Logistical barriers facing Colombia: the case of the company Schryver de Colombia

Barreras logísticas que enfrenta Colombia: Caso empresa Schryver de Colombia[1]

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Abstract

Currently, the logistics sector in Colombia must be considered as a fundamental part of the country's growth and competitiveness compared to other countries to reduce time and costs, this process gives the goods of a country potential and a differentiator that makes it attractive to the market. But, in many respects, Colombia is failing in this sector and it is not being given the value and recognition it deserves.

The objective is to show the shortcomings that Colombia has in terms of national and international logistics and supply chain, determining what their causes are and how much they affect producers, sellers, and the country's competitiveness.

For this, the most recurrent problems will be taken into account, and from there, emphasis will be placed on one of these using the simulation method that can positively impact the traceability of the processes of Colombian importers and exporters in terms of time and costs.

Keywords: Logistics, supply chain, cargo agency, Montecarlo, TMS

Resumen

Actualmente el sector de la logística en Colombia debe considerarse como una parte fundamental del crecimiento del país y de la competitividad frente a los demás países para reducir tiempos y costos, este proceso otorga a las mercancías de un país un potencial y un diferenciador que lo hace atractivo para el mercado. Pero, en muchos aspectos, Colombia está fallando en este sector y no se le da el valor y reconocimiento que se merece.

El objetivo es evidenciar las falencias que tiene Colombia en cuanto a logística nacional, internacional y cadena de abastecimiento, determinando cuáles son sus causas y qué tanto afectan los productores, vendedores y la competitividad del país.

Para esto, se tuvieron en cuenta los problemas más recurrentes y de allí se dio énfasis en uno de estos usando el método de simulación de Montecarlo y la propuesta de un sistema de información TMS que puede impactar de manera positiva la trazabilidad de los procesos de importadores y exportadores colombianos en cuanto a tiempo y costos.

Palabras clave: Logística, cadena de abastecimiento, agencia de carga, Montecarlo, TMS.

Clasificación JEL: L81 - Comercio minorista y mayorista; Logística; Comercio electrónico.

Introduction

As is well known, the logistic is a fundamental part of the supply chain both nationally and internationally and is used for many aspects of daily life, forasmuch as to do the smallest task of everyday logistic are required to comply with it.

Some authors such as Bowersox (2007) talk of logistics as the process to obtain products in the time and the place where it is required 24 hours a day, 7 days a week and 52 weeks of the year. It is also part of the traceability of information between suppliers, company and the final customer with the objective of satisfying the necessities of all parties involved.

In Colombia the logistic sector should move on with the hand with the changes that show currently the international markets and with the globalization that brings the openings of other new businesses, for this, the country should invest in infrastructure and technology which are two of the items that currently have the most shortcomings, moreover, the companies should be train in the following topics both logistical and technological and search alternatives to achieve more attractive in the market, a lot of the problems that occur currently in the supply chain are product of company misinformation, this will always result in extra time and cost overruns, two extremely important factors to be competitive and that above all must be avoided.

Although the country has over the years signed a number of *FTA* (Free trade agreements) with other countries, it has been evidenced that some of these trades have not been taken advantage of as they should have been like the example of FTA with Canada. Although these trades had been signed to ensure the economic grow of the country, this has not been entirely possible for the country's logistical and internal infrastructure problems that have put it at the end of the list without possibility to access to the advantages and decrease of tariffs that these trades have, this is why other countries in Latin America are more easily reached by the others markets and they do more trades with other economic powers. (Llanos & Mejia Rivera, 2011)

The present project will be focus on the problematics that Colombia has in the level logistic and how affect this to economic and the Colombians importers and exporters, focusing in the agency customers of international freight Schryver de Colombia, in addition, is intended to address possible solutions to the problematics like the extra costs of ground transportation, high warehousing costs, low use of technology and customs clearance times, with emphasis on the latter.

The analysis will be done in accompaniment of the company Schryver de Colombia forasmuch as the issues raised in the present project has been evidenced by the operatives of the company and the main point of view is the experience of those who work there.

In relation to customs clearance times, several options were addressed for the improvement of this item both within the company and the process to the end customer, this problem was taken as the main in the research because is an issue that can be improve and

potentiate, although the customs brokerage as such and the topics related with the *DIAN* cannot be changed, it can be improve to make them less traumatic for importers and exporters.

Montecarlo simulation was used to make decisions, as its name indicates is a simulation randomly of some customs processes it has had Schryver de Colombia in the last years and the same time, for this were used random times and was given the estimated value to each invest hour in the customs process, some of the results of this simulation let open doors to give it a management totally different to this process within the company.

There are two viable options for the company at this time, one of them is the system actualization *TMS* (Transportation Management System) according to Mayorga, Patiño, Rocha, Vargas & Taborda (2004) the *TMS* is a system where information is processed and stored with respect to transport processes, whether national or international since point of view of all parties involved in the logistic process; the main objective of this system is give an opportune support the process and keep the control of the logistic in order to optimize costs and avoid mistakes in the information, although it is already in use, it can be updated according to the problem to reduce costs and time, which are the items that are sought to improve in all operations, not only in logistics, the simulation resulted in a 34% improvement in the operation.

The option of a customs department directly within the company is also proposed, this process would not be outsourced, but would be an additional of Schryver de Colombia, this results in the elimination of an intermediary in the logistics chain between the customs agency and the final customer, which in this case is Schryver, but would be the direct communication of the person in charge of the customs operation and the customer, this also translates into a more accurate traceability to the end customer.

The objectives of this work are as follows:

General Objective:

To characterize the logistic problems faced by Colombia with focus on the international cargo agency Schryver de Colombia through the Monte Carlo simulation and the proposal of an update to the TMS information system oriented to the decrease of time and cost.

Specific objectives:

1: Determine the causes of the logistic problems faced by Colombia, through the experience of a cargo agency in order to determine which of these problems affect the company studied to a greater extent.

2: Propose a solution methodology that fits the needs described in the work based on the tools already used by the company to improve processes.

3: Review the feasibility of a customs department of the company Schryver de Colombia to improve traceability with end customers.

1. Statement of the problem

Over the years has been evidenced that Colombia confronts internal logistic problems in the exchange of goods with other countries; is possible mention some as: inefficiency in cargo consolidation, high national transportation and warehousing costs, inefficiency in ports, lack of use and lack of knowledge of technologies, in addition to legal problems leading to cost overruns and delays for importers and exporters that were not contemplated at the time of buying or selling a product and/or service.

According to with *DNP* (National planning department, 2015) and the Encuesta Nacional de Logística, the study conducted for the purpose of measuring the percentage share of total costs in the different processes within the companies and in the supply chain, showed that on average the logistics cost in Colombia is equivalent to 15% of sales and the most important items are reflected in the following table:

Table 1 percentage logistics costs

Item	Percentages
Transport	37%
Storage	20%
Supplier purchases and management	17%
Inadequacies in roads, ports and airports	21%
Lack of logistics information systems	20%
Complexity in customs procedures	12%

Source: Own elaboration based on information DNP (2015)

These percentages are derived from unknowing of the different norms in logistic area, inefficient negotiations that lack management and strategic components with suppliers, as well as failures in the infrastructure of the Colombian road network; in addition to this, there is the inefficiency of the ports and a little more collaboration on the part of the government administration oriented to collaborative models between the national and private business sector and all the actors in the logistics chain where the most representative problems, the most restrictive and those of greater cost, are consensual or treated.

According to the World Economic Forum, (World economic forum. Schwab, 2019) Colombia is in the positions 92 of 114 countries in terms of infrastructure, which positions is below average and indicates that the road and port infrastructure is not well qualified a global level, taking into account that the countries at the top of the list are countries with developed and efficient ports, roads and highways.

This one is one of the reasons for Colombia to be positioned in the 57 of 141 countries in a global competitiveness, in this case the country is positioned well above average, but not as much as one would expect. This rating takes into account aspects such as productivity, growth and human development.

