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Article

Predictor Model of the Supply Chain Effectiveness based on Critical Success Factors in a Commerce Retail Industry

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RESUMO

Os ambientes de negócios da economia globalizada apresentam complexidade crescente sob condições altamente variáveis de volatilidade, risco e incerteza que exercem intensa pressão sobre os varejistas; alguns deles desenvolvem programas para a melhoria da cadeia de suprimentos. Este artigo trata da determinação dos fatores da cadeia de suprimentos e do desenvolvimento de um modelo de equação estrutural. A primeira seção apresenta os antecedentes, a descrição do problema e uma pesquisa bibliográfica dos fatores da Cadeia de Suprimentos e sua classificação. A seção Metodologia explica o desenvolvimento de um questionário como instrumento de medição baseado nos fatores identificados. A validação do questionário foi com o índice alfa de Cronbach e, em seguida, aplicado a uma amostra de varejistas na região central do México. Utilizando a Abordagem de Modelagem de Equações Estruturais de Mínimos Quadrados Parciais, o desenvolvimento de um modelo estrutural identificou os principais fatores impulsionadores relacionados à melhoria da Cadeia de Suprimentos. Nos resultados relatam os fatores mais importantes: 1) qualidade do fornecedor das mercadorias, 2) fatores internos, 3) serviço pós-venda, e 4) infraestrutura rodoviária e 5) ambiente comercial, para o setor de comércio varejista no México.

Palavras-chave: gestão da cadeia de suprimentos; análise fatorial; análise de caminho; fatores críticos de sucesso; modelos preditores.

ABSTRACT

The business environments of the globalized economy present increasing complexity under highly variable conditions of volatility, risk, and uncertainty that exert intense pressures on retailers; some of them develop programs for the improvement of the supply chain. This paper is about determining the factors of the supply chain and the development of a structural equation model. The first section presents the background, the description of the problem and a literature search of the Supply Chain factors and their classification. The Methodology section explains the development of a questionnaire as a measuring instrument based on the identified factors. The validation of the questionnaire was with the Cronbach alpha index, and then it applied to a sample of retailers in central Mexico. Using the Partial Least Squares Structural Equation Modelling Approach, the development of a structural model identified the key driver factors

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related to the improvement of the Supply Chain. In results report the most important factors: 1) supplier's quality of the goods, 2) internal factors, 3) after-sale service, and 4) road infrastructure and 5) commercial environment, for commerce retail industry in México.
Keywords: supply chain management; factor analysis; path analysis; critical success factors; predictor models.

1. Introduction

Commercial operations have changed dramatically in the last 25 years; their nature transformed and multiplied their business schemes. Underlying is the search for flexibility, agility, information exchange, quality, and the continuous cost reduction in all the stages of the supply, production, distribution of goods and services; given this ample spectrum of activities, the multifactorial variation of effectiveness can be expected, in which the suppliers' performance is an important factor.

Today's commercial businesses, either large or medium, pass through aggressive and high-intensity rivalry to search for market share increase. This situation drives the industrial practice to the deployment of supplier improvement programs and the reduction of their base, fewer but better, as initiatives for the creation of competitive advantage, which also serve as the learning processes needed for the creation and development of the capabilities required for the introduction of new products and market share increases. Mexican retailers operate in an open market economy, subject to pressures that negatively influence the performance of their suppliers due to the peso exchange rate, large differentials between domestic production and imported goods, and underdeveloped logistics infrastructure, causes the loss of the competitiveness between retailers, so that several Mexican retailers have closed operations. New threats are emerging with the latest commercial agreement.

INEGI (National Institute of Statistics and Geography by its acronym in Spanish for its acronym in Spanish), reports that in 2022 real income from the supply of goods and services grew 2.2%. Largely, the service standard depends on diverse variables, including the alignment of the processes along the SC, quality, price/cost ratio, service level, delivery, and post-sale policies. Although this seems to have the utmost importance, literature and industrial practice do not have a general acceptance model of the effectiveness of the SC, commonly retailers develop their schemes empirically, based on their experience along the way, and with some theoretical support based in the most frequently applied theories of business management, industrial engineering disciplines, and logistics. Both the main research currents and the industrial practices dedicated to the management of the supply chain are included in the theory of Operations and Supply Management (OSM), which explains how industrial production processes should be carried out for the delivery of competitive products, based on economic and flexible processes, ensuring delivery in time and space. To develop such capacities, the people involved in these processes must understand the theory holistically; that is, they must master logistics, production engineering, quality, and finance. This came from three sources, one of them, the model Just in Time that evolved to Lean Manufacturing, some issues related to SC are assimilated by the theory of Operations Management and Supply, and the third, Logistics, have developed separately because they play an important role (Bugarčić et al. 2020), with different proposals and they are still growing.

