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Integrative Activities with Suppliers and Customers to Achieve Supply Chain Integration

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Abstract

This paper analyzes nine integrative activities about demand forecasts, production plans, long-term relationships, joint planning, information through technologies, product development processes, product design processes, joint goals, that companies do in their daily activities with suppliers and customers in order to achieve supply chain integration. The objective is to analyze these integrative activities to determine if it exists collaboration among external partners of the supply chain in the food industry companies, to know the level or intensity of the exchange of information, communication and collaboration between companies and their external partners of suppliers and customers. The measurement instrument was applied to 93 companies from the food industry sector of Michoacán, México which are divided into nine sectors; grinding grains and seeds, obtaining oils and fats, confectionery with and without cocoa, preserving fruits, vegetables and prepared foods, dairy products, meat and poultry processing, preparation and packaging of fish and seafood, bakery and tortillas. The Integrative activities are analyzed by means of statistical descriptions, paired samples test, one-sided contrast, mean difference and confidence intervals and associations. The results indicate that the difference is always in favor of customers than for suppliers.

Keywords: Integrative Activities, Supply Chain Integration, Integrative Activities with Suppliers, Integrative Activities with Customers

1. Introduction

Supply chain management seeks to improve competitive performance by tightly integrating internal cross-functions within a company and effectively linking them with the external operations of suppliers, customers, and other channel members to be successful [1]. This means that a company pursuing supply chain management practices should pay attention to supply chain integration and teamwork [2], as well as to an open communication climate within the organization to facilitate internal integration of supply management, further to support the influence of social aspects on supply chain integration [3].

To use the supply chain at its maximum level of performance, organizations must integrate their objectives and activities together. Integration becomes the key driving force in supply chain management, explaining that internal optimization

will occur until needs of customers are understood and limitations of suppliers are known [4]. In this way, an organization's ability to improve is closely linked to its ability to understand its supply chain [5].

Integration means sharing information, resources and risks, proactive communication, joint development of supply chain processes and coordinating plan and decision-making within and among supply chain participants. Teamwork means developing a co-operative relationship between supply chain participants as a requirement in creating customer value. An effective communication and teamwork competencies can resolve challenges, can respond to markets with the help of communication skills and technologies [2].

Communication allows firms to transmit persuasive information between themselves, foster participate cooperative decision-making, coordinate joint programs, better known customers and suppliers, and gain partner commitment and loyalty. Research has shown that establishing communication lines across cooperating/collaborating firms is essential to the maintenance of value-enhancing relationships, and leads to enhanced knowledge development, greater understanding of complex interorganizational issues, greater confidence, cooperation, trust and reduced conflict [6].

Paired firms that are highly communicative with each other can lower transaction costs by increasing behavioral transparency, reduce uncertainty between supply chain members, Foster interorganizational learning, facilitate quicker adaptation to change, enlarge the potential for greater joint action, and ultimately increase performance [6].

The food industry sector is one of the most refined sectors that need to generate high integration capacities of its supply chains due to the health and safety characteristics required by its consumers [7]. The security of the food supply chain is essential to ensure a safe and efficient food supply [8]. Being this sector where there are major cultural and technological differences, as well as endless challenges, and barriers.

Non-integrated companies have disconnected product and information flow, limited ability to respond to customer requests, unpredictable product delivery rate, limited visibility into shipment information, and performance based on functional activities [9]. With an integrated supply chain, companies get a greater focus on customer service. They also reduce waste and become faster and more flexible, while maintaining the highest quality standards. In general, they are gaining an advantage over the competition, and they continue to implement continuous improvements to stay in that position [9].

The complexity of a food supply chain network is influenced by the number of participants, interrelated product links and processes, differences in the use of technology by the participants, specific regulations and legislation on food preservation and quality, product characteristics, product assortment, consumer wishes for fresher and more natural products, smaller production batch size, etc. [10]. The sharing of information and knowledge among members of the supply chain; demand information, and inventory status, capacity plans, production schedules, and promotion plans, demand forecast and shipment schedules. Product and process integration across firms within strategic supply chains; allows suppliers to assume responsibility for product engineering activities and product development, understanding of the complexity and scope of coordinated processes.

The purpose of this paper is to analyze the activities that make the integration of the supply chain possible, in order to determine if there is collaboration between the external partners of the supply chain, suppliers and customers of companies in the food industry of Michoacán, to know the level or intensity of information exchange, communication and collaboration between companies and these members of the supply chain.

2. Theoretical background

According to Configuration theory, the alignment of strategy and systems or practices is reflected in the patterns observed in practice. This suggests the need for emerging joint patterns to the supply chain integration. According to Contingency theory, there is no optimal way to manage, but each situation depends on numerous internal and external elements [8, 9].

The literature recognizes that all the value creation potential of the purchasing function (integrated system of suppliers and customers) can only be achieved if decisions, activities, investments and strategy are aligned, as well as the importance of achieving a state of alignment between functional domains and information technology. With the emergence of information technology systems that support the purchasing function, the challenge of aligning them with supply chain strategy and activities has improved [11].