Graph 1 Global competitiveness ranking.

Rank	Economy	Score[1]	Rank	Score
48	Mexico	64.9	–2	+0.3
49	Bulgaria	64.9	+2	+1.3
50	Indonesia	64.6	–5	–0.3
51	Romania	64.4	+1	+0.9
52	Mauritius	64.3	–3	+0.5
53	Oman	63.6	–6	–0.8
54	Uruguay	63.5	–1	+0.8
55	Kazakhstan	62.9	+4	+1.1
56	Brunei Darussalam	62.8	+6	+1.3
57	Colombia	62.7	+3	+1.1

Source: INTERNATIONAL MONETARY FUND (2019)

Talking about transport and road infrastructure that represents one of the main problematics of work and as seen above, the highest cost in the logistics chain, found that the shortfall in Colombia affect to a large extent due to several circumstances such as: lack of road planning, corruption in construction contracts, kilometers built per million inhabitants and high toll costs. (Escandón, Hurtado and Salas, 2014).

However, Colombia should have an advantage over other countries worldwide in terms of port infrastructure because it has ports on both the Pacific and Atlantic oceans and it would be assumed that it would take full advantage of this natural resource, but this is not the case because Colombian ports have operational, technological and infrastructure failures, which results in long waiting times when loading and unloading goods. In addition, if the infrastructure dimensions of the ports are taken into account, it can be observed that the latest generation of container ships with an approximate capacity of 24,000 containers requires ports with minimum drafts, more efficient gantry cranes and docks with sufficient length for berthing. (Velandia, Segura and Fierro, 2013).

A clear example of this problem is that, according to an interview with the president of ANALDEX Javier Diaz, conducted by Noticias Uno (2019) the average waiting time in other ports of the world is 12 hours, the Colombian average is 112 hours, not only due to the lack of technology, but also due to the inefficiency of customs processes, the objective that Colombia has is to clear containers between 48 and 64 hours. This time translates into a variable that affects the indicators of companies in terms of cost overruns, such as extra labor required to meet the delivery times agreed with customers, without taking into account the capacities of installed plant, which is another variable that must be taken into account in planning and programming in the case of manufacturing, and in some cases the service levels are not met due to the effect of not having the raw materials or products on time for manufacturing or marketing.

Nonetheless, this is not a new problem or one that is just being mentioned, port problems began in the 50's as mentioned by Velandia et al. (2013) when the administration of maritime terminals passed through the hands of public and private companies that unleashed a list of irregularities in their management, the budget to invest in improvements was used for other purposes such as providing offices for port personnel and not for the expansion of facilities and that is why currently Colombian ports do not have the capacity to grow at the same pace as the economy is growing. At present, it can still be observed that, although the ports have advanced in terms of infrastructure and technology, they still lack further progress to meet the needs of Colombian trade and compete with other countries.

Taking into account the information of the interview of Javier Diaz, in Noticias Uno, it can be seen that the times in Colombian ports compared to other countries are 100 hours above the average, this is equivalent to 4 days of delays for importers and / or exporters that translates into economic resources, because every day that the cargo remains in port is 1 day more to be paid for storage becoming costs that were not foreseen in the quotation of the goods under the terms of incoterms, in addition to taking into account that all the operations in port are settled under the TRM (market representative rate) that is to say at the value of the dollar, which means that the longer the delay the more expensive it is for the importer in this case, then, some of the costs that are charged for storage in port.

Table 2 Port tariffs Buenaventura port company in USD

Days	Container 20’	Container 40’
From day 1 to day 3	Free	Free
From day 4 to day 5	18,15	20,50
From day 6 to day 10	21,45	24,05
As of the day 11	45,00	50,40

Source: Own elaboration based on information (Sociedad portuaria Buenaventura, 2020)

It can be seen from the table above, that the port generally grants 3 free days for the use of containers for both import and export, these days begin to count from the time the ship arrives at the Colombian port, but as shown in this table the port times range from 3 to 4 days to unload the containers which means that these free days are never really usable. This situation breaks with the purpose or objective of the use of containers, which is to move cargo constantly both nationally and internationally, so the longer the importer delays the container, the higher the cost of importing or exporting.

In addition to this, there is not only a lag in the infrastructure of the ports but also in the airports, and it has also been shown that this is due to low investment, as mentioned by Yepes, Villar, Aguilar & Ramírez (2013), since it is paradoxical that investment in the country has grown in recent years and not enough has been invested in the current demand for transportation services for both goods and passengers.

In addition to the above, according to the study "Characterization of the logistics sector in Colombia" conducted by the Mesa Sectorial de Logística (2014) - SENA to 105 Colombian companies that were visited and consulted through an in-depth qualitative interview and a survey, the main problems affecting the logistics sector in Colombia and the companies studied were evidenced. Among these are barriers of security, coordination and regulation; likewise, the concepts of Supply Chain and Value Network are little known and some companies do not consider logistics as a fundamental part of productivity, efficiency and information flow in the processes.

From the logistical barriers found in the aforementioned work, we can conclude that Schryver de Colombia is affected as shown below:

Table 3 Logistical barriers according to the 105 companies in the characterization:

Logistical Barrier	Findings and conclusion	Schryver de Colombia
Organizational structure	93.3% of the companies studied have between 21% and 100% of their total employees dedicated to logistics activities. This indicates that the more employees dedicated to logistics a company has, the more prepared it is to face the other problems contained in this paper.	As an international freight forwarder, Schryver has more than 70% of its employees dedicated 100% to foreign trade and logistics, among these positions are the areas of: Operations, Commercial, Pricing and Customs. With respect to the company's customers, which is where the problems have become evident, it has been concluded that very few of these companies have enough employees in the logistics area.
Supply Chain	0% of the companies studied do not consider logistics to be important in the supply chain. Logistics is a fundamental part of the supply chain and in a large number of other processes; not using it or misusing it can result in damages and delays for companies.	At Schryver, the knowledge and application of the term logistics is fundamental, the company focuses on providing solutions to these problems, since most customers have major shortcomings in this area.
Security	Between 50.62% and 53% of the companies report certifications related to management systems (quality, control and safety), which reflects that almost 50% of the companies studied are not aware of the possible effects on their environment and do not work safely. Most of these companies are not constituted in accordance with sustainable development policies and the coordination, operation and	Being certified in quality, control and system, makes others have the perception of safety about the company, Schryver has a relationship with attentive suppliers and that have in their internal processes applicability of safety standards, the main flaw found in the company's customers is the need to find lower costs, although this is reflected in less security and possibility of disasters.

	continuous development processes of the National System for Disaster Prevention and Attention (SNPAD).	
Technology	The shortcomings are evident in the handling technologies to make the logistics processes systematic, since the companies under study make little or no use of technologies to improve their processes. In small companies the processes are replaced by man, they do not have the necessary machinery to systematize the processes, which results in delays and the non-utilization of the capacity of the companies. This problem is mainly found in the warehouses, whether they belong to a company or only provide storage services.	In the company there are cases of customers who continue to use physical folders to store the information of their processes, which hinders their work and does not help the environment. This is counterproductive because it takes time and causes traceability problems. In addition, Schryver's suppliers have also noticed a failure in terms of technology and a clear example is the taking of serial numbers of packages in the warehouse, until recently this process was done manually which became cumbersome for warehouse operators and the data arrived with large errors, due to the number of serial numbers to be taken, these range between 1000 and 2000 per stored load; due to these costs increased considerably because the warehouse charges by the hour. Lately there has been an improvement in this aspect and software has been found that makes this serial taking easier.
Occupational environment	Only 5% of the companies studied incorporate logistics professionals with undergraduate, specialization, master's and doctoral degrees. Very few companies train their workers and this is reflected in the productivity of	Schryver tries to hire people with the right skills to provide adequate attention to all its customers and support them in solving their problems. It is very common to find workers in importing and/or exporting