The knowledge of OSM studies: the design operation, improvement of the goods creation and delivery systems, and the essential services of the companies. It contains the managerial perspective of the total system and its supply chains through which resources and products flow, the complete set of business interactions and channel configurations, explaining their effective management. This theory contains topics taken from Logistics and improvement technologies initially developed in the model Just in Time, which has evolved to Lean Manufacturing. The Supply Chain Management (SCM) includes a strategic integration of the functions from suppliers to the final customer and analyzing the value added in every activity of the Supply Chain (Tavana et al. 2019), which represents a source of competitive advantage. SCM is based on the concept of physical distribution as the system's output, integrating the relationships between the different stages, from: packaging, material handling, transportation operations, inventory requirements, warehousing, and other activities, which creates a direct and close relationship with logistics (Babu and Bangur, 2020).

For manufacturing improvement, SCM took methods and techniques from JIT and Lean Manufacturing to reduce waste activities, there are the operations that add cost but not value, such as handling, inspection, material handling, retouching, and repairing (Singh et al. 2020), being the inventory one of the most important forms of waste. All the materials just waiting in warehouses and the production floor not being processed are considered as waste. Inventory has to be reduced to minimal levels to optimize holding costs (Atnafu and Balda 2018). The ideal inventory in JIT systems is the handling and processing of single unit lots or small size Kanbans, with a size in

relation to the different processing times in adjacent activities, a policy that helps in the development of a continuous flow of materials. Although in retail, inventory reduction cannot be in the point of sale-shelf, it could be useful and valuable tool while comparing the costs of supply policies vs. the cost of frequent delivery of smaller lots. Inventory is a way to deal with the flow interruptions produced by the physical separation between supplier and client, resulting in all stages of an SC. As the distance increases, the supply-delivery of the exact quantities needed by the client in the next step of the chain is not economically feasible; this explains the need for inventory, meaning the goods and materials transference by lots. Since JIT includes purchasing operations, it contributes to an important part of the supply problem disappearing, however, a better solution can be achieved by reducing the distances that separate suppliers and buyers, which is the main impediment to the continuous flow of materials.

Likewise, in the 1990s, Honda and Toyota required their suppliers in their USA plants to move production operations no more than 100 miles away, which allows the frequent delivery of small lots, low inventories of raw materials of the production in process, and the reduction of inventory costs. Besides, this closeness allows helping them with manufacturing and quality improvement, leading to a decrease in the supplier's base with long-term business relationships based on several performance measures, other benefits associated with Purchasing. Although this scheme seems logical, reasonable, and has proved the effectiveness, it is challenging to establish mainly because of the high costs associated with deployment and several organizational factors, such as change resistance and loyalty commitment. Searching for sources of competitive advantage, Taghipour et al. (2020) reports that JIT purchasing also applies to the physical distribution channel because JIT offer benefits such as lead-time reduction, reduction in inventory level, the quality improvement of the incoming parts and improvement in relationship with the suppliers. Also, the simplicity of JIT plus the use of information to reduce uncertainty and the order's cycle time, promote fast responses, and enhances the service level (Nimeh et al. 2018).

Returning to SCM, for Kumar et al (2019), it is the collaboration of the participants involved in the improvement of their operations, searching for a common strategic position, based on a layout of channels, part of a web of suppliers and clients, requiring managerial processes in all functional areas of the participants and companies involved. The SC can define their contents, and the material and information flow through models. Essentially, it is the set of activities through which value is added to materials (Min et al. 2019), while Nimeh et al. (2001) define the SC as the application of the resources to enable the transfer of high-quality products in a short timeframe and increase their competitiveness. In this process are involved several actors as suppliers, manufacturers, and customers (Emamisaleh and and Rahmani 2017). SC is a network of companies that participate in design and manufacture product, handling supplies and materials, manufacturing, distribution, and service (Schönsleben, 2018). The integration of those functions must be formally structured to develop coordinated material flows, finances, and expenses control, so information and goods are satisfactorily delivered to customers, enhancing the service level.