The importance of aligning the information systems function with other business functions is widely recognized and empirical studies have found strategic alignment which is defined as the degree to which the mission, objectives and plans contained in the business strategy are shared and supported by the strategic alignment strategy to influence business performance. Alignment involves applying information technology in an appropriate and timely way and in harmony with business strategies, goals, and needs [12].

Alignment implies a shared vision of, commitment to, and plan for addressing areas considered critical to success. Alignment is related to organizational performance. Alignment between information systems and firm strategic plans should increase a firm's ability to realize its goals and objectives [13]. It is important to understand the importance of each other's contributions, communicate regularly and move towards shared goals, to experience improved managerial outcomes. Alignment leads to more focused and strategic use of information systems and, consequently, improved performance [11].

Relational perspective emphasizes that the distinctive competitive advantages will result from the cooperation between companies or networks and not of the organization's resources as unique or separate activities. From company collaboration, competitive advantages will be generated; the routine sharing of knowledge, complementary data sources, and effective governance.

Thus, it would be difficult for a company to create a competitive advantage by itself, based on the unique resources or ability, but on relational capabilities generated or created through active interaction and coordination among enterprises to achieve a common goal [14].

Company Performance involves Supplier Performance-Oriented, Customer-Oriented Performance and Financial Performance [15]. Supplier-oriented performance measures the performance of the supply chain in the upstream and customer-oriented performance measures the supply chain performance in the downstream. A combination of both is called supply chain performance. Supplier performance-oriented and customer performance-oriented affects the overall performance. Supplier-oriented performance and customer-oriented performance is an operations-oriented measurement which involves a variety of performance measurements [14].

Supply chain integration helps companies reconfigure their resources and capabilities internally and externally to consolidate their supply chain as a whole in an effort to improve long-term performance [2, 12]. It is a collaborative process in which companies work together cooperatively to achieve mutually acceptable results.

Supply Chain Integration is the degree to which a firm can strategically collaborate with its supply chain partners and cooperatively manage intra- and

inter-organizational processes to achieve effective and efficient flows of products, services, information, money, and decisions to provide the maximum value to the final customer with low costs and high speed [15].

According to the literature nine integrative activities were chosen to work in this analysis, **Table 1** shows them with a definition of each activity and some of the authors that work with the same activities for suppliers and customers.

Integrative Activity	Suppliers	Customers
1. Share Demand Forecasts		
To share the demand forecasts, prediction of future demand with their main suppliers and the information provided by the customers to the company about their demand forecast, key to their production planning, and to have real-time information directly from the end customer, to make a common demand forecast in order to avoid disruptions.	Devaraj et al. [16], Krajewski and Wei [17], Flynn et al. [18], Alfalla-Luque et al. [19], Mikalef et al. [11], Lii and Kuo [20], Molina-Quintana [21], Molina-Quintana et al. [22].	Devaraj et al. [16], Flynn et al. [18], Wong et al. [23], Kotcharin et al. [24], Alfalla-Luque et al. [19], De la Calle [25], Mikalef et al. [11], Lii and Kuo [20], Molina-Quintana [21], Molina-Quintana et al. [22].
2. Share Production Plans		
To share their production plans with their main suppliers, and their main customers to achieve operational standardization. To have sufficient information to perform the procurement activities that meet real needs.	Frohlich and Westbrook [26], Swink et al. [27], Flynn et al. [18], Won et al. [23], Kotcharin et al. [24], Huo et al. [28], Mikalef et al. [11], Lii and Kuo [20], Molina-Quintana [21], Molina-Quintana et al. [22].	Flynn et al. [18], Mikalef et al. [11], Lii and Kuo [20], Molina-Quintana [21], Molina-Quintana et al. [22].
3. Establish Long-Term Relationships		
To establish stable links with supply chain partners to enable mutual trust. The long-term relationship between the organization, its suppliers and its customers. It is designed to leverage the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits.	Li et al. [29], Alfalla-Luque et al. [19], Otchere et al. [1], Otchere et al. [30], Huo et al. [28], Mikalef et al. [11], Huo et al. [31], Qi et al. [32], Toker and Pinar [33], Molina-Quintana [21], Molina-Quintana et al. [22].	Li et al. [29], Alfalla-Luque et al. [19], Otchere et al. [1], Otchere et al. [30], Qi et al. [32], Toker and Pinar [33], Molina-Quintana [21], Molina-Quintana et al. [22].
4. Joint Planning to Anticipate and Solve Problems		
To make available the supply chain members with information that allows joint planning that takes into account the constraints of the companies involved and seek to improve the planning process of comprehensive supply chain. To establish procedures under the normal order of the company against possible environment or business unexpected situations.	Devaraj et al. [16], Wong et al. [23], Alfalla-Luque et al. [19], Molina-Quintana [21], Molina-Quintana et al. [22].	Devaraj et al. [16], Wong et al. [23], Alfalla-Luque et al. [19], Molina-Quintana [21], Molina-Quintana et al. [22].
5. Share Information through Information Technologies		
To make compatible the information systems so as to allow access to	Devaraj et al. [16], Flynn et al. [18], Wong et al. [23],	Devaraj et al. [16], Wong et al. [23], Hosseini et al. [34],