	operations. It is well known that everyone has the opportunity to learn, but in the logistics market there are countless trained people who are unemployed, the unemployment rate in the logistics sector is 10.6%, above the national unemployment rate which remains at 8.4%.	companies who know absolutely nothing about international trade and logistics, which causes delays, errors, cost overruns, problems, etc.
Environment	Transportation and infrastructure are related to air pollution, biodiversity loss and energy dependence. The land transportation sector contributes to 86% of the total pollution generated by Colombia, 23% of the world's greenhouse gases and 80% of the average noise level. In Colombian companies the problem is more significant because it has been shown that warehouses and warehouses are not using renewable energies or biodegradable materials so as not to affect the biological cycle, the need to use green and renewable energies is not understood in the country.	The environmental "pico y placa" is a necessary evil that must be applied in the country to counteract the pollution we have, but this greatly affects the logistics of transportation because there are fewer vehicles and time available to move goods, adding also that freight rates tend to increase which makes the entire operation and the supply chain more expensive, in addition to the infrastructure problems of each city when the cargo must pass there. This problem should be treated more as an opportunity for improvement not only for the logistics sector but for the country in general, sufficient attention should be paid to problems related to the environment and solutions should be provided to improve the quality of life of Colombians and the smooth flow of foreign trade.
Human Resources	Many of the companies studied consider "supply chain" to be the same as "logistics" and none of them expressed the need for training and education in these terms.	Ignorance is one of the biggest problems that Schryver's customers have, it is a good thing for the company because it has the ability to provide support and seek solutions, but the real problem lies

	Ignorance and lack of training is a cause of low levels of productivity and competitiveness and is the most notorious problem, since the other problems stem from it. In Colombia, companies in the logistics sector are not given enough visibility and they have several flaws that affect employees, among them: low salaries and little training and education.	when an importing and / or exporting company in his ignorance starts a foreign trade operation and when his cargo is going to leave the country or is arriving to the country he realizes the mistakes made such as: Wrong documents, ignorance of the Colombian law regarding customs, possible penalties and if their product could be marketed, that is where Schryver comes in to provide support, but there are times where there is no solution.
Downtime at load generators and ports.	In this study, an investigation was made of the maritime ports that do not have as many problems as the present study, since they have all the management systems and certificates, but the reality is different.	Actually, what has been evidenced in Schryver de Colombia is not in agreement with the characterization research carried out because in it the ports are highly qualified and the real day to day problems are not mentioned, among these we can highlight: Delays for unloading containers, delays in inspection processes, high warehousing costs and slow response to requests.
Lack of efficiency and effectiveness in customs.	It is considered a regulatory barrier because it still has very extensive and cumbersome processes.	This problem has arisen mainly with Schryver's clients due to lack of knowledge of the laws. They import products without knowing how they should be nationalized in Colombia, and in order to recover their goods they must pay high ransom or finally abandon them.

Source: Own elaboration based on information CHARACTERIZATION OF THE LOGISTICS SECTOR IN COLOMBIA (2014).

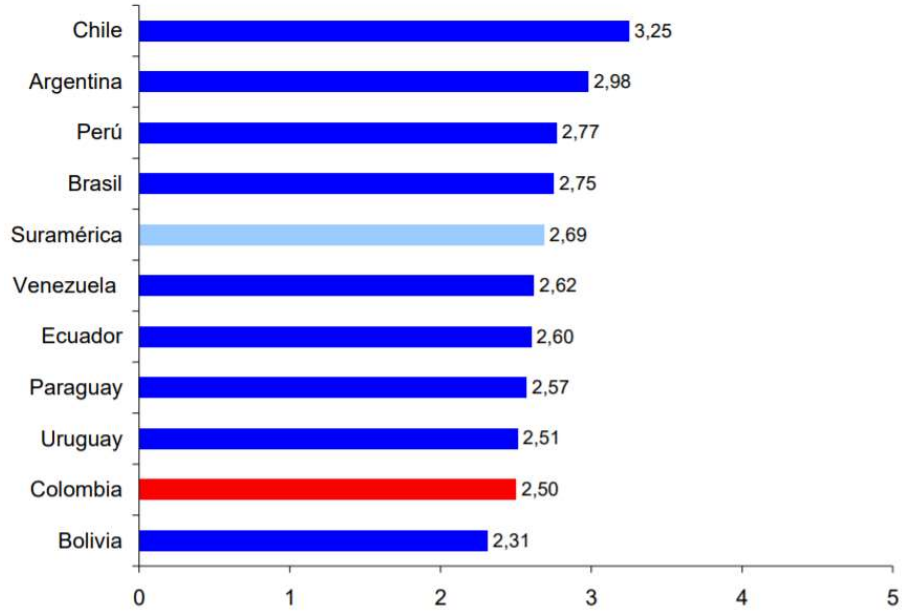
The recommendations given in the work of characterization range from updating the Conpes 3547 of 2008 which talk about national logistics policy to designing and implementing systems of information that facilitate the management of operations. An important aspect to improve the above-mentioned problems is the knowledge of the law and the Colombian process

to avoid the same problems to continue to occur so often, it is important to clarify that some of these problems cannot be controlled for small companies or agencies international cargo such as port delays.

Regarding the Conpes 3547 of 2008, this document contains strategies to improve and develop of national logistics system, as well as support to increase of the competitiveness and productivity, this mentions the parties involved in the supply chain and how they positively or negatively affect the productivity and efficiency of the sector (Consejo Nacional de Política Económica y Social, 2008).

In this last update of 2008, the Logistics Performance Index - LPI (World Bank, 2007) evaluates the performance of countries in terms of foreign trade and Colombia is in 82nd place out of 150 countries and in second to last place if the countries of Latin America and the Caribbean are taken into account, as shown in the following graph:

Graph 2 South American Ranking - LPI



Source: Connecting to Compete. World Bank, 2007

The previous graph confirms what has been mentioned throughout the project and are the shortcomings that the logistics chain presents, since Colombia occupies this place due to its infrastructure, management of its processes of goods and management to the internal logistics of the entities responsible for supporting the same.

The possible solutions to the problem of transportation infrastructure are the visibility of a wide range of transportation logistics services where it is possible to play with costs, distribution and facilitation of the flow of goods and also the proper access to much of the country so that the distances traveled are smaller and can be transited more easily.

In accordance with the above and according to information provided by Schryver de Colombia, in the period between January 1, 2020 and January 1, 2021 and taking into account 200 import operations and 50 export operations, these are the problems that have occurred the most in the company:

Table 4 Logistical barriers at Schryver de Colombia

PROBLEM	TIMES
High land transportation costs	90
Port delays	75
Errors in internal customer communication - technology	70
Complexity in customs procedures	60
High storage costs	52

Source: Own elaboration based on information from Schryver de Colombia (2020-2021)

By this way the problems are manifested as follows:

1. High land transportation costs, sometimes higher than international air or sea transportation. The following example is based on the experience and costs offered by Schryver de Colombia:

Export cargo from Cartagena, Colombia to Veracruz, Mexico weighing 1,471Kgs, 3.5m3.

The value of the international maritime freight is USD65.00 (all inclusive) x Kg/M3 in this case cubic meters which is greater, which gives a value of USD195.00 converting it to a TRM of $3,500 we have an international maritime freight cost of $682,500. Now, the freight forwarder was asked to perform the land transportation from Medellin to Cartagena and the best rate was: Express $1,400,000 - Consolidated $820,000 taking into account that it must wait 2 to 3 days to complete the consolidation.

In this specific case, the customer chose the consolidated option because it was within the timeframe, but there have been operations that are extremely urgent and the customer must opt for the express option, given this, it can be concluded that domestic land transportation can sometimes be twice the price of the same international route.

