Handbook of Research on Industrial Applications for Improved Supply Chain Performance

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Chapter 7
Model of Skills and Capabilities of the Logistics Administrator

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ABSTRACT

This chapter designs a model of the skills and capabilities required of a logistics administrator. The design of the theoretical model of these skills was carried out based on six skills: management in the supply chain, information technologies, quantitative methods, finance, legislation, and soft skills. Its validation was made through the judgment of experts in the area of the supply and logistics chain. The result obtained was a Kappa value of 0.715, a good value. To validate the reliability of the measurement instrument, it was applied to 20 people working in the logistics area. The Cronbach alpha coefficient was used, obtaining a value of 0.928, which allows the reliability of the instrument to be considered excellent.

INTRODUCTION

As business environments continue changing rapidly, the logistics and supply chain sectors have faced several challenges. As a result, there is a necessity to have specialized professionals in logistics (Thai, 2012) that will allow the development of processes, minimizing costs, and increasing the efficiency of the workforce, providing an increment in productivity, which has generated that different innovations in the organizational systems greatly affect their performance. Consequently, they must be updated in order to deal with the possible challenges that the global market may present for the company. These specialized professionals in logistics must have knowledge and skills that allow them to work in an integrated and effective supply chain.

In 1991, Murphy and Poist carried out the first studies related to logistic skills identification. They focused on the skills of high-level logistics managers, concluding that the manager of contemporary top-level logistics needs to be efficient in three categories: business skills, logistics and management. Management skills emerged as the most important of them, followed by logistics and business skills.

According to Santamaría (2012), there are some skills and competencies that logistics personnel must possess according to the growth trends of the supply chain. These are: capacity to plan and execute strategies with a different focus to the tactical knowledge of processes; strategic vision based on an understanding of the business environment, including markets, industry trends and awareness of particular local conditions and the ability to demonstrate the value of supply chain management through financial results.

Similarly Yen-Chun, Huang, Goh, and Hsieh (2013) raise that a professional in logistics must be able to integrate, communicate and analyze from an international perspective, know how to perform a financial analysis, maintain good relations with both, the industry and with customers, and finally to understand the laws and regulations. In other countries, such as Ireland, studies have shown that, in addition to technical knowledge, the human aspects and the development of interpersonal and social skills should have more emphasis, such as a guidance to work as a team and inter-functional relationships (Farrell and Wagner, 2014).

In addition to the new skills needed in the industry, Randstad Holding presented on its website (Randstad.es, nd) a study that states that they not only refer to technological issues, but also to those in the current working world which are profiled as critical. These are called: "People Skills" (communication skills, ease of teamwork, interpersonal skills ...) and leadership skills (problem solving, rapid and effective decision-making, etc.), and until now they had been little contemplated.

In general, as business environments continue changing rapidly, the logistics and supply chain sectors face many challenges and that is why there is a need to have specialized professionals in logistics (Thai, 2012). Also, in recent years, a greater awareness has been taken of the fundamental role played by human resources, for the success of the supply chain based on their knowledge and talent (Shou, Li, Park, & Kang, 2017).

On the other hand, although these skills have been defined, there are differences between the theoretical and what the industry professionals say. The first ones consider the logistic management capacity as the forecast of the demand, supply, planning and integration of systems like key priorities. The others believe that the skills are focused on the general development of logistics, such as skills with a global perspective, especially in the improvement of business competitiveness and the formulation of strategies (Yen-Chun et al., 2013). These differences affect both, the professional development of logistics workforce and the industry in general.

From the professional point of view, employees who do not have these skills and do not know how to develop them adequately will see their employability decrease during their professional life (Pita-Yanez, Cristina, Pizarro-Lucas, 2013). Meanwhile if the industry does not have the adequate personnel in the development of its activities, it will affect the fulfillment of its general objectives. Therefore, this close relationship between professional and business development forces the sector to be aware of what are the basic qualities required by a logistics professional to help the sector make a great leap forward as a country (RevistaLogistec.com, n.d.)

In 2014, the American Production and Inventory Control Society (APICS) developed a Competency Model for the supply chain manager. Its purpose is to guide individuals who are considering a professional career within the supply chain management, the supply chain professionals who are seeking to advance their positions, and the administrators and human resources managers who are hiring in this field with such rapid growth. The model is organized into three levels of competencies: Fundamental (personal, academic, labor and leadership effectiveness); Related to the profession (management techniques / operations management, areas of knowledge of the supply chain manager, techniques of the supply chain manager) and those related to their job (specific requirements for the supply chain manager). The model also includes descriptions of the activities and behaviors or conducts associated with each competition.

To design the model, the logistical skills and capacities were identified from a documentary research that aimed to analyze the theories that reflect the development of the skills and abilities that a logistics professional should possess, as well as how it is the market perspective on supply chain skills. This was done by searching databases such as Emerald, Elsevier, Mendeley, among others; also in specialized books in Logistics and Supply Chain and different journals. After the identification of the theories that sustain the skills that a professional in logistics should possess, the design of the theoretical model of these skills was carried out taking as a base the six skills with the highest percentage: management in the supply chain, information technologies, quantitative methods, finance, legislation, soft skills. Corporate social responsibility skills and metaheuristic skills were included in soft skills and supply chain management respectively.

In this sense, the organization of this chapter is as follows: it begins by reviewing topics such as logistics, supply chain and review some previous work on skills and capabilities of a logistics manager. Then, the research problem is raised, as well as the proposed methodology to design and validate the measurement instrument. Finally, the results obtained are presented.

BACKGROUND

Logistics and its Evolution through Time

Logistics has evolved through several stages (Coyle, Langley, Gibson, Novack and Bardi, 2008, Kent and Flint, 1997). Specifically, the 1950s and 60s promoted the appearance of the system concepts that integrated several functions of logistic output into physical distribution.