As companies grow and develop an inherent change in their functions, related to quality-quantity of information and their performance, it influences the flow of materials; therefore, the integration of the webs and their control becomes more complex. Then, the SC effectiveness is compromised, so that top management needs to deal with the risks associated with the underlying complexity of companies' web (Yildiz et al. 2016). It should be noted that the information technologies have a fundamental role by providing SC information, identifying needs and opportunities, and deploying the correct measures to ensure supplies, manufacture, and logistics in all their complexity, which leads to transform external knowledge (Jimenez-Jimenez et al. 2018; Gu et al. 2021). These issues, in the context of Logistics 4.0, have evolved to better connections for higher coordination and acute information in real-time (Yildiz et al. 2016; Keyvanshokooh et al. 2016; Chatzikontidou et al. 2017; Tsao et al. 2017; Hassan et al. 2020). From a process point of view, the SC adequate management and its improvement are a source of competitiveness; the SC evolves searching for better product delivery and reports the Center for Supply Chain Management (Abdel-Basset et al. 2018). Helmold and Terry (2021) considers this as a value creation process enhanced by the information sharing needed of the integration and the coordination of the functions for correct management of costs, benefits, and risks. Because of its strategic focus, companies can confront all sorts of risks, such as financial crisis, natural catastrophes, political instability, and variation in deliveries without competitiveness (Kotula et al. 2015).

Another dimension of the SC is the green focus, which consider environmental objectives based on the growing need to reduce the impact that production processes have on the environment and their benefits at the level of the supply chain (Jian et al. 2019). This pressure has driven the evolution of the SCM to Green Supply Chain Management (GSCM) to comply with the laws related to

environmental protection; that is, obtain a better image, significant competitiveness, higher efficiency in the use of resources, increases in customer's service level and hence higher profitability (Tang and Wei 2018). Also, GSCM deals with society by using and disposing of the goods and the environment because of ecological standards while enhancing value to clients, partners, and investors based on several strategies as eco-design, internal environmental management, green purchasing, investment recovery, customer cooperation, reverse logistics, green manufacturing, green information systems, supplier collaboration, and waste management (Khan et al. 2022) The transition from SCM to GSCM is a great challenge (Öberg and Graham 2016). In this sense, Cousins et al. (2019) report that GSCM has an essential role for sustainable development, then companies are changing to face regulation policies, pressures from society, and increase its competitiveness; finding that the costs associated with its deployment are controversial. Liu et al. (2020) estimate than the GSCM provides a good cost-benefit ratio and complies with the social and environmental issues.

Another system related to SCM is the Enterprise Resource Planning (ERP), which is a tool of supply chain to help offer a better customer service (Langenwalter, 2020), this represents an effective alternative for managing key resources, such as money, personnel, products, customers, and suppliers. Finally, out of the purpose of the SC, which is the synchronization of the company's functions upstream and downstream, so the materials and information flows are adequate and respond to the customers, which provides a competitive advantage (Anitha and Patil, 2018), this explains why the effective management and the SC improvement has the utmost importance.

2. Performance Factors of the Supply Chain

Competitiveness of the supply chains depends on several factors; its variation is multifactorial. Given the high importance of the supply chain, its management must be prudent. In the search for answers, we found 37 different factors influencing the performance in literature (Table 1). This multifactor variation makes the chain's management challenging because it does not explain the distinct contribution of the factors to the chain effectiveness.