2. Delays in port: Colombian ports offer 3 free days of use of facilities from the arrival of the ship at the dock, but the unloading of the ship can take up to 2 days, which really does not make these times so profitable.
3. Errors in the internal communication of the client - technology: In the company there have been some clients that still organize their operations in a physical way, that is, by

folders with documents and do not have a software that supports them to give a more appropriate and faster handling to their cargo, this problem affects the environment because a large amount of paper is printed that is not necessary, the client himself and Schryver de Colombia because the information tends to be delayed and sometimes incorrect.

This problem goes hand in hand with delays in the customs processes, although this will be explained later; there have been cases in the company of customers who have paid up to $10,000,000 for warehousing in port because the goods cannot be removed until the customs clearance is completely correct or there is a shortage of vehicles to transport the goods from the port to the interior of the country, which also accumulates warehousing.

4. Complexity in customs procedures: The following is a specific operation seen at Schryver de Colombia in 2020 with one of its customers:

A Colombian importer brought from China some infrared thermometers with a CIF value of $100,000,000, in China the cargo was inspected and at first sight the thermometers did not have serial numbers and were declared in Colombia. Once the cargo arrived, it was presented to the *DIAN*, taxes were paid and it was assigned to the transport to take it to the final destination.

When the vehicle was leaving the airport, the police requested a review of the documents and the cargo. After a lengthy review, they concluded that the cargo did have serial numbers and that these had not been included in the import declaration.

Some of the issues raised in the paper arise here:

A. A transport had already been contracted that did not make the trip and had to be at the airport for more than 12 hours, so the domestic freight was charged, although the merchandise did not arrive at its final destination.

B. While the DIAN determined the correct sanction, the merchandise was moved to a warehouse where it remained less than 15 days and the cost of storage was high, additionally, there was a loss of 4 units of thermometers and it was never clarified what happened to them, in that case Schryver de Colombia and the customs agency had to pay these units to the client.

C. The final customer not being knowledgeable of the norm did not take much care with the issue of the serial numbers when really after the seizure of the cargo it was verified that they did have them, for this, a penalty of 50% of the CIF value had to be paid according to the OFFICE 021444 OF 2019 AUGUST 29 Legal Problem Legal Thesis Descriptors Merchandise - Description Serials Formal Sources DECRETO 1165 DE 2019 ARTS. 3 and 295 RESOLUTION 46 OF 2019 ART 302.

Not knowing the rules completely resulted in costs that were not contemplated when purchasing the product, these will be shown below, but that is not the problem that was mentioned initially, the real problem is that customs procedures are so tedious and delayed that

resulted in the operation will take almost a month since the arrival of the cargo, the response from the competent entities was almost nil and when they gave answers to the process these were not accurate until finally the customer was forced to resort to hiring a law firm.

Table 5 Comparison of COP values

		
CIF VALUE	$100,000,000	$100,000,000
CUSTOMS	$700,000	$50,000,000
TAXES	$19,000,000	$19,000,000
TRANSPORT	$1,200,000	$1,200,000 (flete muerto)
WAREHOUSING	$0	$2,000,000
TOTAL	$120,900,0000	$172,200,000

Fuente: Schryver de Colombia (2020)

This comparison shows the difference in value between a correct operation without delays and the example with which there were many mishaps, the difference between both operations is $51,300,000. This value was not contemplated by the importer at the beginning of the operation and could mean the profit they expected to receive from the sale of the units.

5. High storage costs: This is a recurring problem both at the port due to the high storage costs and for air cargo arriving by direct unloading, since, if the unloading is not completed, the airline transfers the goods to a warehouse where they have an agreement and the storage costs for 1 or 2 days that the cargo remains their range between $350,000 and $480,000 for small cargoes.

2. Frame of reference

2.1 Theoretical framework

Firstly, it is important to know the term logistics for evidence from which such problems arise or logistics barriers. Some authors refer to this term as the fundamental part in the supply chain, the part that makes possible that a seller and buyer and the final consumer (Ballou, 2005). Also, according to Ruiz, Gaitán and Morato (2005), logistics is the support for the necessary supply in commerce and has to do with companies that distribute products; it is also necessary in the provision of services.

For this study we intend to adapt the theory of comparative advantage.

The law of comparative advantage, according to Chipman, (1965) was discovered by Robert Torrens in 1815 and integrated into the study of the economic system as a whole by David Ricardo in 1817. It criticizes Adam Smith's idea of absolute advantage because it is not beneficial for a country to have an absolute advantage over any commodity if it does not have a comparative advantage, and it raises the potential gains that a country can obtain by opening its doors to foreign trade by adopting a production structure specialized in goods with higher relative labor productivity.

As its name indicates, comparative advantage refers to the ability of a country to produce an asset using fewer resources than another country.

This concept is reflected in this research because it is known that the country has an advantage in the production of certain products such as: a. natural honey; b. mushrooms and fruits; c. vegetable waxes; d. oil, cooked, dehydrated; e. flour and corn; f. cocoa, paste; g. beans, dried; h. figs; i. oats, flakes; j. vegetables, temporary; k. food, waste; l. tea; m. cocoa, butter; and n. vegetables, preserved, but its logistical problems prevent it from being highly competitive and prevent good negotiations with other countries in the exchange of goods and/or services. cocoa, butter; and n. vegetables, preserved, but its logistical problems prevent it from being highly competitive and prevent good negotiations with other countries in the exchange of goods and/or services, this generates delays and additional costs that cause the product to arrive at the final destination with a higher value than initially estimated (Irina Azuero & Orrego Guzmán, 2015).

The theory of comparative advantage applies more to exports because it refers to the goods or services produced by a country that make it competitive with other countries and it is at this point where some problems are observed, a clear example is the cost of land transportation, which for small loads can cost more than the same maritime transportation. In this order of ideas, who ends up affected in this chain is Schryver de Colombia, since initially the company offers a value of land transportation to its final customer, if this cost increases it is not possible to make the increase to the customer because it had already closed a negotiation and must comply with it. Schryver de Colombia is the one who must assume this extra-cost, which translates into an effect on the company's profit.

An importing company may have the best supplier, but if at the time of importing the product the costs are not well calculated in the quotation, this product may arrive in Colombia with a much higher cost and will not be sold in comparison to the local competition.

The Ricardian model has a model called relative prices of goods, which means that a country that has a lower relative price of a good than another, already has a comparative advantage in that good and therefore should specialize in the production of this (Escobar, 2010).

In history, other authors and specialists had spoken and supported the comparative advantages. but adding other factors, because the fact that a country produces a good at lower cost does not mean that this good is entirely profitable. This is how it puts it the Heckscher-Ohlin model, the comparative advantage is determined by the interrelationship between a

country's resources, the abundance of production factors and technology. It is the interaction between abundance and the extent to which these resources are exploited that is the source of comparative advantage (Ceupe Magazine, 2018).

At this point it follows that logistics plays an important role in making a good and/or service have both comparative and competitive advantages, in the case of competitive advantages it is the differentiating factor that positions a product over another.

To understand completely the comparative advantage model, must be taking into account the absolute advantage of Adam Smith; the absolute advantage that a country has is the ability to make a good more easily than others and that this can be exported for other countries to benefit. Adam Smith initially proposed the idea that the correct way for a country to benefit from free trade is to open the doors to imports, but it is with David Ricardo that a more systematic theory of international trade emerges. (Gómez Chiñas, 2003)

Now, what does it bring to a country to produce goods at a lower price if its logistics is not sufficiently prepared for foreign trade? Colombia may have comparative advantages in the production of certain goods and/or services, but internally its logistics is failing and because of these problems, the products do not arrive at a really competitive price to their destination country. The most notable disadvantages between Colombia and other countries are the extra time in port that translates into more costs than those established by importers and/or exporters at the time of quoting their entire operation and the time invested in customs processes, the latter in most cases due to the lack of knowledge of traders in Colombia.