The integrated logistics management concept from the 1980s defined logistics, from the outset to the physical distribution, in response to deregulation of transportation as well as increasing globalization (Coyle et al., 2008). The influence of the supply chain value model by Porter (1985) extended the logistic

management to achieve the efficiency and effectiveness of the total system of interrelated companies, from the original sellers to the final customers; a concept that was known in the 90s as Supply chain management.

In addition, the logistics management is defined as the creation of economic time and the value of place through the acquisition, movement, and positioning of inventory for a specific business (Bowersox, Closs and Cooper, 2007, Christopher, 2005).

On one hand, Quiroga (2009) defines logistics as the process of planning, implementing, and controlling the flow and storage of materials, products in process or finished products, as well as the management of information from the place of origin to the place of consumption, with the purpose of satisfying the customers' requirements.

On the other hand, Nickl (2005) distinguishes a traditional logistics, which includes the physical movement of materials, where the areas, such as purchases or production, trading or sales, are what define their type of performance; the main objective is to manage the inventories generated by inflexibilities related to purchases or production.

Based on the research by Young and Esqueda (2005), the supply chain theory emerged in the 60s, when companies decided to combine related activities creating the physical distribution management, which resulted from the union of the management of inventory, storage, dispatch of finished product, and customer service.

Therefore, the concept of logistics has been extended to cover the management of the supply chain. Lambert, Cooper and Pagh (2008) define logistics as "The part of the Supply Chain Management (SCM) that plans, implement, and control the efficient and effective flow of materials and storage of products, as well as the associated information from the point of origin to the point of consumption, in order to fulfill the customers' needs."

Currently, logistics has taken great relevance in organizations, which have created areas or departments for their treatment, to become one of the main tools for an organization to be considered as a first world company (Acevedo, Sablón, Acevedo, Gómez and López, 2019).

Also, Ballou (2007) defines it as "all movement and storage that facilitates the flow of products from the point of purchase of the materials to the point of consumption, as well as the information flows that are set in place, in order to give the customer the right level of service at a reasonable cost."

Supply Chain Management

The management process, within an organization, is based on the cycle of planning goals that must be achieved, carrying out fundamental strategies to achieve the principal objectives, measuring the results obtained, and acting along with the results, oriented towards improvement of the system. The supply chain management aims to optimize the chain, looking forward to increase the level of service, reduce inventory levels without jeopardizing its operation, and implement strategies that allow it to improve the administration of processes, cycle times since the customer places an order until it arrives to the destination point. Therefore, based on the level of logistics processes that integrate the supply chain, the following aspects can be found:

A. Demand forecasting: it is the beginning of the processes, this represents the consensus about what is estimated that will be sold in the future, (Mena, Lario and Vicens, 2006), through the demand forecasting associated with costs can be estimated on the production and raw material, through

the estimations of sale prices. The demand forecasting is the base for the planning of production capacity, as a result, determination regarding the necessary materials and estimation of inventories for both, materials and finished products is required.

B. Sales and Operations Planning: these are the agreements established by the commercial and operational area regarding the products that will be produced based on the quantities that will be delivered to customers.

C. Commitments with Customers: it focuses on the compliance with agreements that are established with customers, regarding to what type of products will be delivered, the place, quantity, and date.

For his part, Ballou (2007) considers that the Supply Chain Management has the same importance as marketing or finances in an organization, and mentions that the areas of purchasing (procurement), production and logistics are functions of the supply chain. Similarly, Porter and Kramer (2019) classified supply chain topics such as product design and the introduction of new products, reverse logistics and green issues, outsourcing and organizational alliances, metrics and performance, as well as global issues.

Supply Chain Trends

The supply chain has been developed; this being a continuous process in search of the competitiveness of companies, then some trends are established towards where the supply chain is focusing. Based on the analyzes made to journals and information on logistics issues, we have the following:

A. Change from the push (push) marketing approach to the pull marketing approach. The pull approach refers to the fact that the products must leave the plant based on customers' requirements, this concept is based on the exact knowledge about the customers' needs, in this case, there is an open relationship with the final distributor and planning that is done based on replacing the sold inventory.In addition, while the push strategy is based on the estimation of the demand to carry out the production and build the inventory, the demand is pushed towards the final customer (Quiroga, 2009).

B. The companies that are looking for the competitiveness in the market tend to center their operations to the productive processes and focus their attention to the client, leaving to third parties the activities related to the administration of warehouses. The outsourcing of logistics processes is known as 3PL due to its acronym in English, referring to the companies that provide different logistics services to their customers.

C. For Arroyo, Gaytán, and Sierra (2007), this is an activity that grows continuously due to the increment in efficiency in logistics operations along with a decrement in operating costs allowed for an integrated and flexible supply chain. In this sense, companies specialized in logistics operations have seen the need to be updated in order to provide to their customers an appropriate level of service in a competitive and adapted way for each business necessity. In addition, this means that companies have become more specialized, and can offer a wide range of opportunities designed to support the management of companies that require their type of service.

D. A reverse logistics is the management process, the flow of raw materials, inventory of product in process, finished product, and information related to goods, from the moment of consumption, until it is taken to the recycling process, in other words, it involves all activities related to the final disposal of the product once it is discarded.

E.   According to Sarkis (2012), the green supply chain management is the integration of aspects that include customer relationships and distribution management, material logistics management, purchasing and contracting, as well as the management areas of production and operations considering business management with environmental management. The determination of the critical levels, as well as the flows managed by this type of administration are necessary, in order to be able to effectively implement a green supply chain.