Table 1. Supply Chain Managerial and Organizational Factors

Factors	Authors
Volume and Shipment Size	Anitha and Patil, 2018; Wang et al. 2018; Keya et al. 2019.
Cost of Goods	Peng and Lu 2017; Giusti et al. 2019; Ali et al. 2020; Taghipour et al. 2020; Sholeh et al. 2021
On-time Delivery	Muralidharan and Deshmikh 2009; Mavi et al. 2016; Peng and Lu 2017; Chowdhury et al. 2018; Tavana et al. 2019.
Distance	Yang and Chen 2006; Ali et al. 2020;
Flexibility	Kumar et al. 2015; Srinivasan and Swink 2018; Remko 2020; Shekarian et al. 2020; Hellmond and Terry, 2021
Agility	Kumar et al. 2019; Dolgui et al. 2020; Shekarian et al. 2020; Sholeh et al. 2021.
Quality	Hudnurkar et al. 2014; Mavi et al. 2016
Finance	Cho et al. 2012; Marak and Pillai 2019.
After Sales Service	Ab Talib and Hamid 2014; Murali et al. 2016; Tavana et al. 2019.
Trust	Kumar et al. 2015; Dolgui et al. 2020;
Historical Performance	Tan 2001; Mavi et al. 2016
Direction and organization/Leadership	Ballou 2004; Ab Talib and Hamid 2014; Hudnurkar et al. 2014; Zhang et al. 2018.
Attitude	Tummala et al. 2006; Emamisaleh and Rahmani 2017
Labor Relations	Hudnurkar et al. 2014; Distelhorst et al. 2017
Collaboration/Information	Ab Talib and Hamid 2014; Kumar et al. 2015; Luthra et al. 2015; Giusti et al. 2019; Helmold and Terry, 2021.

Focus on Strengths	Fawcett et al. 2008; Cheng 2011; Kumar et al. 2015;
Long-term Vision	Prajogo and Olhager 2012; Hudnurkar et al. 2014;
Resource Management	Cho et al. 2012; Singh and Kumar 2020.
Human Resources	Ab Talib and Hamid 2014; Luthra et al. 2015; Kumar et al. 2018; Perera et al. 2019; Dolgui et al. 2020;
Environmental Awareness	Anitha and Patil, 2018; Kouhizadeh and Sarkis, 2018; Sunil et al. 2018; Dolgui et al. 2020; Khan et al. 2022.
Planning	Hudnurkar et al. 2014; Soni et al. 2020
Government Support and Regulations	Hudnurkar et al. 2014; Sunil et al. 2018; Giusti et al. 2019;

Source: self-made.

Helmold and Terry (2021) consider the integration between suppliers and clients along chain value is an indispensable requirement for the SC competitiveness, reaching improvement, opportunities through coordination and collaboration between the participants (Ballou, 2004). This entails advantages in delivery of goods costs, time, and place (Ali et al. 2020), and it shows the importance of intermodal webs to accomplish those objectives.

Table 2. Supply Chain Technical Factors

Factor	Authors
Production Capacity	Yang and Chen, 2006; Dolgui et al. 2020.
Design	Naim, 2006; Yang and Chen, 2006; Muralidharan and Deshmikh, 2009; Luthra et al. 2015; Koolwijk et al. 2018; Dolgui et al. 2020.
Technological Capacity	Yang and Chen, 2006; Muralidharan and Deshmikh, 2009; Luthra et al. 2015; Peng and Lu 2017;
Information Technologies	Kouhizadeh and Sarkis, 2018; Gu et al. 2021.
Repair Service	Cho et al. 2012; Rejeb et al. 2019; Govidan et al. 2020.
Processes	Kumar et al. 2015; Rejeb et al. 2019; Govidan et al. 2020.
Resources Invested	Kumar et al. 2015; Emamisaleh and Rahmani 2017; Rejeb et al. 2019;
Integration/Synchronization	Hellmond and Terry, 2021; Kumar et al. 2015
Collaboration/Information	Sohn and Lim, 2008; Flynn et al. 2010; Prajogo and Olhager, 2012; Ab Talib and Hamid, 2014; Luthra et al. 2015; Dolgui et al. 2020; Helmold and Terry 2021;
Forecasting	Sohn and Lim, 2008; Cho et al. 2012; Kumar et al. 2015: Perera et al. 2019
JIT Capacities	Kumar et al. 2015; Nimeh et al. 2018; Singh et al. 2020; Taghipour et al. 2020
Development and Supplier Selection	Cho et al. 2012; Hudnurkar et al. 2014; Luthra et al. 2015; Sureeyatanapas et al. 2018; Yawar and Kauppi 2018; Govidan et al. 2020.
Environmental Awareness	Kumar et al. 2015; Luthra et al. 2015; Kouhizadeh and Sarkis, 2018; Dolgui et al. 2020. Liu et al. 2020
Facilities	Shukla et al. 2009; Ülkü and Schmidt, 2011; Prajogo and Olhager, 2012; Mangla et al. 2014; Aday and Aday 2020.
Outsourcing	Hudnurkar et al. 2014; Tian and Guo 2019.
Production Planning	Hudnurkar et al. 2014; Mönch et al. 2018;
Quality	Sureeyatanapas et al. 2018. Singh and Kumar 2020.