2.2 Conceptual framework

According to Ballou (2005), the logistics planning is based on the activities that manage the company and how the same are performed to achieve the corporate goals and generate decisions that define the level of customer service. In international logistics there are significantly important aspects, among them the ground transport or national transport, this is the one that connects the importing or exporting company with the port or airport for the cargo to make its international journey.

Some authors, such as Anaya Tejero (2007), agree that the main criteria to define a transport are the price, the service offered by the carrier, reliability, and pick-up and delivery time. In Colombia this is one of the problems that is most evident because are presented cost overruns in this item and many times the transport companies do not provide adequate service to the needs, it is extremely important for Schryver de Colombia not only to have suppliers at its service, but also good allies to support the company in solving problems and, at the same time, to add value to the chain and to the customers.

According to the *DNP* (Departamento Nacional de Planeación, 2018) and the report of results of the National Logistics Survey of Colombia in 2018, the logistics cost is mainly composed of storage cost, with a 46.5 % share; and transportation cost, with 35.2 %. These two items represent 81.7% of the total logistics cost.

Storage costs include: costs of logistics operators, warehouses, leases and investments, associated technologies, cost of labeling, surveillance, insurance, among others. In the country, the cost of storage is really high, without taking into account that everything is charged separately, labels, insurance, etc.

The value of storage ranges between $ 30,000 and $ 35,000 per m2 per month or fraction, handling a minimum of $ 350,000, in addition to this, the warehouses also provide the service of packaging, repacking and labeling of goods, labels - stickers according to their size and quantity can range between $ 300 and $ 1. 000, the pallets have a cost of $26,000 each and they charge per hour, an hour can cost up to $40,000, all these values are expressed in Colombian pesos.

At this point it should be taken into account that freight forwarders offer services according to market rates. In addition, in this link of the chain, mishaps can also occur, such as poor labeling or packaging, a process that must be repeated, and as a result, operations may take longer than stipulated. (Riveros Ballesteros & Ballesteros Silva, 2008).

Transportation costs include: primary and secondary transportation costs, fuel, which represents a large percentage of the value of the service, vehicle parking and drivers' lodging for long distances, tolls, associated technologies, information systems and GPS, escorts, transportation insurance, and monitoring. What is really expensive in transportation is the service itself; the costs of monitoring and escorts are relatively low for the security they provide. (Alvarez & Grajales, 2015).

3. Methodology

Based on the characterization of the logistic barriers in Colombia that directly or indirectly affect Schryver de Colombia, we propose as an alternative solution the improvement of the *TMS* (Transportation Management Systems) software in order to ensure the management of the Supply Chain with the objective of enhancing the administrative functions in terms of documentation management, traceability and visibility of information, as well as a key support in the integration of port operations in terms of import or export that allows between the port authorities, the cargo agent, the actors of the chain such as transporters, cargo consolidators, customs agency and the client to make decisions so that the processes flow properly without many unforeseen events such as those mentioned in the context of the work, making it possible for the company under study and for the client, owner of the cargo, to reduce time and logistics costs as a result of efficient management of information in each of the operations.

As a consequence, more efficient operations for the company and for the client according to its business model, the financial objective is the generation of profits through an economic activity, for this case study between Schryver de Colombia and its portfolio of clients.

Of the problems mentioned, the company works every day in a large part of them to differentiate itself from the competition in the market, among these are the times and costs of

ground transportation that translates into a decrease in costs and an increase in the quality of service, this is achieved by seeking suppliers that apart from being simply suppliers are allies for the company, providing solutions and improvements in every aspect of the operation, likewise happens with the warehouses and warehouses, you must have agile suppliers, with strategic locations for the storage of goods.

Currently the technologies are controlling a large part of the market doing tasks that before were made manually something more systematized and faster, this translates into both time and cost savings for the end customer and these are the key suppliers to the company. Good negotiations are largely a solution to certain logistical problems.

There are other problems that are uncontrollable by the company such as delays and processes in port and the complexity of customs procedures, this goes beyond the management of a cargo agency, but in general is a significant problem facing Colombia and it is the State and the private sector who control and monitor the port system in the country who must find solutions to these problems.

Customs procedures are also not under the control of the company, but the solution of this project is intended to focus on how to internally make the processes less traumatic for end customers and how to provide advice and possible improvement to the problems, because in many cases customers come looking for help to processes that they did on their own; Something so simple is that they bring to the country cargo in Courier and when they arrive to the territory these goods must pay taxes or it is a company that confidently bring a new product and this requires permits, the internal processes have been standardized to provide the best support, but always seeks to improve.

In the current environment at import and export level in our country there are information systems such as *MUISCA* (Modelo Único de Ingresos, Servicio y Control Automatizado) used by the *DIAN* (Dirección de Impuestos y Aduanas Nacionales de Colombia) where its main objective is the integration of Customs operation, *AEO* (Authorized Economic Operator) which aims to control foreign trade operations, satellite systems that facilitates the non-inspection of containers, but in many cases it is done, which takes time away from the agility of the operation and increases costs. Even so, with information systems available in our national territory, it is necessary the support of a systematized tool such as a *TMS* software to streamline all processes along the chain and its actors.

Talking about the *AEO*, it is worrying that there are not enough companies in Colombia that have this certification, to date and according to data from the *DIAN* (2021) there are only 282 companies with this title and in terms of competitiveness at a global level this certification is a trade facilitator instrument because it is a sign of security in the eyes of other countries with which an importer and/or exporter has relations, *AEO* programs in the world bring benefits and conditions of improvement for all parties involved in the supply chain at the international level. (Naufal Pedraza & Solano Roa, 2017) For Schryver de Colombia it is necessary in terms of customs brokerage to work with customs agencies that have this certification.

The methodological approach to solve the problems in Schryver de Colombia is described in the following table:

Table 6 Solution methodology

Specific objectives	Activities	Type of information	Results
Compare the times and costs of the import cycle that generates errors in the current internal communication-technology with respect to the proposals for the implementation of an information system that synchronizes the traceability of the customs agency and the information system on the part of the client as an integral collaborative system between the actors of the chain through the Monte Carlo simulation.	Gather timing information by reviewing import processes. Transfer the information to an Excel template for simulation using SimulAR software.	Primary	Classify the critical processes of the import process analyzed.
To propose the main variables in the import process for the simulation model.	Analyze the key information in the import process to propose them as input variables in the simulation model.	Primary	Key processes to be involved in import matters.
Analyze the creation of a Customs department at Schryver de Colombia.	To raise the analysis and proposal with the company's management.	Primary	Validation of results with the company.

Source: Own construction

Based on Table 6, the steps to be followed in Table 7 for the methodological implementation of the Monte Carlo simulation for the company under study are presented below.

Table 7 Procedure to establish the statistical probability distribution of an input variable.

1)	Selecting and describing the input variable to be statistically analyzed
2)	Collect information from the population or a sample of the input variable in the logistics process under study.
2.1) If data cannot be collected, it can be taken from a similar process or from another company. Another option is to ask an expert to establish the parameters for the variable under analysis.	
3)	Implement goodness-of-fit test for the data using statistical software such as: SimulAR
4)	In the goodness-of-fit test, if the p-value obtained is greater than 0.05 (5%) the data fit the statistical distribution under evaluation. The higher the p-value, the better the fit
4.1) By the Central Limit Theorem (C.L.T.), if there are more than 30 data, the data tend to behave like a normal distribution. It is not usually recommended, but can be used, if graphically it does not show a behavior close to the normal distribution.	
4.2) If none of the distributions fit the data, nor is the CLT used to assign the normal distribution, an empirical distribution can be modeled.	
5)	For the selected statistical distribution. The parameters are established and modeled in the Monte Carlo simulation software SimulAR ®.
6)	The modeling of the random input variable is performed in SimulAR®.

Source: Own construction

From table 7, for the development of the simulation, a sample of 105 data for each import process will be taken into account as shown in table 3 through a history of 60 months and number of transactions per month.