Skills and Talent Capacities of the Specialized Personnel in Logistics

As a matter of fact, due to the dynamics from the globalized world as well as from the development of coverage networks and global category, there is a growing demand for professionals that are able to manage these types of networks, with the coverage and depth required. Specifically, professionals who understand and manage internal and external logistics operations are required, which is why the demand for professionals related integrated processes is increasing, having the skills that help to reduce costs, minimize supply risks, and improve the levels of service for clients (Ruth and Torres, 2013).

There are some series of skills and competences that a professional in the logistics area must have according to the growth trends of the supply chain. Among these competencies the following are considered: ability to plan and execute strategies differently focusing on the tactical knowledge of processes; strategic vision based on an understanding of the business environment, including markets, industry trends and awareness of a particular local environment, as well as the ability to demonstrate supply chain management value through financial results (López, 2009)

Moreover, Murphy and Poist (1991) classify the appropriate skills for logistics managers, such as business, logistics, and management skills. In another study, Murphy and Poist (1998), incorporated human resources management or strategic management into business skills. Also, included in the management skills, there are some soft skills, such as communication and leadership.

Mangan and Christopher (2005), identify the essential areas that are required by specialists in logistics and the supply chain management (SCM), as skills concerning to finance, technology, and innovation, management/strategy, operations/SCM, processes/flows, legislation, security and international trading, logistics and multimodal logistics in relatively new markets, as well as analytical skills, interpersonal skills, leadership, changing and project management.

Myers, Griffith, Daugherty and Lusch (2004) mention the tacit skills which include social skills, such as decision making, problem solving, and time management.

Similarly, Gammelgaard and Larson (2001), defined 45 skills that managers in logistics must have, which are relevant in the supply chain and arranged into interpersonal/managerial skills, quantitative/technological skills, and supply chain basic skills. In fact, another important skill is the ability to communicate.

Gravier and Farris (2008) emphasize on the innovation and technology as well as in the soft skills. In addition, Ozment and Keller (2011) considered the management skills, marketing and finance, while Vokurka (2011) emphasizes on the management, quantitative methods, technology and innovation, and finance.

On the other hand, Griffis, Bell and Close (2012) mention some skills in logistics, such as the knowledge in metaheuristic techniques that examines risks and interruptions in the supply chain, intermodal operations, customer service compensations, backhaul strategies and simultaneous location of facilities, as well as vehicle route problems.

Finally, an analysis of the new trends forecast for the coming years is essential by diagnosing the new specific skills of people who intend to survive within the business sector, where it seems, that the key to the global logistics industry lies in a set of skills and competences not only correct, but functional and effective (Ellinger and Ellinger, 2014, Flöthmann, 2018, Campos et al., 2019, Bules, Curkovic, Eckert and Stamper, 2019).

RESEARCH PROBLEM

Due to the globalization of the markets, companies have had to implement improvements in their processes to make them more efficient and, in this way, offer their customers a better quality and lower cost of the goods and services they produce (Quiala, Fernández, Vallín, Lopes, Domínguez and Calderio, 2018). To achieve this, a set of skills and competences of the human resource is required, which in turn considers increasingly disruptive changes (Cvetić, Vasiljević and Danilović, 2018, Burke, Scurry, Blenkinsopp, & Graley, 2016). A qualified workforce contributes greatly to the success of any company, and much more if this workforce is within the areas of logistics and supply chain management (Tatham, Wu, Kovács, and Butcher, 2017).

Furthermore, Logistics is a crucial element for competitiveness and economic performance, for their own performance and for increasing globalization. Most countries in Latin America and in the Caribbean (LAC) are focusing on strategies to increase exportations. In fact, in order that these strategies are successful, an essential component is an effective and efficient logistic framework that addresses the entire spectrum (previous, intermediate, and subsequent phases) of the supply chain and production value (Guasch, 2011).

On the other hand, the improvement in the efficiency of the logistics processes eliminates the costs of services that do not add any value, thus improving productivity (Cook, DeBree and Feroleto 2001, Derwik and Hellström, 2017, Quiala et al, 2018). According to the Ministry of Economy (2008), cited by Botello (2016), in Mexico the total cost of logistics of companies is in the order of 12.6%, of which 40% corresponds to the cost of transport and 60% to inventories, order processing, storage and planning of transport operations (Celis, 2015). Decreasing these logistics costs directly translates into lower costs of the goods produced, which in turn generates a significant number of benefits (Derwik, Hellström and Karlsson, 2016)

At a global level, there is a benchmark index that measures the efficiency of the supply chain, this is known as the logistic performance index, which measures aspects, such as cargo transportation, storage, customs clearance, and payment system. The data comes from surveys and evaluations conducted by the World Bank every two years, in partnership with academic and international institutions, private companies, and individuals that are involved on international logistics.

On the other hand, although these skills are defined, there are differences between the theory and what the industry professionals say about this topic. The first considers the capacity of logistic management as the demand forecasting, the supply, the planning, and the integration of systems, such as key priorities. While the second believes that the skills are focused on the general development of logistics, such as skills with a global perspective, especially in the improvement of business competitiveness, and the creation of strategies (Yen-Chun et al., 2013). These differences may affect both, the professional development of logistics personnel and the industry in general.

From the professional perspective, employees who do not have these type of skills and do not know how to develop them adequately will see their employability decrease during their professional life (Pita-Yanez et al., 2013). Meanwhile if the industry is not having the adequate personnel in its activities performance, it will be affected in the fulfillment of its general objectives. Consequently, this close relationship between professional and business development encourage the sector to be aware on the basic qualities that are required for a logistics professional, in order to help the sector to be better in logistics terms as a country (RevistaLogistec.com, nd)

Based on the previous information, this type of issue may have two different aspects. First, universities do not have an instrument or guide for updated content that they could include in their different subjects in the logistics area, since, although logistics and supply chain management promote the integration of multifunctional processes, many universities are still struggling to redesign their curricula to reflect that complexity (Yew, David, Barbara, Inga, and Grant, 2014). Therefore, universities offering logistics courses should identify these emerging requirements for the labor market, and redesign their courses in order that they can teach what industries currently require.

