The Effects of Some Risk Factors in the Supply Chains Performance: A Case of Study

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ABSTRACT
This paper proposes a structural equation model to assess the effects of some risk factors in the supply chain performance. The model includes demand, suppliers and processes as risk factors of a case study in Ciudad Juarez, Chihuahua, Mexico. The model, assessed following a structural equation modeling methodology (using AMOS 16.0), indicated that the demand (considered as an independent factor) has a direct positive relationship with suppliers, politics, and manufacturing factors. As a consequence the suppliers have an effect on the flexibility factor. The flexibility has a direct positive relationship with the customer service factor. The results also indicate that the infrastructure factor does not have any relationship with the others assessed factors. The study has important implications for researches and practitioners in the manufacturing sector. It allows evaluating risk activities that have negative effects on the performance of supply chain in manufacturing exports companies in Mexico.

Keywords: supply chain, supply chain performance, supply chain management, risk.

1. Introduction

In today's world, supply chains will focus on mastering changing markets with requirements such as being competitive in delivering products on time, low costs, shorts cycle times and better quality. Plus, the ability to efficiently manage global supply chain is considered a vital source of competitive advantage.

In this paper the supply chain (SC) is defined as a network of firms connected by flows of materials, information and financial resources [1], where each firm aims to add value to the product, good or service. The supply chain has been thoroughly researched because it is a complex element that requires a periodical analysis to be successful in a global environment. In order to improve their competitiveness the companies need some operational and planning strategies, so they compete between their supply chains [2]. The manufacturing export companies in Mexico are very important for its economy. These companies provide a platform to build highly competitive industrial products between the United States and Mexico. Mexico currently counts with 6257 manufacturing companies, 482 of which are in Chihuahua State and 326 in Ciudad Juárez. The workforce consists of 2,241,000 jobs; Chihuahua State and Ciudad Juárez respectively have 356,076 and 222,741 jobs. Regarding the foreign trade cost, Ciudad Juárez imports 22,655 million USD, and exports 43,000 million USD [3]. These companies are part of global supply chains, in which suppliers, retailers, distribution centers, information, demand, and manufacturing processes are implicated to meet up the requirements of customers. The identification of risk factors must be broad in scope to provide ideas on how the process operates through at least 3 companies [4]. That is to say, it requires identifying not only risks in their operations, but also in other companies and identify its causes. The risk in the supply chain is often interpreted as

unreliable resources and uncertain interruptions that originate it, and where the uncertainty can be explained by the interaction between the risk in suppliers and in demand within the processes. The risks are identified more widely as operational activities and process [5], converting the manufacturing activities into a key point to assess the operational risks. The activities and process outside the company diminish the capacity to identify the risks that threaten them as a whole.
Therefore, it is important to know the risk factors that affect the SC performance, find relationships between them, and design models that show their effects. The aim of this paper is to develop a structural equation model to assess the effects of some risk factors in the supply chain performance for a case of study in manufacturing export companies of Ciudad Juárez, Chihuahua, Mexico. It can be useful in the manufacturing sector to assess and improve their competitiveness.

2. Literature review

2.1 Supply chain management

The term supply chain management is defined as the integration of key business processes among a network of interdependent suppliers, manufacturers, distribution centers, and retailers in order to improve the flows of goods, services, and information from original suppliers to final customers, with the objectives of reducing system-wide cost, while maintaining required service levels [6].

2.2 Supply chain performance

An attribute of performance is a set of indicators that are used to express a competitive strategy [7]. The performance is the ability of the SC to offer products and services with good quality, on time and in precise amounts, while minimizing the costs [8]. According to the SC literature review, when designing models, it is important to consider the current and emerging elements, such as globalization, always with the aim to improve specific performance indicator. The evaluation of performance extends to all the companies that make up the SC chain to ensure their sustainable growth. For a company, it is necessary to know its performance measures and compare their standards with the competing chains. Organizational performance refers to how well an organization achieves its market oriented goals as well as its financial goals, and that's why organizations adopt suitable strategies and policies for better organizational performance (customer satisfaction, innovation and learning, and financial performance).

Typically, the research work has tended to emphasize quantitative factors to measure operational competitiveness while there are few models that capture qualitative attributes [9]. A SC requires analyzing performance, using assessment techniques that include not only quantitative attributes, but also qualitative attributes. As it is the case of Abu-Suleiman et al., who considered attributes of planning, material procurement, production, distribution, and customer service [10]. Supply chain performance is measured through attributes or metrics that permit know if the strategic goals provide information and direct feedback of the processes involved in the SC. The attributes are also the basis to identify and evaluate alternatives that will help achieve decision criteria to improve the business processes [11, 12]. Performance measurement can be defined as a process of quantifying the efficiency and effectiveness of an action [12]. To measure the SC performance it is important to monitor the viability of strategies, and also identify the performance measurement method, but each implementation must be taking into account its own specific variables [14]. All participants in the supply chain should be involved and committed to common goals, such as customer satisfaction and enhanced competitiveness [13].

The organization, the suppliers and the customers should discuss how they would address the measurement and improvement of supply chain management performance.

2.3 Risk in processes, demand and suppliers

The risk in the SC is often interpreted as unreliable and uncertain resources creating interruption, whereas uncertainty can be explained as matching risk between supply and demand in SC processes [5]; uncertainty tends to affect the SC performance. Process risk results from the unreliability of the production process due to machine breakdowns. And demand risk is maybe the most serious risk since it arises from volatile demand or inaccurate