Table 8 Process time table

Module ERP_Schryver de Colombia

Objective	Collect data from the ERP system of the company under study			
Sample size	105		Operations	
Customs provider choice (Hours)	First pre-alert shipment to customs with documents (Hours)	Approval of documents or sending corrections (Hours))	Customer mininnums and final documents (Hours)	Nationalization from the moment of arrival (Hours)
1	2	24	24	30
1	1	24	24	32
1	1	26	26	30
1	1	40	24	35
2	1	44	24	35
3	1	24	24	40
3	3	24	30	70
1	2	26	24	66
1	1	40	24	70
1	2	48	26	50
1	1	40	30	46
1	1	24	26	35
2	1	48	32	35
2	1	24	24	35
1	1	24	24	60
3	2	50	40	66
3	3	60	42	35
2	3	68	42	35
2	3	70	36	72
1	2	70	40	70
2	1	62	42	66
1	1	60	24	60
1	1	70	48	60
1	1	26	24	50
3	2	70	40	70
2	1	50	35	60
3	1	24	24	55
3	1	24	24	36
2	2	24	24	60
1	1	24	26	60
1	1	70	34	60
1	3	66	35	66
1	1	60	38	70
2	1	50	40	72
1	1	24	26	58
1	1	24	35	36
1	1	70	44	60
2	1	25	24	60
1	2	26	24	68
2	1	25	24	46
2	1	24	24	70
1	1	30	26	66
3	1	34	24	50
3	2	24	24	70
3	3	70	40	70
3	3	30	24	46
2	1	70	40	60
2	1	60	30	38
1	1	24	24	40
2	1	24	24	50
1	1	32	24	56
2	1	30	24	56
1	2	40	26	46
3	1	60	24	50
1	1	24	28	50
1	1	24	30	60
1	1	26	24	72
1	2	30	24	50
3	2	55	30	70
2	2	40	24	48
1	3	45	32	46
1	1	24	24	50

Source: Own construction

It can be seen from Table 8 the process times, which we will treat through the simulation software with the objective of identifying the critical variables, times and potential costs.

The following table 9 shows the objective of the simulation with respect to the time and costs of the import process, the solution approach, the construction of the input variables, the output variables, this table will also reflect after 3000 simulations that are considered optimal to analyze the import process, the difference in time, costs, savings obtained per month, projected annual savings, investment and return on investment.

The simulation will reflect the importance of synchronizing the information of the import process and the integration of the actors in the chain between the shipping company, logistics operators, carriers of the different modes and means of transport, as well as for the end customer, which will allow him to obtain first-hand information in real time and at the same time each and every one of the actors can plan, schedule, execute and monitor their processes in order to be efficient, effective and products in what characterizes each business model as Core Business (main function of the business to its customer).

The construction of Table 9 also shows the *TMS* supplier for the company under study, which through installed demos, data is obtained to be simulated and from which statistics will be obtained for decision making, as well as in the same table is reflected in parallel the positive and potential difference of each of the planted items within the table.

The results will be presented after Table 9 once the SimulAr software is run with 3000 simulations.

Table 9 Approach to the simulation approach, input variables and output variables

Data obtained from the analysis and pilot of ICT appropriation (TMS)	
SCHRYVER company of Colombia	

Objective	Compare the times and costs of the import cycle that generates errors in the current internal communication-technology with respect to the proposals for the implementation of an information system that synchronizes the traceability of the customs agency and the information system by the client as an integral collaborative system between the actors of the chain, which allows the analysis of the potential increase in efficiency for this import logistics process.		
Solution approach	Monte Carlo simulation to study the potential import cycle times generated by the current method and technology, taking into account a new approach, the use of TMS software. This simulation approach is selected because the input variables of the import process have uncertainty. This is proposed because the times depend on the product to be imported and the nationalization modality, hence uncertainty is generated in the total time of the import cycle. Therefore, the total time of the import cycle is usually DIFFERENT FOR EACH SHIPMENT ORDER, which generates uncertainty.		
Input variables	Variable name	Deterministic or random	Comments
	Choice of customs supplier (EPA) Between 1 and 3 hours	Random	a) Determine the statistical probability distribution of the variable by implementing goodness-of-fit test. b) For the current system, historical information of Schryver's import process is collected, which is used to establish the statistical distributions (Sheet: Current data of the process). c) TMS and Schryver's own customs brokerage are established based on data collected from the implementation pilot.
	Sending first pre-alert to customs documents (PDA) 1 to 3 hours	Random	
	pproval of documents or sending of corrections (ADOC) from 24 to 72 hou	Random	
	Customer Minimums and Final Documents (MCDA) 24 to 48 hours	Random	
	Nationalization from the moment of arrival (NA) from 30 to 72 hours	Random	

Average transaction times obtained from pilot test (hours)	ERP Actual			Approach 1: TMS		
	Value to	Media	Destandar	Value to simulate	Media	Destandar
EPA	2	2	1	8	7	2
PDA	3	2	1	11	16	3
ADOC	50	40	18	9	10	3
MCDA	33	29	7	1	2	1
NA	68	54	13	2	3	1
Total purchase cycle time per transaction	156,00			31,00		
# average number of transactions per month	31					
Total purchase cycle time hours per month	4855			954		
Cost per hour ($/hour)	10240			12300		
Total cost per month	$ 49.715.200			$ 11.734.200		
Difference in % of time (ERP system used as reference)	Current ERP system			20,1%		
Difference in % of cost (ERP system is used as reference)	Current ERP system			-76,4%		
Savings obtained in $/month ((negative decrease, positive increase in costs)	Current ERP system			$ (37.981.000,00)		
Projected one-year savings	Current ERP system			$ 455.772.000,00		
Investments	Current ERP system			$ 400.000.000		
Return On Investemnt (ROI_Return On Investemnt)	Current ERP system			1,13943		

Source: own construction

Table 9 shows the results of the simulation where the total cycle time of the import process with the current ERP of the company is 126.36 hours compared to the proposed improvement approach with the *TMS* that integrates the information in all the processes of the actors of the chain with a time of 42.88 hours, making it a valuable resource with a significant scope in the reduction of approximately 34%, in addition to the costs associated with the operation per month with a reduction of approximately 42%. 88 hours, making it a valuable resource with a significant scope in the reduction of approximately 34%, in addition to the costs associated with the operation per month with a reduction of approximately 42%, a difference or reduction in time with the *TMS* of 18. 6%, with a difference in operating cost of -58.4% and projected savings of 23,483,126.92 per month and an annual savings of 281,797,523, so the *ROI* (return on investment) with respect to the acquisition value of the *TMS* which is 400,000,000, the *ROI* is approximately 70%. If analyzed carefully, the total investment would be recovered in less than two years, leaving as benefits important reductions in the time of

import operations, better traceability and visibility of information for all those involved in the chain, in addition to the vital importance of real-time information for the customer. It is well known that sustaining service level indicators for companies is not easy and even more so for transportation companies, due to intangible events that cannot be controlled, to mention just a couple of examples, natural phenomena, public order problems in each country, which is why it is essential that logistics processes and in this case study operations are increasingly faster and more efficient, thus allowing the flow of a number of administrative procedures and smoother processes.

As we know today worldwide, we talk about panic demands and panic supplying for eventualities that originate in any country of the world and that finally ends up mutating to many other countries, so the movement of loads at international level specifically in our country need a quick agility in the management of information to give way to other processes of movements and departures of goods, because associated with this, our Colombian geography makes the goods move slowly.

Below, you can see the statistical data after running the software with 3000 simulations for the Current ERP.

Illustration 1 Statistical results of current ERP vs. proposed TMS.