The other aspect is somehow related to the first aspect, although there are researches related to the study of the skills of the professional in logistics, these are mostly concentrated in European and Asian countries with few studies carried out in America and fewer in Mexico, where only those made by the American Association of Production and Inventory Control (APICS) were verified.

METHODOLOGY

The methodology section is distributed in three phases, which is presented in Figure 1. Specifically, it identifies the theories concerning the skills professional logistics must have, then a theoretical framework is designed based on the literature review, finally the measuring instrument is designed and validated.

In the following section, each phase from the methodology is presented:

Figure 1. Methodology phases
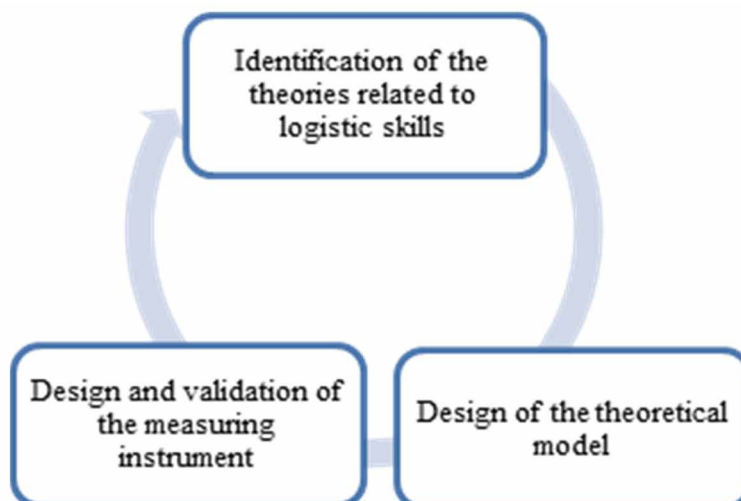
Phase 1: Identification of the theories related to logistic skills

In this phase, the literature review is carried out that support the theories that reflect the development of the abilities and capacities that a professional in the logistics area must have, which is done by searching on databases, such as Emerald, Elsevier, Mendeley, among others; also in Logistics and Supply Chain specialized book, as well as in different web journals. The literature review is done using the registration matrix as a technique.

Phase 2: Design of the theoretical model

In order to design the theoretical model, the results obtained in phase 1, where different theories were already identified, it is proceeding to consider the type of theoretically dimensions to measure or represent the skills and capabilities that a professional in logistics must have.

Phase 3: Design and validation of the measuring instrument

In this phase, the measurement instrument in order to be applied is designed and validated; first, it is established to the operationalization of the variables where dimensions or constructs are represented, as well as their indicators. These indicators are based on the development of the items or statements corresponding to the measurement instrument. The instrument is validated by an expert panel using the Kappa analysis as technique. The next step is applying the instrument to a pilot group whose results were used to estimate its reliability through the Cronbach's alpha.

RESULTS

The results obtained in this investigation are presented below. It is also important to mention that the investigation was carried out in Ciudad Juarez, specifically in the Industrial Export Manufacturing.

IDENTIFICATION OF THE THEORIES RELATED TO LOGISTIC SKILL

For the identification of the logistical skills and abilities, a documentary research was carried out that aimed to analyze the theories that reflect the development of the skills and abilities that a logistics professional should have, as well as what the market perspective is like. Regarding the skills on the supply chain, this was done by searching on databases, such as Emerald, Elsevier, Mendeley, among others; also, in in Logistics and Supply Chain specialized books, and different web journals. The following 8 dimensions were integrated based on the literature review according to what authors consider as skill and competence: Management in the supply chain (Murphy and Poist, 2007), Information communications technologies (Mangan and Christopher, 2005; Pérez-López, Olguín-Tiznado, García-Alcaraz, Camargo-Wilson, C., and López-Barreras, 2018), Quantitative methods (Gravier and Farris, 2008),

Finance (Vokurka, 2011), Legislation (Sodhi, Son, and Tang, 2008), Soft Skills (Yen-Chun et al, 2013), Corporate Social Responsibility (CSR) (Harrison and Van Hoek, 2011), and Metaheuristic Skills (Griffis et al, 2012). Table 1 presents a summary of the skills and abilities that are necessary for an effective logistics management.

In addition, this table shows the following: 100% of the authors consider management as a skill and competence in the Supply Chain, 67% handle information communications technologies, 58% quantitative methods, 50% finance, 42% legislation, 17% soft skills, and finally with 8% corporate social responsibility and metaheuristic skills.

Regarding what is reviewed on the requirements of the companies, the logistics professional must have analytical and technical skills, but also a creative thinking with the ability to see the general perspective of the organization, as well as be able to communicate horizontally and vertically within the organization, other companies, and between communities of business partners, and be able to explain the concept of SCM in simple terms at various levels of the organization. Another capacity would be to manage and interact with teams located in multiple countries, where they are part of the supply chain. They must be updated about how to face challenges that companies and the community in general may require for their development as society and country.