Source: self-made.

Jayachitra and Parthasarathy (2020) says that productivity growth is becoming more because it allows the industry to stay competitive, hence the importance of improving efficiency by eliminating non-productive activities, with utmost importance in industries where the material costs go up to 70% of the product unit cost, materials management has to be effective. Tables 1 and 2 show the most frequently mentioned factors. It is important to note that researchers like Ockham Razor and later, Pareto, did propose the theory that only few factors in each system are the source of variation. In the case of SC, it is necessary to carry out a broader investigation about this theory, this because two unfinished concerns are observed. The first is the number of factors that influence performance. The second is the indeterminate importance relative to these factors. It is crucial to distinguish the factors according to their relative contribution to the chain performance. These factors can classify through the concept of Critical Success. According to Haleem et al. (2012), these factors are the key to facilitate the activities required for the organization's success. Therefore, they are an excellent focus to discriminate the wide variety of factors, with which management may focus the attention on their variation and control.

3. Methodology

The process began in the preliminary determination of the industrial sector in which companies have strong supply chains. The sample is integrated with the largest retail stores of Mexico. A selective non-probabilistic sampling was applied since the intention was to have cases that could be representative of the study population (Rojas, 2013). Decisions to manage the supply chain in the retail segment in Mexico are made by middle and senior managers, in charge of logistics departments, purchases, distribution centers, points of sale, among others. Thus, engineers, department heads, middle managers, and top management in charge of logistics, purchasing, distribution centers and warehouses answered the questionnaires. Thereby, one hundred and eighty-seven questionnaires were applied 187 in more than 45 large companies located in Central Mexico, returning 96 fully answered. It has 43 items for the measurement of seven constructs, representing the critical success factors of the supply chain effectiveness, and three items for measuring the management and managers of the supply chain. A five-level Likert scale is used, in the range Strong Agreement (5), going down to High Disagreement (1).

This sample size is acceptable to Hair et al. (2019) criteria. This author suggests a minimum sample size of 75 questionnaires to detect an R^2 of 0.25 under a significance level of 1% and a statistical power of 80% and determine the capability of structural modelling with partial least squares (Ringle et al. 2015).

The reliability of the questionnaire is evaluated with two criteria. The first one, the factor loading of the variables is measured, requiring them to be 0.708 or higher as recommended by Hair et al. (2020). It is also considered the criteria proposed by Hulland (1999), who suggests keeping items with loads higher than 0.55 because of their 30% contribution to the variance associated to the latent variable. The second criterion is the reliability evaluation of the construct can be measured in two ways: Cronbach's alpha (α) and composite reliability (CR). The rule of thumb for both reliability criteria is they need to be above 0.70 (Hair et al., 2020) The proposed model's convergent and discriminating validities and the predictor relationships are evaluated with the statistics recommended by Hair et al. (2019).

Given that, frequently, the data obtained by transversal studies do not follow normal distributions (Landeros and González, 2006; Manley et al. 2021). The use of non-parametric techniques is pertinent, particularly Partial Least Squares-Structural Equations Modeling (PLS-SEM) for the evaluation of the research model (Civelek, 2018). Among the advantages of the use of SEM are its high flexibility, the capability to recognize the imperfect nature of the measurements, it solves the concerns of multicollinearity, makes complex relationships easily understandable and includes multi-item latent variables, small population sample data, as is typical of social sciences and survey data (Manley et al, 2021).

The Analysis of this research based on the procedure proposed by Hair et al. (2016) includes the evaluation of the measurement model, reliability analysis of the indicators, internal consistency, and convergent and discriminant validity of the constructs, as well as the assessment of the structural model made by R^2, Q^2 and f^2 analysis, considering the significance of the standardized coefficients of the relationships of the variables is obtained.