Simulation results				
Select output variable				
N*	**Name**	**Sheet**	**Cell**	**Formula**
1	TMS	Sheet 1	F25	F23*C24+vsalida()
2	ERP	Sheet 1	C25	C23*C24+vsalida()
Descriptive statistics of the variable N 2				
Statistic		**Value**		
Minimum		1654,145752		Calculate descriptive statistics of the selected variable
Average		3869,932076		
Maximum		6454,082497		
Median		3851,413379		Show histogram of the variable N 2
Variance		538777,462		
Standard deviation		734,0146198		Tornado plot of the variable N 2
Rank		4799,936745		
Kurtosis		-0,205872799		Generate report of variable N 2
Asymmetry coefficient		-0,022742397		
Coefficient of variation		189671189387297%		Generate report of all variables in Excel
Percentile 1%		2211,80459		

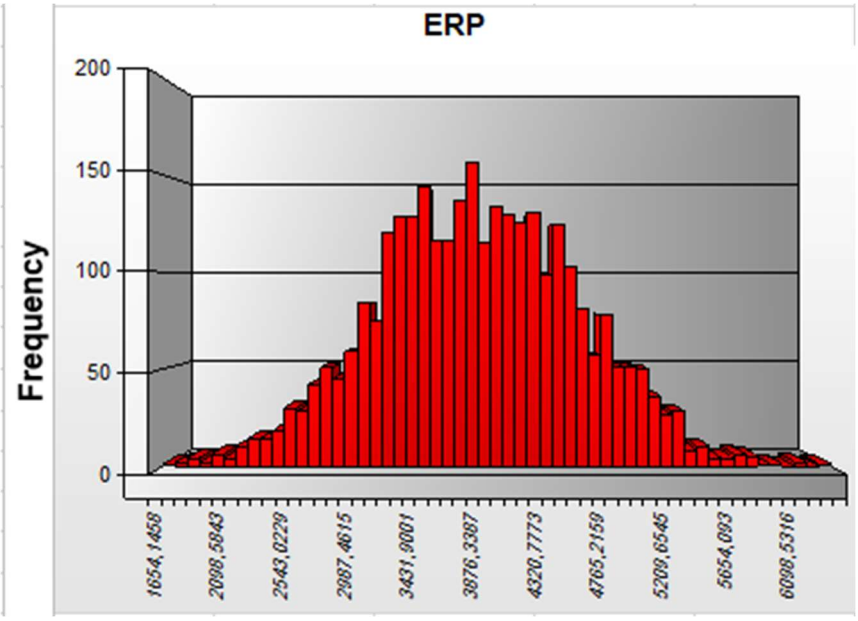
Source: Own elaboration based on SimulaAR Software.

It can be seen from Figure 1 that the minimum time for 31 transactions on average per month in terms of import processes has a duration of 1654 hours, taking into account that many of the variables mentioned throughout this research for the company under study make this time oscillate around 122.36 hours, so it is necessary the support of an information system to

help improve the management of the process in terms of information, traceability, procedures, among others, making the process flow faster.

The minimum and maximum time with the company's current ERP is shown graphically below.

Graph 3 Histogram of current ERP times



Source: Own elaboration based on SimulaAR Software.

It can be observed from the time histogram of the current ERP that the probability that it takes less than 1654 hours for approximately 31 transactions per month in the import process is 0 and that the maximum time for the current ERP is 6454 hours, which means that it is important to continue working on the possibility of improving process times through an information system, which in this case is a proposed *TMS.*

Next, you can see the statistical data after running the software with 3000 simulations for the TMS.

Illustration 2 Proposed TMS vs Actual ERP

Simulation results				
Select output variable				
N*	**Name**	**Sheet**	**Cell**	**Formula**
1	TMS	Sheet 1	F25	F23*C24+vsalida()
2	ERP	Sheet 1	C25	C23*C24+vsalida()
Descriptive statistics of the variable N 1				
Statistic		**Value**		
Minimum		695,8055022		Calculate descriptive statistics of the selected variable
Average		1161,517821		
Maximum		1662,17251		
Median		1158,888658		Show histogram of the variable N 1
Variance		23730,85417		
Standard deviation		154,0482203		Tornado plot of the variable N 1
Rank		998,3670074		
Kurtosis		-0,157070521		Generate report of variable N 1
Asymmetry coefficient		0,12344769		
Coefficient of variation		13262665243347%		Generate report of all variables in Excel
Percentile 1%		830,014335		

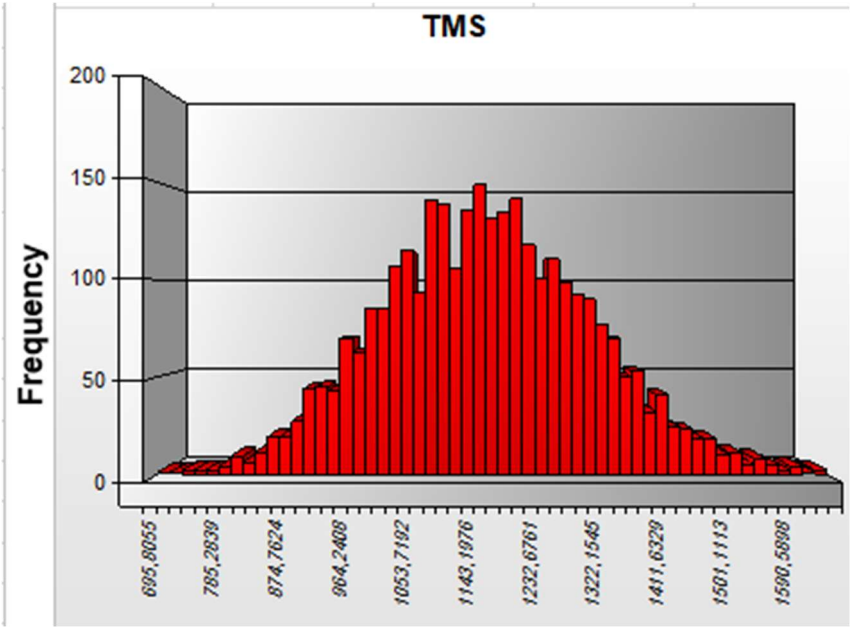
Source: Own elaboration based on SimulaAR Software.

It can be observed from illustration 2 that the minimum time for 31 transactions on average per month in terms of import processes has a duration of 695 hours taking into account that many of the variables mentioned throughout this research for the company under study make this time oscillate around 42.88 hours, thus achieving a significant time reduction of 79.48 hours. 48 hours, thus achieving an important advance in the import flow in its different processes, in addition to a precious time for the final customer who is the one waiting for the cargo, such time at a logistic level allows aligning the organizations in terms of planning, programming, execution, supervision and control of the processes and business models.

It is well known that, by not having minimum details in documentation processes, information, administrative processes, work schedules in Colombian ports make the movement of cargo, clearance of goods and the different logistics operators involved in the import process are very long times as has been demonstrated through simulation based on the data obtained.

The minimum and maximum time with the proposed *TMS* for the company is shown graphically below.

Graph 4 Proposed TMS Information System for the Company



Source: Own elaboration based on SimulaAR Software.

It can be observed from graph 4 that the minimum time with the support of the proposed TMS information system is 695 hours for 31 transactions per month on average and a maximum time of 1662 hours, which means that having an information system that integrates all the information of each step, the administrative processes and processes in the import of cargo is key to the fulfillment of indicators of on-time delivery, level of service, among others. In addition, the reduction of time, an increase that translates into profitability for the owners or shareholders of the company and owners of the cargo because as mentioned throughout this research are many costs to be borne by both the company and the customer when the import is stuck for any new.

Another of the solutions proposed above is the possibility that the customs brokerage be a service provided directly by Schryver without any intermediary as it has been handled in recent years, for this the feasibility of a purely customs department within the company should be reviewed.

A few years ago, this system worked like this, the customs brokerage was performed by certain people inside the company, commonly known as inhouse, it was a person from a customs agency working in the facilities of Schryver de Colombia, but what is proposed for today is that the same workers of the company with customs capabilities are the ones who are aware of this new department. This option is considered to be very similar to the problem statement, since sometimes problems have been evidenced by the exchange of information, having the customs department directly would reduce times, problems and costs because it would be a direct connection with the customer without waiting or being aware that the customs supplier informs what is required for the operation.

