between inter-organizational factors and supply chain performance.

1. Introduction

A supply chain is made up by multiple actors, multiple flows of items, information and finances. Each network node has its own customers' and suppliers' management strategies, demand arrival process and demand forecast methods, inventory control policies and items mixture. On the other hand, supply chain managers are involved in different problems for directing the organizations to the predefined destination. In other word, managing environmental changes is the most important managers' responsibility in such uncertain environment where mangers face different problems. These days, only those organizations are survived that could handle environmental conditions.

On the other hand, the internal characteristics of the organization make up critical sources for success (Barney,1991). So, increasing attention has been paid to identify what characteristics are vital to organizational success and how they exert their influence on organizational outcomes. Internal organizational context focuses on broad and relatively stable categories of organizational characteristics such as structure, culture, and strategies (Pettigrew, 1979). They constitute an

* Corresponding author. Tel: +989127141887
E-mail addresses: ajava55@gmail.com (A. Javan Jafari)

environment where organizational activities take place. There has been a large volume of studies, which examine how to cope with organizational context and organizational strategy when there are variances in organizational performance (Daft,1995; Robbins,1990).What is missing in existing literature, though, is an understanding the intervening mechanism, which explains the paths of the influence from organizational context and strategy to supply chain performance. The main factors for evaluation of supply chain performance categorized into three groups of economical, communicational and product performances and any organization, which could have the most strategic alignment tend to reach more level of these dimensions (Carmeli et al., 2010).

The purpose of this study is to examine the possible mediating impact of organizational structure, organizational culture and organizational strategy on the product quality, customer's satisfaction, gross profit and market share, which are the most important factors for evaluating of supply chain performance. The rest of this paper is organized as follows. In Section 2, a literature review is presented, In Section 3, evaluation methods are presented. In Section 4, an empirical study in SAPCO Co, one of the biggest Iranian auto makers, is illustrated. One of SAPCO's mission is to supply the needed raw materials of vehicle industry, especially for Iran Khodro Company in Iran. Finally, according to the findings of this research, conclusions and suggestions are depicted.

2. Literature review

2.1. Organizational Structure

Organizational structure can provide better understanding about organization philosophy and the way that organization is established. Some existing work explores the organizational structure using a hierarchy. Li et al. (2008) proposed a hierarchical community model to distinguish community cores from the affiliated members. Clauset et al. (2008) presented a general technique for inferring the hierarchical structure from a network, explicitly including the organizations in all scales. Grobelnik et al. (2009) employed an approach to semi-automatically construct ontology, in which the hierarchy of the ontology presents the organizational structure. In the workflow area, organization mining has also been the focus of past research (Bertino et al., 1999; ZurMuhlen, 2004; Song & Van Der Aalst, 2008). In other words, organizational structure shows how organizations are divided and they are designed to reach their goals.

2.2. Organizational Culture

According to Lewis (2002) a universal definition of organizational culture has proven elusive, however it is generally considered to be the shared values, beliefs and assumptions that exist among employees within a company that help guide and coordinate behavior (Schein, 1991). Organizational culture is generally accepted to be a holistic and multidimensional concept, which is historically determined and socially constructed (Hofstede et al., 1990). Tyrrell (2000) explained that organizational culture is constantly being negotiated as it is an emergent property of human interaction. The emerging values and beliefs coming from the ongoing negotiation and practices among group members become a source of reference for what is deemed acceptable or unacceptable in an organization in terms of right and wrong behavior (Kusluvan & Karamustafa, 2003).

The values and beliefs that underlie organizational culture normally reflect important factors for the founders and/or company leaders as they are responsible for the vision and objectives of the organization, and presumably exemplify and reinforce the core values and opinions through their own behavior (e.g., Schein, 1991; Scheres & Rhodes, 2006; Weese, 1995; Wilkins, 1983). Organizational culture is also manifested through member dialogue and behavior as well as organizational practices (Schein, 1985). It is also represented by company artifacts, dress codes, grooming standards, ceremonies, frequently recited company stories, and how a company copes with crises and these reflect an organization's values, beliefs, and underlying assumptions (Beach, 2006; Dastmalchian, 2000; Detert, 2000; Rafaeli & Pratt, 2006; Smith & Shilbury, 2004).