Table 1. Logistics skills and capabilities review

Autors	Supply Chain Management	Quantitative Methods	Information Communications Technologies	Finance	Legislation	Soft Skill	CSR	Metaheuristic Skill
Murphy and Poist (1991,1998,2007)	●	●	●	●	●	●		
Gammelgaard and Larson (2001)	●	●	●		●			
Myers et al. (2004)	●			●				
Mangan y Christopher (2005)	●	●	●	●	●			
Ballou (2007)	●	●	●	●				
Gravier y Farris (2008)	●	●						
Sodhi et al. (2008)	●	●	●		●			
Ozment and Keller (2011)	●		●					
Vokurka (2011)	●	●	●	●				
Harrison and Van Hoek (2011)	●		●				●	
Griffis, Bell and Closs (2012)	●							●
Yen-Chun, Huang, Goh and Hsieh (2013)	●			●	●	●		
	100%	58%	67%	50%	42%	17%	8%	8%

Model of Skills and Capabilities of the Logistics Administrator

Figure 2. Proposed model
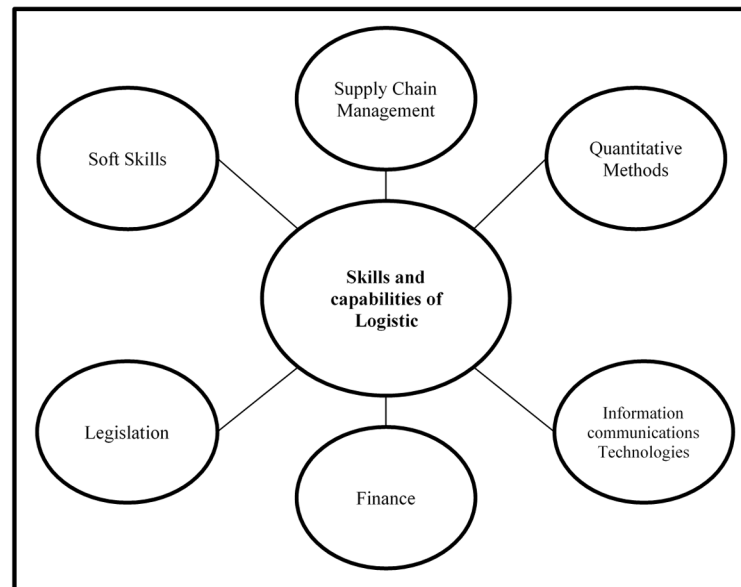
In general, some skills that a professional in logistics must have according to the growth trends in the supply chain are: ability to plan and execute strategies with a different focus on the tactical knowledge of processes, strategic vision based on an understanding about the business environment, including markets, industry trends and awareness of particular local environments and, the ability to demonstrate the supply chain management value through financial results.

PROPOSED THEORETICAL MODEL

After the identification of the theories about skills that a professional in logistics must have, the design of the theoretical model of these skills is carried out consequently. The six (6) skills with greater percentage are illustrated in Table 1 and these are: Supply chain management, Information communications technologies, Quantitative methods, Finance, Legislation, Soft skills; Corporate social responsibility skills and metaheuristic skills were included in soft skills and in the supply chain management, respectively. Therefore, the proposed theoretical model is presented:

- **Supply Chain Management:**

This dimension is the tracking of materials, information, and finances during the process which is from the supplier to the manufacturer to the wholesaler to the retailer and to the costumer. The supply chain management is related to the coordination and integration of these types of flows, which can be performed within a company and between different companies.

- **Quantitative Methods:**

The second dimension refers to the knowledge and the necessary tools that the logistics professional must have in order to take logistic decisions, through the use of simple mathematical models, which allow to optimize the supply chain processes as well as develop the ability to interpret and implement solutions with practical criteria on the results obtained.

- **Information Communications Technologies:**

This dimension refers to the knowledge management of computers and telecommunication equipment to register, retrieve, transmit, and manipulate data, often used in the business context as well as in other business. Several companies are associated with information communications technologies, including hardware and software, electronics, semiconductors, internet, telecommunication equipment, e-commerce, and computer services. Information communications technologies play an important role in the new business administration, as well as in systems that allow the planning, organization, communication, integration of internal processes, data from the company, systems for supply chain management, and customer relationships management.

- **Finance:**

Logistics finance is another dimension which is considered a strategic tool in the supply chain, allowing an opportunity for emerging markets, where optimizing inventories becomes a major competitive weapon, speed of delivery, and inventory turnover are an indispensable on profitability. Professional logistics must understand finance in the logistics areas to make easier the structure of financial reasons that allows to reduce investment risks, ensuring budgeted profit margins, and locate cost-cutting opportunities.

- **Legislation:**

It refers to the type of rules or a set of rules to follow in a place, which have a legal power that is conferred by the government authority. In the area of logistics, personnel must know everything related to international regulations that affect goods, the customs regulations, and both, exportation and importation regulations.

- **Soft Skills:**

Soft skills is a term used in organizational psychology which is related to the emotional intelligence, and that considers personality traits, social skills, communication, language, personal habits, friendship, and optimism. Large companies focus on developing their soft skills, such as communicative and relationship skills, creativity, ability to work in a team, responsibility, honesty, commitment and proactive attitudes when solving problems, as well as the developing of innovative ideas.

DESIGN AND VALIDATION OF THE SURVEY

Based on the proposed model, the survey is designed by operationalizing each of the dimensions. Once the survey is designed, the following step is to validate it. In this sense, there are many specific considerations to be considered in the evaluation of a survey; one of them is Validity, which according to Fuentes (1989), refers to the degree to which a test provides information that is appropriate to the decision that is established.

There are several types of validity, in the present research the content validity was used, which according to Corral (2009) is the degree to which an instrument reflects a specific domain of the content of what was measured.

Specially, when estimating validity, it is necessary to know certainly the features or characteristics that are desired to study, this feature or characteristic is called the criterion variable. In this regard, Ruiz Bolívar (2002) states that "... we are interested in knowing how well the positions of the individuals correspond to the distribution of the scores obtained, regarding to their positions in the continuum represented by the criterion variable". The validity was also made by experts in order to verify that the items measured each dimension of the model and finally, the Cronbach alpha index was used to validate the internal reliability of each dimension.

Once the survey is designed and validated, can be applied through email, telephone interviews, or face-to-face interviews. Although face-to-face interviews are more expensive than email or telephone calls; they may be necessary when the data that will be collected is complex to gather (McClave and Sincich, 2013).

