

**STRATEGIC COLLABORATIVE PLANNING MODEL
AND ITS APPLICATIONS IN ECUADOR, MEXICO AND CUBA**

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Abstract:

Collaborative planning is an international practice that encourages the integration of companies in supply chains. The objective of this article is to systematize a strategic model of collaborative planning among the actors of the supply chains to improve their competitiveness in Ecuador, Mexico and Cuba. It is validated this proposal in five cases applied to agrifood chains (tomato puree chain and milk in Cuba, orange juice chain in Mexico, milk chain, Ilex guayusa and panela in Ecuador) because it is what prevails in these countries. The main results are focused on the low integration of these study chains, although not all of them are manifested in the same way. The main results are focused on the low integration of these study chains, although not all of

them are manifested in the same way. In this study, the application of the strategic collaborative planning model is validated in several different contexts and products. Its social value is expressed by contributing to the competitiveness of the supply chain; Its practical value comes as a result to improve the level customer service. It is concluded that in these chains the main integration problem cause is the low training and qualification in logistics and supply chain issues.

Keywords: Integration, enterprise, collaborative model, Ecuador, Mexico, Cuba.

1. Introduction

At the global level, changes are manifested in the of managing way and shaping business. Now, the problem is not to make a product, but to make a profit by making some of its parts. From this is inferred the need for interconnection between several companies, entities and organizations (actors). In addition, the new forms of production that are approaching: the new materials development, based on the elaboration and sale of customized projects to the customer's needs, as well as the three D technology. This framed in the information technologies, communications and knowledge infer the need for the international supply chains development.

Supply chain as an object to manage is a trend that emerged in the 90s, and is conceived as a global network of multiple activities, processes and businesses, from the final customer to the very initial supplier, models. It is associated to the material flow but also to information and financial flows, oriented to a better customer satisfaction (Farhad Panahifar, Cathal Heavey et al. 2015, Zhou, Guo et al. 2018). It is expressed as a philosophy that encourages integration among actors in the supply chain (Balloud 2004, Winkler 2005, Pires and Carretero Díaz 2007, Mula, Peidro et al. 2010, Maliah, Shani et al. 2017). Integration is a new form of management among businesses, which encourages interaction between companies to be competitive in the market (Cooper, Lambert et al. 1997, Ribas Vila and Companys Pascual 2007, Zhu, Krikke et al. 2018), where collaborative planning is the highest level of integration (Hill, Zhang et al. 2018). In recent times, the chain focuses on the circular economy, where integration is the basis for achieving the production byproducts recycling (Korhonen, Nuur et al., 2018, Pakdeechoho and Sukhotu (2018)), and obtaining products with added value (Moktadir, Rahman et al. 2018, Mathivathanan, Kannan et al. (2018)).

Collaborative planning is based in jointly plan demand information, orders, service and product that are offered in this framework of Internationally, the World Bank records and defines the overall competitiveness index (Schwab 2017). The mentioned benchmark is made up from several components, namely: customs formalities, infrastructure, services quality, waiting times, international shipments, goods traceability, information management and exportation supply chain. The indicator allows a classification of 155 countries according to the meter pattern value, using a scale where one is the lowest and five is the best. Latin America presents a metric of 2.60 in 2016, so the logistic performance index is low, although it increased from 0.52 in 2007.