2.3. Organizational strategy

The link between strategy and performance management has been explored in different studies (Andon et al., 2003; Chenhall, 2003; Hartman & Vaassen, 2003; Langfield-Smith, 1997; Manzoni, 2002; Miles & Snow, 1978; Otley et al., 1995; Porter, 1985; Speckle, 2001). These findings are not always consistent (Hartman & Vaassen, 2003; Porter, 1985) and Chenhall (2003) is among those who argue that a general pattern prevails. More specifically, organizational strategies characterized by conservative orientations, featuring defender, harvest, or cost leadership strategies, can be properly served by performance management systems based on "centralized control systems, specialized and formalized work, simple co-ordination mechanisms, and attention directing to problem areas" (Chenhall, 2003: 150). Furthermore, organizational strategies characterized by entrepreneurial orientations, featuring prospector, build, and differentiation strategies can be properly served by performance management systems based on a "lack of standardized procedures, decentralized and results oriented evaluation, flexible structures and processes, complex co-ordination of overlapping project teams, and attention directing to curb excess innovation" (Chenhall, 2003: 150).

The performance management and organizational strategy literature is largely based on conventional., 20–30 year old conceptions of organizational strategy, resulting in a number of researchers questioning its usefulness (Andon et al., 2003; Campbell-Hunt, 2000; Chenhall, 2003; Hartman &Vaassen, 2003; Otley et al., 1995; Speckle, 2001; Manzoni, 2002). More specifically, it has been argued that in an increasingly competitive business world, the ability for a business unit to secure and to maintain uncontested ground to implement a strategy is becoming less likely. The emergence of corporate behemoths, presumably as a consequence of the Ricardian model, or what economists call the theory of comparative advantage, is shrinking the survival zones of many industries. Survival zone size, or what can best be described as the cost, quality, and functionality thresholds a firm must achieve to remain in business (Cooper, 1995), ultimately determines not just the number of competitors but the nature of the competition as well.

3. Evaluation method

In this section, some essentials of the DEMATEL are briefly described as follows.

3.1 The DEMATEL

The Battelle Memorial Institute conducted a DEMATEL method project through its Geneva Research Centre (Gabus & Fontela, 1972, 1973). The primary objective of DEMATEL was at the fragmented and antagonistic phenomena of world societies but later it became popular in many countries such as Japan since it became a comprehensive method for constructing a structural model involving causal relationships among complex factors. Digraphs are more useful than directionless graphs because digraphs can show the directed relationships of sub-systems. Moreover, the digraph portrays a basic concept of contextual relationships among the elements of the system, in which the numeral represents the strength of influence. The DEMATEL is based on digraphs, which could separate involved factors into cause and effect groups. To apply DEMATEL smoothly, this paper refines the version used by Fontela and Gabus (1976) and proposes five main steps as below.

Step 1: Create the direct-relation matrix, First, measure the relationship between criteria where comparison scale is divided into four levels: 0 (no influence), 1 (very low influence), 2 (low influence), 3 (very high influence) and 4 (very high influence), Create sets of the pair-wise comparisons in terms of impact and direction among different criteria. As a result, the initial data can be generated as the direct-relation matrix, which is an n×n matrix A, in which a_{ij} is denoted as the degree in which the criterion *i* influences the criterion *j*.

Step 2: Normalize the direct-relation matrix based on the direct-relation matrix A, the normalized direct-relation matrix X can be obtained through formulas:

$$X = k.A \tag{1}$$

$$k = \frac{1}{\max\limits_{1 \le i \le n} \sum\limits_{j=1}^{n} a_{ij}}, \quad i, j = 1, \cdots, n \tag{2}$$

Step 3: Obtain the total-relation matrix, once the normalized direct-relation matrix X is calculated, the total relation matrix T can be acquired by using Eq. (3), in which the I is identity matrix

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

Step 5: Set a threshold value and obtain the network relationship map (NRM), To explain the structural relationship among the criteria and keep the complexity of the system to a manageable level at the same time, it is necessary to set a threshold value p to filter out some negligible effects in matrix T. Only some criteria, whose effect in matrix T is greater than the threshold value, should be chosen and shown in a network relationship map (NRM) for influence (Tzeng et al., 2007). In this paper, experts decided the threshold value is arithmetic mean of T matrix numbers. After the threshold value is decided, the final influence result of criteria can be calculated.