Results

This section is divided into two parts. The first one is about the measurement instrument validation, and the second part is focused on the statistical analysis of the data through the confirmatory factorial analysis with structural equations. Cronbach Alpha is calculated with 28 questionnaires, obtaining $\alpha = 0.936$, indicating a reliable questionnaire suitable for the application. It was also considered the possible elimination of items if it improves the internal consistency, finding that by removing the IC4 and IC5 indicators from the construct highway infrastructure, the internal consistency is improved. The final version of the questionnaire contains 44 items with $\alpha = 0.942$.

Table 3. Reliability and Convergent Validities

Construct	Symbol	Composed Reliability (CR)	Average Variance Extracted (AVE)
Product Quality	PQ	0.835	0.630
Logistic Cost	LC	0.797	0.577
Internal Factors	IF	0.744	0.496
Highway-Road Infrastructure	HI	0.892	0.805
Intermodal Infrastructure	II	0.833	0.624
Commercial Environment	CI	0.793	0.563
Suppliers	SU	0.839	0.512
Service Level	SL	0.891	0.732

Source: self-made.

The reliability of every construct composing the structural model and the convergent validity are in Table 3. The values of CR are higher than 0.7, and the AVE values are also higher than 0.5, the value recommended (Hair et al. 2016). This value implies that the selected items explain more than 50% of the construct's variance. In addition, discriminant validity determination present when the square root of the AVE value is higher than the correlations of the other constructs Hair et al. (2019). Table 4 presents the square roots of the AVE's, observe that the values in bold are higher than the ones below the diagonal; therefore, the discriminant validity of the constructs is established, and it also verifies their conceptual independence.

Another issue to consider in PLS structural models is the absence of a significant effect produced by co-linearity between the constructs and the model. Hair et al. (2016) recommend measuring that effect through the VIF index. If the VIF < 5, then redundancy of the linear effects can be discarded. VIF values between the variable Effective Supply Chain (ESC) and the corresponding exogenous and endogenous variables are higher than 1, meaning that the regression estimations between the variables are reasonably reliable to contrast. Table 5 exhibits the β-standardized coefficients of the ESC variable; the variables were estimated by Bootstrapping using Smart PLS with 3,000 arrangements. Table 3 shows that Logistic Cost is not significant ($p>0.5$), indicating that this variable is not a critical dimension for the Effective Supply Chain and is discarded as an important factor, a relevant reason for the customer's increase' service level.

Table 4. Analysis of Discriminant Reliability

	Product Quality	Logistic Cost	Internal Factors	Highway Infrastructure	Intermodal Infrastructure	Commercial Environment	Customer Service Level	Suppliers
Product Quality	**0.794**							
Logistic Cost	0.052	**0.76**						
Internal Factors	0.411	-0.062	**0.704**					
Highway Infrastructure	0.172	0.065	0.250	**0.897**				
Intermodal Infrastructure	0.196	0.124	0.417	0.470	**0.79**			
Commercial Environment	0.36	0.185	0.408	0.385	0.451	**0.75**		
Customer Service Level	0.269	0.262	0.183	0.202	0.11	0.291	**0.856**	
Suppliers	0.301	0.065	0.439	0.381	0.388	0.533	0.185	**0.715**

Source: self-made.

Table 5. Regression Coefficients of the Structural Model

Variables	β sample	β Bootstrapping	Standard Deviation	T Statistic
Effective Supply Chain (ESC)-> Product Quality	0.561	0.573	0.087	6.485*
ESC -> Logistic Cost	0.204	0.249	0.156	1.303
ESC -> Internal Factors	0.656	0.652	0.093	7.089*
ESC -> Highway and Road Infrastructure	0.609	0.613	0.077	7.871*
ESC -> Intermodal Infrastructure	0.674	0.675	0.071	9.523*
ESC -> Commercial environment	0.774	0.773	0.056	13.934*
ESC -> Suppliers	0.775	0.772	0.059	13.136*
ESC -> Customer Service Level	0.454	0.460	0.139	3.253**

** p<0.01, *p<.001

Source: self-made

Figure 1 shows the structural model where the supply chain is composed of six factors, with a combined effect, capable of predicting a standardized R^2 of 0.455, meaning that for every unit of effectiveness in the supply chain, customer service level increases 44.5%. Another important observation from Table 4 is that the factors with the highest contribution to the Effective Supply Chain (ESC) are the commercial environment and suppliers, followed by the relative importance of the intermodal infrastructure, highway and road infrastructure, and internal factors. At the same time, the quality of the products shows a lower relative weight or contribution to the effectiveness of the chain.