For the theoretical model, the operationalization of the variables where the variables or constructs were represented was proposed, their conceptual definition, the dimensions and the indicators related to these dimensions, since in order to establish a possible universe of reagents it is necessary to have an adequate conceptualization and operationalization of the construct, in other words, the researcher must previously specify the dimensions that will be measured as well as their indicators, from which the items will be selected. Therefore, the selected items must measure the dimensions of the construct (Ding and Hershberger, 2002). In Table 2 presents the operationalization of the variables.

Once the dimensions and indicators measuring the skills and logistical capacities were identified, the measurement instrument (questionnaire) was designed, which consists of a questionnaire that groups 33 items around six dimensions: the first referred to the supply chain management, which is structured into 12 items that measure the skills related to the process, facilities, transportation, distribution, storage, customer service, relationships with suppliers, risks, multimodal logistics, logistics in emerging markets, inventory, and reverse logistics; the second dimension referred to the Quantitative Methods, which consists of 5 items that measure the skills in terms of uncertainty, analytical methods (Operations Research), metaheuristic models, Lean tools, and Six Sigma; the third dimension refers to information communications technologies, with 5 items that measure the abilities in business resource planning, e-commerce, mobile communications GPS type, bar codes, RFID, Voice picking, and Key Performance Indicators (KPI); the fourth dimension refers to finance, with 3 items that measure skills in financial indicators, logistical expenses, and logistic utility; the fifth referred to the legislation, with 3 items that measure knowledge in international regulations, customs regulations, as well as exportation and importation regulations; finally, the last dimension is related to soft skills, with 5 items that measure communication, leadership, personal development, foreign languages, and the ethics that a professional in logistics should have.

Table 2. Operationalization of the variables

VARIABLES	CONCEPTUAL DEFINITION	DIMENSION	INDICATORS
Logistics skills and abilities	It supposes an individual aptitude to execute, understand and manage internal and external logistics operations, with the capabilities to reduce costs, minimize supply risks and improve service levels to customers (Ruth and Torres, 2013).	Supply Chain Management	- Processes / flows - Facilities - Transportation - Distribution - Storage - Customer service - Relations with suppliers - Risk - Multimodal logistics - Logistics in emerging markets - Inventory and forecast - Inverse logistics
		Quantitative Methods	- Simulation (Uncertainty) - Analytical methods (Operations Research) - Metaheuristic Models - Lean tool - Six Sigma
		Information Communications Technologies	- Business resource planning - Electronic Commerce - Mobile communications type GPS - Barcode, RFID and Voice picking - Key performance indicators (KPI)
		Finance	- Financial indicators - Logistics Expenses - Logistic utility
		Legislation	- International Regulations - Customs Regulations - Export and import regulations
		Soft Skills	- Communication - Leadership - Personal development - Foreign languages - Ethics

Notably, it is necessary to emphasize that from the indicators, thirty-three (33) statements were designed, which are the base of the instrument in order to be validated by experts. The measurement scale is dichotomous, where one asks if one is, "Agreeing" or "Disagreeing" with the affirmation, that is, what it is aimed to be known is whether the items that integrate the questionnaire measure the dimensions identified in the literature review.

Furthermore, it must be considered that content validity cannot be expressed quantitatively, it is rather a matter of judgment, it is estimated in a subjective or intersubjective manner, usually using the Expert Judgment. In fact, it is used to know the probability of possible errors in the instrument settings.

Expert judgment basically consists in asking to a group of people to portray a judgment over an object, an instrument, a teaching material, or their opinion regarding a specific aspect (Cabero and Llorente, 2013). It is a technique that adequate implementation from a methodological point of view, which is sometimes the only indicator for content validity of the data or information collected with the instrument (Escobar and Cuervo, 2008); hence, it is useful in assessing aspects of a radically qualitative nature.

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A critical part of the validation process is the identification of the participants who will be part of the expert judgment, as a result, Skjong and Wentworht (2000) propose the following selection criteria: (a) Experience towards making judgments and making decisions based on evidence or expertise (degrees, research, publications, position, experience, and awards, among others), (b) reputation in the community, (c) availability and motivation to participate, as well as (d) impartiality and inherent qualities, such as confidence and adaptability.

In addition, taking as a fundamental criterion of selection the competence of candidates in the area of study, in research based on their personal curriculum is included, and three experts are selected, as it is seen in Table 3, with extensive knowledge in the Supply Chain and Logistics, where a questionnaire for each participant was handed in order to be answered.

According to Aiken (2003), in order to estimate the agreement between experts, it is necessary to acknowledge the degree of agreement between them, since a judgment includes subjective elements. When the measure of agreement obtained is high, which indicates that there is consensus in the process of classification or assignment of scores among the evaluators, in the same way, it is linked to the interchangeability of the measuring and the reproducibility measuring. (Ato, Benavente & López, 2006).

Similarly, in order to determine the degree of agreement among the experts in this research, the Kappa coefficient has been implemented, which reflects the inter-observer agreement that can be estimated in tables of any dimension, as long as two observers are contrasted. In addition, the Kappa coefficient can take values between -1 and +1; the closer to +1, the greater the degree of the inter-observer agreement, on the contrary, the closer to -1, the greater the degree of inter-observer discordance. A value of $\kappa = 0$ reflects that the observed agreement is precisely what is expected due to the exclusively to chance (Lopez, 1999).

Finally, to interpret the value of the Kappa coefficient, it is useful to have some rating scale. It has found some approaches where the authors always propose recognizing a certain arbitrariness. Altman (1991) offers a classification of Kappa that can help to interpret the obtained coefficients. In fact, this author registers values that go from 0 to 1, where 0 is the value where there is greater disagreement between researchers and 1 is the point where the greatest agreement is found. Also, their classification indicates that the Kappa coefficients can be Low (0 to 0.20), Weak (0.21 to 0.40), Moderate (0.41 to 0.60), Good (0.61 to 0.80) and Appropriate (0.81 to 1.00). The present research based its interpretations on this classification, because it is more complete in this sense.