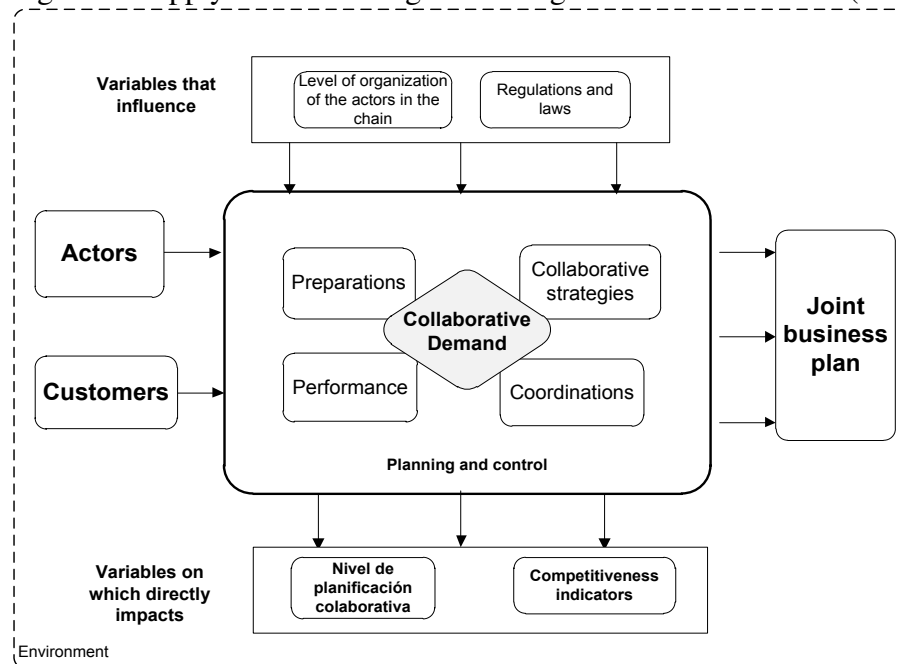
This article aims to propose a strategic collaborative planning model among actors in the supply chains to cope with these problems and to validate the proposal in two supply chains real cases, in Ecuador, in Mexico and in Cuba.

2. Materials and methods

The Supply Chain Strategic Collaborative Planning Model (MPCECS), applied to agro-food chains and the implementation process, contribute to the chains development in the Ecuadorian Amazon, Cuban and Mexico. It consists of three stages and 11 steps that integrate a tools group that facilitate the implementation of collaborative planning and control at a strategic level in agro food chains, with the study of 105 models and tools.

The MPCECS purpose was to determine the Collaborative Planning Level (NPC) in the food chain actors, in order to analyze the integration chain level, to design strategies types (interrelation Matrix between the NPC of the proposed strategies), the collaborative planning aim in the chains and finally to formulate a joint business plan for agro-food chains that focuses on competitiveness improving (Figure 1). The matrix allows the strategy approach, depending on the NPC in which the chain take place. The NPC is calculated using a checklist of 91 questions.

Figure 1: Supply Chains Strategic Planning Collaborative Model (SCSPCM).



Source: Sablón Cossio, Acevedo Suárez et al. (2016).

The collaborative planning and control of this one as a center of its development is distinguishes (Sablón Cossio, Acevedo Suárez et al. 2016). There is the presence of other elements, including the main ones:

- ✓ The influence and demands of political, economic and social environment and the environment in which the supply chain is manifested,
- ✓ The collaborative strategies and objectives of the supply chain from the existence of joint planning,
- ✓ The variables that influence (level of organization of the actors in the supply chain, regulations and laws) that are within the scope of the actors and that can determine the successful implementation of collaborative planning in the supply chain,
- ✓ The variables on which directly impacts (competitiveness indicators and Planning Level).
- ✓ Collaboration with the correct application of collaborative planning in supply chains and,

- ✓ The inputs (actors and customers) and outputs (joint business plan) of the elements from a collaborative planning system and supply chains control.

Description of the study: For the development of studies case, how to validate the SCSPCM application, the structure proposed by the BestLog project of the European Commission for the reference case study is followed (Guerola and Sendra 2008). The proposed structure is the description of the problem, solution, challenges and benefits.

3. Results

The model application was carried out between September 2009 until December 2016 in two supply chains in milk supply chain, Puyo, Ecuador (17 players), tomato puree (25 players) in the province of Matanzas and in orange juice export supply chain, Veracruz, Mexico (12 players).

Model validation:

Through experimentation, the model formulation is validated from its application in supply chains in the productive sector of Cuba, Mexico and Ecuador.

APPLICATION OF THE MODEL IN MILK SUPPLY CHAIN IN PUYO, ECUADOR

Problem description

- Dairy production low levels in the Ecuadorian Amazon.
- Insufficient coordination between the actors that make up the chain.
- Low training of human potential that belong to the chain actors.
- Little incidence of the universities of the territory with scientific research projects.
- No strategy or extension model of the Value Network is applied.

Premises

- a) The SCSPCM premise is satisfied, because the supply chain staff is committed with the researching and philosophy contributions.
- b) The existence of planning, is met in each actor of the chain under study, in different amounts and in accordance with the business split between the partners of each actor.