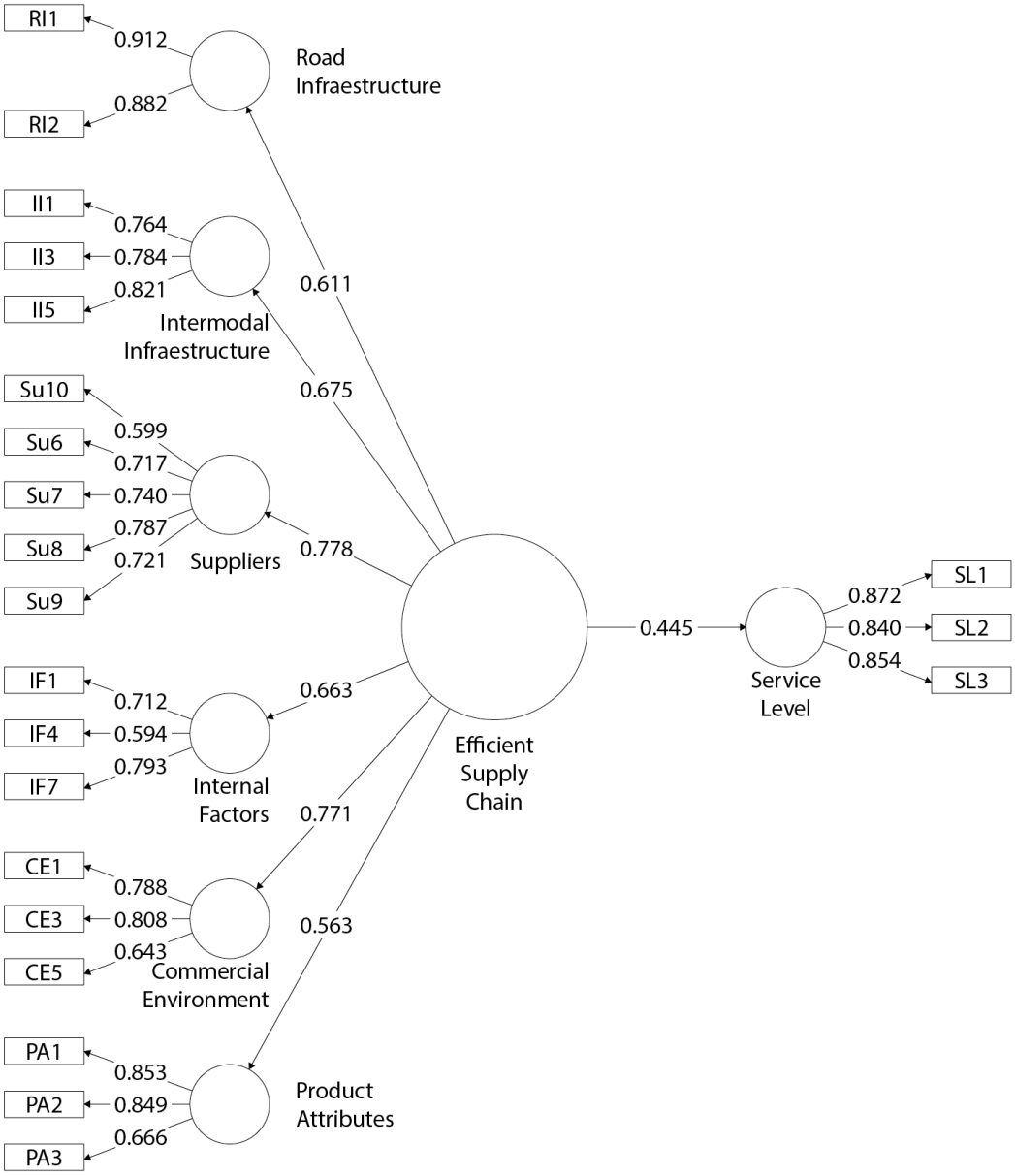

Figure 1. Structural Model of the Supply Chain Factors

Most improvements in retail stores are based on the capacity of creating advantages upon the competition through developing better supply. However, given that there are no common practices in the industry, every retailer develops its own SC, with a big influence on individual competitiveness. Regarding the logistic infrastructure, because of the limited highway web, intermodal infrastructure, and the high toll of their use, they have high influence on competitiveness, although differences and advantages are smaller. Although logistic cost shows a considerable impact (β =0.204) on the variable Service Level, it is not significant, neither to high fashion clothing and furniture nor to department stores and groceries.

This effect may be explained by the fact that logistic costs are the same for all companies and stores. They do not change by using different commercial or distribution strategies, and the reduction it is not possible given the government robust control. Then, the customer service level –as the indicator of the chain effectiveness, its performance- can be explained by the six factors listed in Table 3, excluding logistic cost. The Determination Coefficient R^2 = 0.206 explains 20.6% of the variable Customer Service Level variance for the set of the six factors.

4. Conclusions and Future Challenges

Figure 1 shows the base structural model for assessing supply chain management performance based on the critical factors influencing its effectiveness. Every company may use the list of factors to improve the way they measure their supplier's performance and, according to their contribution, assign weights for a differentiated measurement based on the relative importance of every factor. According to the results of this study, the most important factors are the supplier's quality of the goods, internal factors, after-sale service, road infrastructure and commercial environment.

Regarding the quality of the goods, retailers consider quality a mix of characteristics including the seller prestige and business relationship, better shelf life of the goods, which also increases the importance with their price. Whether Mexican or foreign, in this case, the origin is also considered, including other makes and varieties. In addition, the quality increases with the retailer size make and prices of the items.

After-sales service also has high importance, particularly when unexpected sales deplete inventory, rapid responses are necessary. Likewise, when quality problems is present, retailers feel pressured expecting sellers to address the issues as soon as possible and to their entire satisfaction.