The documents necessary for nationalization or for the customs process required by the customer would be delivered directly to the department who would have a maximum of 3 hours to review them and report if they are correct or what would be pending to start the process, this would be transmitted immediately to the customer and the company would be saving almost a day that the customs supplier can take to review and approve the information. It has been evidenced that customs suppliers can take between 1 and 3 days to give a complete review of the documents of the operation and sometimes, the processes have more requirements such as approvals or records and if the goods are about to arrive, additional storage costs can be incurred for not reviewing the documentation on time, because these requirements can sometimes take a long time to be approved.

The most common errors that may have the documentation for customs clearance and/or nationalization of a merchandise, according to Legiscomex (2019) are:

Table 10 Errors in nationalization documents

Problem	Out of every 10 operations
Lack of negotiation term on the invoice or currency	2
Decimals that do not give the invoice total	2
Number of packages between invoice and packing list	1
Missing serial file	1
Costs are not commensurate with the negotiation term	2
Sending the documentation in parts	3

Source: Own construction

Although these are minimal errors, it must be taken into account that if a change must be made, this must be requested at origin and due to the different schedules, this information can take 2 to 3 days, which added to the delay of the customs agency in the review of documents can take up to 5 days to start the operation. This time could be controlled if the Schryver operation reviews the same day and sends comments to the client, the start of the operation would take a maximum of 3 days.

Another additional benefit for the operation is that Schryver directly can be more vigilant and exert more pressure, when necessary, a third party or supplier always has additional customers and must have the same attention with all of them so sometimes it takes longer to confirm the status of the process.

4. Results and/or Findings

The problems or logistics barriers that Colombia confronts go beyond what is perceived with the naked eye such as delays on the road due to their poor condition or the delays in port, many of the problems mentioned in this project has been evidence since ignorance of Colombia's importers and exporters themselves, in the majority of the cases if the focus is on customs issues, these are due to the speed of the companies in doing their processes before looking for all the related information and what is required for the process to flow smoothly.

There is a problem that has been mentioned on several occasions and other barriers arise from this and it is the country's infrastructure. The country is behind in the rail and river systems, in ports and airports, as well as in road corridors, and this is the source of problems such as high transportation costs, environmental pollution, transportation regulations, technology itself, and Colombia's shortcomings in this regard. According to Gómez Villamizar (2007). This is a reality that has been experienced for many years and is that the State does not have a future vision of what the country would be like if it invested significantly in its highways; they think in the short term in the investment and not in the significant return that this investment would have.

Another fundamental aspect that gives as result the little efficiency that the country has in international trade it that it does not taking into account the logistics sector as an strategy factor of grow but rather the sector is spoken of as an additional accessory, many countries have grown thanks to the fact that they have been adjusted to what the market needs to be competitive and have invested internally so that their products are much more economical, unlike Colombia, where the supply chain represents a higher percentage of the value of the product compared to other countries, which makes the merchandise relatively more expensive.

With the intervention to improve the *TMS* within the company and according to the results of the MonteCarlo simulation, significant changes in time and costs are noted, in addition to the unification of the information of the entire logistics chain, that if a shipping company changes its arrival schedule the system is simultaneously updated, that once the cargo documents are reviewed they can be uploaded to the system and both the customer and the customs and cargo agency have access to them. Empowering the *TMS* will be a great help not only in the customs process, but it will save time for Schryver de Colombia and the customer to repeatedly ask about the cargo if the system will have everything at hand.

Schryver de Colombia already has a very complete *TMS* that facilitates the operation of the company's workers, but it is a system that can be used for much more, that can be enhanced so that all those involved in the process can intervene, with this improvement, it is expected that in the future operations will grow and customer service will be enhanced. In addition, the investment made in the system will be recovered in less than 2 years according to the results of the analysis, since with an investment of $400,000,000,000 it is estimated to achieve annual savings of $281,797,523 and thus recover the investment.

In terms of time and although much has been said on the subject, as the saying goes "time is money", saving time also has a great impact for the company because that time that was invested in the customs operation can be focused on other aspects such as providing feedback to management systems and more support to customers, everything that has been raised in the work is aimed at improving all conditions for the end customer.

Regarding the customs agency within the company, there are studies that reveal that customs agencies do a very vulnerable work in the logistics chain, as mentioned by Martinez Cardenas (2015) there may be fines, penalties, contamination and fraud in this link, in case of something of this size who would be involved first is Schryver de Colombia in the eyes of the customer because finally the customs agency is its supplier, so you should always evaluate the risks associated with outsourcing, it is an aspect that having its own department would be avoided.

Either of these two options results in a significant improvement in the company and it is up to the company to decide which one to implement, although a better result is expected if the *TMS* upgrade is chosen because being up to date with the technology is not only an advantage in the market but also a necessity and the simulated data is very similar to the real data and the result that it yields in the improvement of time and money.

Finally, it is important to mention that although there are a large number of problems that affect all links in the supply chain, as has been mentioned repeatedly in this paper, many of them cannot be improved without government intervention, and the only thing that the companies affected can do is to try to improve other aspects of the chain that can be improved thanks to good suppliers and good negotiations.

5. Conclusions and/or recommendations

Schryver is an agency of international cargo forwarder that has been in the market for more than 90 years and has been present in Colombia for more than 25 years, providing services of international sea, air, land, customs, national transportation and other consultancy in logistics processes, which is why it is extremely important for the company to be aware of what is happening in the logistics environment, from updates to problems to address them in the best way and in a timely manner.

Given the above, there are logistic barriers in Colombia, in which the cargo agency cannot intervene because they are problems that encompass not only the logistics sector but also the economic sector of the country, infrastructure problems, technology and delays cannot be handled by these companies without state intervention, as these problems have been evidenced by lack of investment in technology in ports, roads and main accesses of the country which results in the increase in price of all products traded in the country either for export or import.

The country must rethink that the global economy is growing and that the national economy must grow at the same pace, it must have all the tools to meet the increase in demand and an extremely important factor is the logistics within the country, how the goods are distributed and if they meet the standards to be competitive with other countries, According to what has been seen in the work, Colombia is below average, it is not up to compete with other economies, taking into account the advantages in terms of production of certain goods and the outlets to the sea that we have, what is needed is to establish an organized logistics process that meets the needs of all parties involved in order to reduce costs and times.

Regarding the international freight forwarder Schryver de Colombia, the barriers that have been evidenced in recent times are the high costs of land transportation, which although it is the most used in the country tends to be the most expensive in the logistics chain, sometimes higher than the same international freight, another problem has been the whole process related to customs clearance, which being such a sensitive issue the slightest error in the information or documents can cost a lot of money and must invest a lot of time to resolve.

The company has been working on improving these aspects to provide the best service by anticipating what may occur in the operation, but there are fortuitous cases that are not expected by anyone, they just happen and affect the entire chain, as one of the main recommendations for Scryver is to maintain good relationships with suppliers that provide alternatives and solutions to maintain good service, apart from being suppliers are allies and are willing to improve every day for the end customer to see that differentiating factor because the market is crowded with freight forwarders, but customer service can make the difference between one and another.

The main recommendation and focus of this work are the update of the *TMS*, currently the company has a very complete program, where you can verify and carry all the traceability of the processes, but improvements can be made, new options can be implemented and thus

reach a more accurate traceability of all operations with the end customer and with other partners involved in the process.

Reviewing the option of no longer outsourcing the customs operation and having the customs department come directly from Schryver would also imply an improvement in operations; it would be a convenience and an extra for the end customer. In case of continuing to outsource this operation, it is recommended to work with customs agencies that are already certified as *AEO* (Authorized Economic Operator) in order to provide more value and security to the process.

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