Objectives

The milk agro-alimentary chain in Pastaza presents a value (NPC) of 2.14, which represents a low level. The milk agro-alimentary chain, Puyo, Ecuador has a low integration level, so it is located in the assignment-negotiation stage. Because of this result, strategies should be geared towards negotiation among actors.

The types of joint strategic objectives focus on enhancing customer satisfaction and result in:

- ✓ Market reach: increasing the market share by 40% of the total commodity.
- ✓ Competitiveness: To increase the logistics and industry resources efficiency by 20%.
- ✓ Service Level: To increase the variety through three new products, where the culture of the Ecuadorian Amazon is enhanced.

Relations with the environment

- ✓ Variables of influence: Knowledge level and actor's organization in the chain. The culture that integration forms are negative for the organization.
- ✓ Impact variables: the formulation of a possible Ecuadorian Amazon brand that allows entry into higher quality markets, and the levels identification of collaborative planning.

APPLICATION OF THE MODEL IN ORANGE JUICE SUPPLY CHAIN IN VERACRUZ, MEXICO.

Problem description

Orange juice for export of Veracruz, Mexico, has different technological levels in each actor, which influences the final customer service. Causes of this problem is identified by the study by (Bautista Santos, Martínez Flores et al. 2015):

Large producers have a high technological level implemented, in their crops fertilizer application, irrigation and weed, pests and diseases control; normally they give maintenance to their gardens during the year to ensure a production level according crops volume. They have technology to receive and share information in real time; they represent, approximately, 10% of the producers

Medium producers make weed control and fertilized only and occasionally make the pests and diseases control. They represent 55% of producers, they share information with the next connection in the supply chain that are the wholesaler's collectors wholesale or collection centers in the same juice processing industry.

The remaining 35% of producers are small producers, who their activities are reduced to weed control and pruning. Normally, product sellers buy them in the same plot and getting the lowest cost - benefit for your product.

According to the previous diagnosis, the supply chain affords the following challenges:

- a) Improving the correlation among actor's technological systems, to contribute to the supply chain competitiveness.
- b) To achieve the integration among supply chain actors with the goal of improving customer service level and therefore competitiveness.

The results of the application of the SCSPCM model are:

Premises

- a) First, SCSPCM premise is satisfied, because the supply chain staff is committed with the researching and philosophy contributions.
- b) The existence of planning, is fulfilled in each chain actor under study, in different amounts and according to comply contracted with customers.

Objectives

The supply chain integration level is middle, because the NPC value is 3.11 and the actor with less valuable are orange producers in the agriculture, being a "standard level". The variable most heavily weighted according to the criteria of the actors is collaborative planning. The biggest shortcoming variable is supply chain collaborative replenishment in orange juice of Veracruz.

Based on these results, the integration level is located in cooperation. The types of strategies to be followed by supply chain, focusing on the development of few suppliers and long-term contracts

The types of joint strategic objectives focus on enhancing customer satisfaction and are:

Competitiveness

- ✓ Invest capital in orange producers, to reach higher productivity standards.
- ✓ Supply chain integration with high NPC
- ✓ To define a supply chain system for the supply chain actors, where cycles, flows and processes of the actors are coordinated.
- ✓ To design partnership contracts between chain actors.
- ✓ Service level: To increase to 95% the applications and orders from chain study actors.

Relations with the environment

- ✓ Influencing variables: organization level of the supply chain actors and technological level of the supply chain actors.
- ✓ Impact variables: the prediction, the installed capacity of the supply chain actors and the level of collaborative planning.

The prediction (main variable of the model which is required to reduce their error margin) improved by about 15% because the company fixed its main orange suppliers (large and medium producers who provide to the company with approximately 75% of citric fruit per season), by signing long term contracts to receive all the fruit they produced. So, they guaranteed they would not seek another client, managing to keep 70% of its citric suppliers as exclusive suppliers. Mechanisms to predict the yield of providers fields were implemented, to get more accurate forecasts. Some of this mechanisms were recording the flowering and fruit quantity by tree, in three different times of the growth process.

Another variable that was improved as a result of the forecast reduction was utilization of installed capacity and vehicles waiting time that carrying fruit from the fields to the plant. In production peaks input extra lines to the selection process and washing were installed. The plant utilization increased from 65% to about 76% in its installed processing capacity. Supply chain SCSPCM implementation in study, shows that the proposed methodological tools are useful and valid to improve chain integration through collaborative planning; the above enabled the validation of the model.