3.2 Data analysis

The findings resulted from step by step methodology implementation is presented as following. This research used 10 experts of SAPCO Company.

C1: Organizational Structure, C2: Organizational Culture, C3: Organizational Strategy, C4: Product Quality, C5: Customer Satisfaction, C6: Gross Profit, C7: Market Share.

Table 1
Direct relationship Matrix

	C1	C2	C3	C4	C5	C6	C7
C1	0	0.196	0.286	0.250	0.268	0.158	0.132
C2	0.286	0	0.161	0.268	0.302	0.432	0.178
C3	0.196	0.125	0	0.179	0.179	0.152	0.196
C4	0.143	0.232	0.143	0	0	0	0
C5	0.143	0.196	0.143	0	0	0	0
C6	0.122	0.221	0.127	0	0	0	0
C7	0.151	0.320	0.321	0	0	0	0

Table 2
Inner Dependence matrix

	C1	C2	C3	C4	C5	C6	C7
C1	1.034	1.148	1.42	1.322	1.526	1.052	1.278
C2	1.340	0.998	1.540	1.451	1.532	1.231	1.416
C3	1.489	1.132	0.691	1.481	1.568	1.443	1.601
C4	0.691	0.983	0.880	0	0	0	0
C5	1.054	1.320	1.243	0	0	0	0
C6	0.931	1.219	1.471	0	0	0	0
C7	1.321	1.127	1.321	0	0	0	0

The threshold based on negotiation to experts was determined as 1.2. So, C1 effects on C3, C4, C5, C7; C2 effects on C1, C3, C4, C5, C6 and C7; C3 effects on C1, C4, C5, C6 and C7, C5 effects on C2 and C3, C6 effects on C2 and C3 and C7 effects on C1 and C3. The ranking for affection based on Table 2 is presented in Table 3.

Table 3
The ranking of criteria

Criteria	Row sum (R)	Column (D)	R+D	R-D	Ranking
C1	8.78	7.86	16.64	0.92	2
C2	9.508	7.909	17.417	1.599	1
C3	9.405	8.566	17.971	0.839	3
C4	2.554	4.254	6.808	-1.7	7
C5	3.617	4.617	8.234	-0.109	5
C6	3.621	3.726	7.347	-0.105	4
C7	3.769	4.295	8.064	-0.526	6

As illustrated in Table 3, organizational culture (C2) (1.599) is the most effective criteria and product quality (C7) (-1.7) is the most impressible criteria. On the other word, organizational culture is a dominance factor and product quality is a permeable criteria.

4. Conclusion

The main goal of managers in organizations is reaching to organizational goals like making profit for stakeholders. Undoubtedly, the predetermined goal is not reachable without defining and designing a suitable supply chain management based on value creation for customers. To do so, they try to utilize the internal variables of supply chain management like organizational structure; organizational culture and organizational strategy align with the variables that are effective on the measurement of supply chain performance. Hence, product quality, customer satisfaction, gross profit and market share. Therefore, determination of the relationships between criteria is one of the main problems that managers face. On the other hand, today, there are different statistical and decision making techniques for solving this problem. In this paper, we have determined important factors influencing inter-organizational factors on the supply chain performance using DEMATEL technique. The results showed that organizational structure impacts on organizational culture and strategies, product quality, customer's satisfaction and market share; organizational culture impact on organizational structure and strategies, product quality, customer's satisfaction, gross profit and market share; organizational strategy impact on organizational structure, product quality, customer's satisfaction, gross profit and market share. Customer satisfaction influences on organizational culture and strategies; gross profit influences on organizational culture and strategies; market share influences on organizational structure and strategies. On the other words, organizational culture is a dominance factor and product quality is a permeable criteria.

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