According to the results obtained which are shown in Table 4, the Kappa value is 0.715, therefore, in order to describe its meaning the rating scale set by Altman (1991) was used in the preceding paragraph and, according to the scale, it is considered that the degree of correlation or agreement between the experts is appropriate. In the same way, from the statistical point of view, it is observed that the value

Table 3. Characterization of the experts who participated in the survey

Number	Place of work	Academic degree	Years of experience
1	Autonomous University of Ciudad Juárez	Master	35
2	Autonomous University of Ciudad Juárez	Phd	27
3	Technological Institute of Ciudad Juárez	Master	18

Table 4. Kappa coefficient results (Fleiss Kappa Statistics)

Response	Kappa	SE Kappa	p(vs >0)
0	0.715517	0.174078	0.0000
1	0.715517	0.174078	0.0000
2	0.715517	0.174078	0.0000

of p-value (p = 0.00) is lower than the level of significance of 5%, considering the null hypothesis (H_o), and the alternative hypothesis (H_1) of the tests, which are the following:

$H_0 : \kappa = 0$ (There is a disagreement among the experts)

$H_1 : \kappa \neq 0$ (There is a significant agreement among the experts)

The null hypothesis (H_0) is rejected, where it is concluded that there is an agreement between evaluators, the value of K provides the ratio of the agreement degree, removing what may occur by chance. Therefore, based on these values obtained through the Kappa analysis, it is determined that the instrument is valid.

The final instrument consisted of 33 items divided into 6 dimensions: 12 items related to the supply chain management, 5 items related to quantitative methods, 5 items related to information technology, 3 items related to finance, 3 items related to legislation, and finally 5 items related to soft skills as it is seen in Table 5. Additionally, in the end of the questionnaire a second section corresponding to complementary information was added, where the gender of the respondent was requested, the current job position, years of experience in the area, and the industrial sector where the company belongs.

In order to evaluate the reliability of the measurement instrument, the Cronbach alpha index was used, which is a statistical test that measures the degree of correlation between one item and another on a scale (Bernard, 2013). It is a reliability coefficient that values the consistency of the entire scale. The general agreement on the lower limit for Cronbach's alpha is 0.7; an aspect in the evaluation of this index is its positive relationship with the number of items on the scale (Hair, Anderson, Tatham and Black, 2007), and the formula for its estimation is presented in the following equation (Bland and Altman, 1997) .

Table 5. Items by dimension

Dimension	Items
Supply Chain Management	1-12
Quantitative Methods	13-17
Information communications Technologies	18-22
Finance	23-25
Legislation	26-28
Soft Skills	29-33

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$$\propto = \frac{K}{K-1}\left[1 - \frac{\sum Vi}{Vt}\right]$$

(1)

Where:

α=Cronbach´s alpha
K= Number of items
Vi= Variance of each item
Vt= Total variance

Likewise, in order to carry out the reliability of the measurement instrument, a pilot test was done by applying the questionnaire to 20 participants (previously selected by sampling and agreement) with experience in the areas of logistic and suply chain management of the Manufacturing Industries Exportation. Once the data was collected implementing the SPSS® software, the validation and the reliability of the measurement instrument was carried out using the Cronbach's alpha coefficient (Bland and Altman, 1997).

The questionnaires applied were answered on a 6 points Lickert scale, where the lowest value (1) corresponds to "totally disagree" and the highest value (6) corresponds to "totally agree", as shown in Table 6.

Once the application period was over, the information obtained was captured using the SPSS 22 ® software, a database was generated, where each row represents the results of the questionnaire of each subject, while the columns represent each one of the variables. In the cases in which some respondents did not respond to any item, these values were considered lost, and were replaced by the median of the item in which the surveys were answered.

In Table 7, the Cronbach's alpha index for dimension is presented, which is why the reliability of the instrument is considered appropriate.

Table 6. Survey scale

1	2	3	4	5	6
Totally disagree	In disagreement	Relatively disagree	Relatively agree	In agreement	Totally agree

Table 7. Realibility statistic result

Dimension	Cronbach´s alpha
Supply Chain Management	0.888
Quantitative Methods	0.758
Information communications Technologies	0.776
Finance	0.889
Legislation	0.825
Soft Skills	0.753

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CONCLUSION

The principal purpose of this research is to design a model for the identification of skills and abilities in a professional manager in the Logistics area, in the section below, the conclusions reached by the researchers are presented.

Moreover, the theories that reflect the development of the skills and abilities that a professional manager in logistics must have were examined, the literature review was based on several articles by different authors, each of them related to the skills and logistical abilities that are necessary for the effective supply chain management, as well as the companies requirements that are mandatory for a professional in logistics. The skills and abilities identified are 6: supply chain management, information communications technologies management, application of quantitative methods, knowledge in finance, legislation, and finally the development of soft skills.

In fact, in the design and validation of the measurement instrument about the skills and abilities that a professional specialized in logistics should have, a questionnaire was created containing 33 statements that measure the six dimensions that were found in the literature review; the instrument has a suitable validity with a Kappa coefficient of 0.715, as well as an appropriate reliability with a Cronbach's alpha acceptable for each dimension.

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APPENDIX 1

QUESTIONNAIRE FOR IDENTIFICATION OF SKILLS AND CAPABILITIES OF LOGISTICS ADMINISTRATOR

The following statements refer to skills and capabilities that a company requires for a logistics expert. Based on your experience, choose the level of agreement or disagreement for each statement.