THE TOMATO PUREE SUPPLY CHAIN OF MATANZAS, CUBA

Description of the problem: The tomato puree supply chain of Matanzas, has low availability and variety of products for sale. This problem has several causes that are identified by applying the checklist Model Value Networks proposed by Acevedo Suárez (2008), which are grouped into four, and are: the customer service level, technical and materials, planning and control.

Challenges:

- a. To improve the availability products variety for sale, to contribute to the supply chain competitiveness.
- b. To achieve the integration among actors in the supply chain with the goal of improving the customer service level of and therefore competitiveness.
- c. To develop programs to achieve a higher market share, to satisfy to the customers and increase market competitiveness.

The results of the application of the SCSPCM model are:

Premises

1. The first SCSPCM premise is fulfilled because the supply chain staff is committed to research and contributions from its philosophy.
2. The second, the existence of planning, is fulfilled in each chain actor under study, in different degrees. The actors set presents an annual planning in line with the Plan of National Economy and the allocation of economic planning.

Goals

The integration level of the supply chain is low, because the NPC value is 1.35 and actor lowest value is in Agriculture, being a "low level". The greater weight variable according to the actors criteria is the joint application. The biggest shortcoming variable is tomato puree supply chain collaborative planning, in Matanzas region.

Based on these results, the level of integration lies in negotiation and association. The strategies types to be followed by supply chain, focusing on: join goods in critical processes with only economic purposes or other interest; the discussion focused on cost leadership, differentiation, focus or niche and in relation as adversaries. The types of joint strategic objectives focus on enhancing customer satisfaction and are:

Competitiveness

- ✓ To improve the supply chain integration with high NPC.
- ✓ Encourage strategic collaborative planning among actors.
- ✓ Develop partnership contracts among actors of the supply chain.

Relations with the environment

Influencing variables are: organization level of the actors along the supply chain, National Economy Plan and price policy.

Impact variables are: product availability, inventory turnover and of supply chains collaborative planning level.

In this case, the value of product availability, tomato puree for sale to final customers is evaluated. In 2010 and 2012 when the indicator was 75.2 and 81.4% of presence for sale, respectively. In terms of product variety, decreased from 71.2 at 40.2% of range from 2010 to 2012 is estimated. Because in the last year decreases of tangible imports and domestic production should ensure availability and variety of pureed tomato product.

The value of supply chain inventory turnover in the tomato puree increased from 5.09 in the year 2010 to 7.2 rotations in 2012; it is deficient because it must rotate at least 24 times a year, since it is a food product. The most stables products are La Conchita (3.2 kg container), Premion and Doña Tina (boxes from a one liter).

4. Discussion

The chains under study are enclosed in food, because it is a common variable in the representativeness in the three countries. In them there are different integration levels, but they demonstrate the need for collaborative planning in the chains, and the possibility of being competitive. The work of Zhu, Krikke et al. (2018) it demonstrate the need for this philosophy in the current context and the evidence that the basic problem of this approach is the formation and

training of human potential. Like Hill's studies, Zhang et al. (2018), related to the technique of collaborative planning, forecasting and collaborative replenishment, and adds elements of structural equations. This last element is the follow-up of this investigation.

5. Conclusions

A model of collaborative strategic planning in the supply chain, as well as its validation in two real cases of supply chains (Ecuador, Cuba and Mexico) is proposed. All cases belong to the food industry. The relevance of this question, whose solution is managed in this article, is confirmed with the development of SCSPCM and its application in supply chains under study. The theoretical proposal shows the supply chains in collaborative planning relevance and the contributes to the adoption of best practices worldwide what represents a significant conceptual, theoretical and practical reference.

The existing models analysis in collaborative planning literature reveals the absence of a strategic level model. Collaborative planning variables, at the strategic level, in the supply chain that contribute to the supply chain competitiveness, in terms of providing a high service level to end customers are synthesized. This article has social value, contributing to improve the supply chain competitiveness.

The results of applying the model to the different cases in studies show their validity. The model demonstrates its applicability in different planning environments like Ecuador, Cuba and Mexico and demonstrates its ability to improve competitiveness in all cases.

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