Transportation is the third important factor that affects the environment, where companies cannot act due to diverse conditions. Transportation is the third important factor that has a significant effect on the SCM. Moreover, it depends on various conditions, such as road limitations. In this country, most sections and routes are carried out through one-way roads, which implies that the opportunities for transport optimization are minimal.

Internal factors must be considered, such as payment time-lapse and instalment payments, budgets, consolidation (as in purchasing by lines of products), pricing policies, or non-loyal practices that are standard between purchaser and seller. All of them represent sources of pressures towards the selection of a specific seller.

Another factor of the SC is the commerce environment, which contains the supply and demand, publicity, rivalry, prices, exerting pressures upon purchasers searching for goods from the suppliers and the shoppers. In high risks environments, and in seasonal and cyclic products, it is crucial to have the flexibility of the SC, while in low-risk uncertainties, it is more important than the efficiency of the SC.

In addition, the low contribution of the price is noteworthy. It is assumed that the other factors are more critical because their control has a more significant impact on the SC improvement than the possible feasibility obtained from price reduction by negotiation or other purchasing terms.

Those are the most important factors to focus on and concentrate efforts in improving the supply chain, whether upstream or downstream, that is, upstream to evaluate the suppliers using those factors, and downstream to determine the improvement opportunities in our operations. It is also important to identify the most critical factors as valuable empirical evidence searching for a general predictor model of the SC effectiveness. It is advisable to replicate similar investigations to determine the Supply Chain Factors in several industries in the search for coincidences, that is, the generality of the factors among industries.

The factors identified in the literature are reported as critical to the success of the supply chain in isolation. For example, Murali et al. (2016) highlights the importance of post-sale service; likewise, Marak and Pillai (2018) offer an analysis of the importance of the finance factor in the SCM, while in this study the relative weight of the six different factors that intervene in the efficiency of the supply chain are reported. In the case of Kumar et al. (2015) report a model that integrates 13 factors for the efficiency of the supply chain, but this model is focused on the manufacturing industry, while this study focuses on the efficiency of the supply chain of retailers. Then, the importance of this study lies in the integration, supported by the method of structural equations, of the identified factors, offering a base for the knowledge of these factors.

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