1. Visualizes the entire process and helps find problematic locations by the use of process mapping.
   Completely disagree   1   2   3   4   5   6   Completely agree

2. Finds the optimum assignment of supply sources in order to meet the demand of the logistics network destinations
   Completely disagree   1   2   3   4   5   6   Completely agree

3. Ensures the efficient use of transportation resources and accomplishes the customer's requirements.
   Completely disagree   1   2   3   4   5   6   Completely agree

4. Distributes products among suppliers, production facilities, distribution centers, warehouses, and customers efficiently by the use of techniques for delivering, scanning, labeling, and shipping.
   Completely disagree   1   2   3   4   5   6   Completely agree

5. Configure warehouses by formally defining storage locations, identifying aisles, sections, shelves, levels and racks
   Completely disagree   1   2   3   4   5   6   Completely agree

6. Execute the interrelated activities with logistics, so that the client obtains the product at the right time and place
   Completely disagree   1   2   3   4   5   6   Completely agree

7. Locate and source from key suppliers of materials, analyzing the total cost associated with the procurement of an item or service
   Completely disagree   1   2   3   4   5   6   Completely agree

8. Identify and analyze accurately the risks that affect the supply, transformation, delivery and demand of the client
   Completely disagree   1   2   3   4   5   6   Completely agree

9. Understand the use of different conveyance (multimodal logistics) to carry various goods to their destination in a short time, in the right amount and in the right place
   Completely disagree   1   2   3   4   5   6   Completely agree

10. Measures the environment to have businesses with other countries (logistics of emerging markets) and identifies strengths or areas that require development in terms of logistics framework and infrastructure.
Completely disagree   1   2   3   4   5   6   Completely agree

11. Reduces inventory levels to minimum ensuring the availability of finished goods, work in process, raw material, and process inputs, when the process needs it.
Completely disagree   1   2   3   4   5   6   Completely agree

12. Manages the return of raw material, work in process and finished goods, as well as the related data, from the consumption point to the origin, with the objective of recovering the cost of material or achieve its elimination in a cost-efficient manner.
Completely disagree   1   2   3   4   5   6   Completely agree

13. Analyzes and represents systems under uncertain conditions.
Completely disagree   1   2   3   4   5   6   Completely agree

14. Understands the use of analytic techniques of operations research given its orientation to optimum solutions.
Completely disagree   1   2   3   4   5   6   Completely agree

15. Understands the use of metaheuristic models (genetic algorithm, tabu search, ant colony optimization, among others).
Completely disagree   1   2   3   4   5   6   Completely agree

16. Demonstrates knowledge and experience in order to actively participate in lean-related teams by the use of just-in-time, kaizen, Kanban, among others.
Completely disagree   1   2   3   4   5   6   Completely agree

17. Demonstrates knowledge and experience in order to actively participate in Six Sigma teams.
Completely disagree   1   2   3   4   5   6   Completely agree

18. Demonstrates knowledge in business resource planning by the use of Enterprise Resource Planning, Supply chain Management, and Customer Relationship Management.
Completely disagree   1   2   3   4   5   6   Completely agree

19. Is able to do transactions of goods and services by the use of mobile devices that connect to the internet and use it as platform.
Completely disagree   1   2   3   4   5   6   Completely agree

20. Utilizes telecommunications and GPS systems for route control, and efficient transportation and fleet management.
Completely disagree   1   2   3   4   5   6   Completely agree

Model of Skills and Capabilities of the Logistics Administrator

21. Understands the importance of bar codes, radiofrequency identification and voice picking utilization.
    Completely disagree   1   2   3   4   5   6   Completely agree

22. Analyzes and demonstrates key process indicators (KPIs) by the use of control boards, interactive analysis' and standard reports.
    Completely disagree   1   2   3   4   5   6   Completely agree

23. Analyzes financial statements and explains the implications of financial ratios and all components of the income statement (profit and losses) and balance sheet.
    Completely disagree   1   2   3   4   5   6   Completely agree

24. Understands the expenses of logistics (labor expenses, human resources, telecommunications, inputs and outputs, fuel, real property leases).
    Completely disagree   1   2   3   4   5   6   Completely agree

25. Compares the existing differences between asset leases related to logistic operations, and profit-ability of all assets of the company.
    Completely disagree   1   2   3   4   5   6   Completely agree

26. Has knowledge of international regulations for decision-making in distribution systems.
    Completely disagree   1   2   3   4   5   6   Completely agree

27. Has knowledge of customs regulations.
    Completely disagree   1   2   3   4   5   6   Completely agree

28. Knows the laws for importation and exportation.
    Completely disagree   1   2   3   4   5   6   Completely agree

29. Expresses information to groups and individuals, listens to others carefully to understand them, and pays attention to non-verbal languages.
    Completely disagree   1   2   3   4   5   6   Completely agree

30. Influences others by using persuasion in order to get others' compromise and support.
    Completely disagree   1   2   3   4   5   6   Completely agree

31. Pursues knowledge and personal development by doing what is necessary.
    Completely disagree   1   2   3   4   5   6   Completely agree

32. Is fluent in English and other languages.
    Completely disagree   1   2   3   4   5   6   Completely agree

33. Demonstrates professional ethics when dealing with customers, co-workers, and team members.
    Completely disagree   1   2   3   4   5   6   Completely agree

Model of Skills and Capabilities of the Logistics Administrator

Complementary information. Mark your answer with an x

1. Gender
   a. Male   b. Female

2. Current job position
   a. Low   b. Medium

3. Years of experience in the field.
   a. 0-5 years   b. 6-10 years   c. 11-15 years   d. 16-20 years   e. 21 years or more

4. Industrial segment of current company.
   a. Food   b. Automotive   c. Electronics   d. Electrical field   e. Machinery and equipment
   f. Transportation   g. Medical   h. Transportation services   i. Others: _____