Integrative Activity	Suppliers	Customers
information concerning the activity of the company from different departments and companies that make up the supply chain. The extend to which supply chain partners strive to make and keep their communication systems compatible with each other to be ready for inter-firm forecasting and planning in addition to routine electronic transactions and information exchange within the supply chain. The extend to which critical and proprietary information is communicated to one's supply chain partner.	Hosseini et al. [34], Alfalla-Luque et al. [19], Leuschner et al. [35]. Huo et al. [28], Mikalef et al. [11], Saleh [36], Qi et al. [32], Molina-Quintana [21], Molina-Quintana et al. [22], Yu et al. [37].	Kotcharin et al. [24], De la Calle [25], Mikalef et al. [11], Lii and Kuo [20], Alfalla-Luque et al. [19], Molina-Quintana [21], Molina-Quintana et al. [22], Yu et al. [37].
6. Involvement in Product Development Processes		
The extend to which members of the supply chain have developed joint knowledge sharing routines that facilitate use of innovative practices, sharing of new ideas, and working together in identifying and implementing improvement initiatives on new products development.	Li et al. [29], Swink et al. [27], Flynn et al. [18], Wong et al. [23], Hosseini et al. [34], Leuschner et al. [35], De la Calle [25], Huo et al. [31], Lii and Kuo [20], Molina-Quintana [21], Molina-Quintana et al. [22].	Narasimhan and Kim [38], Flynn et al. [18], Wong, et al. [23], Kotcharin et al. [24], De la Calle [25], Molina-Quintana [21], Molina-Quintana et al. [22].
7. Participation in Product Design Processes		
To maintain close communication with suppliers and customers about product design change considerations. To guide organizations towards a joint search for the end customer satisfaction.	Thatte [39], Swink et al. [27], Flynn et al. [18], Saleh [36], Huo et al. [31], Lii and Kuo [20], Molina-Quintana [21], Molina-Quintana et al. [22].	Saleh [36], Huo et al. [31], Molina-Quintana [21], Molina-Quintana et al. [22].
8. Set Joint Goals		
To involve in the setting of goals the supply chain members to benefit companies and activities.	Li et al. [29], Thatte [39], Alfalla-Luque et al. [19], Molina-Quintana [21], Molina-Quintana et al. [22].	Alfalla-Luque et al. [19], Molina-Quintana [21], Molina-Quintana et al. [22].
9. Develop Joint Responsibilities		
To involve the Supply chain members in decision making.	Molina-Quintana [21], Molina-Quintana et al. [22].	Molina-Quintana [21], Molina-Quintana et al. [22].

Source: Own Elaboration.

Table 1.
Integrative activities with suppliers and customers.

3. Method

The measurement instrument applied to 93 companies in the food industry sector of Michoacán, México, collects information on the supply chain integration, referring to the integration of suppliers and customers, through a five-point Likert scale. The measurement instrument, in terms of external measurement with suppliers and customers, coincides in nine activities that are intended to be analyzed,

activities of manufacturers towards suppliers and customers, to know the level or intensity of the exchange of information, communication and collaboration. The nine activities are practical on how the business organization has been implementing supply chain management in general.

The variables used for this research are integrative activities referring to demand forecasts, production plans, long-term relationships, joint planning, information through information technologies, involvement in product development processes, participation in processes of production design, joint objectives and joint responsibilities. The activities are the same for both, suppliers and customers, which allow to relate both concepts.

Although food industry sector includes the activity of food for human and animals' consumption, beverages and tobacco, for the purpose of this research, only the food sector for human will be taken into account, without taking into account prepared animal food, or the beverage or tobacco industry. In this research we will take the description of the food industry from [40, 41], which is comprised of the following subsectors with their respective frequency of companies for this study; 1) grinding grains and seeds (11 companies), 2) obtaining oils and fats (4 companies), 3) confectionery with and without cocoa (21 companies), 4) preserving fruits (7 companies), 5) vegetables and prepared foods (31 companies), 6) dairy products (2 companies), 7) meat and poultry processing (7 companies), 8) preparation and packaging of fish and seafood (1 company), 9) bakery and tortillas (9 companies).

4. Analysis of the integrative activities that make up the supply chain integration

The following **Table 2** shows the descriptives for the integrative activities that food companies have with their suppliers and their customers, as well as a test of paired samples.

Suppliers		Integrative Activities	Customers		Paired Samples <i>t</i> -test	
Mean	Standard Deviation		Mean	Standard Deviation	<i>t</i>	<i>P</i> Value
2.882	1.552	Share demand forecasts	3.527	1.372	-2.844	0.006
2.419	1.432	Share production plans	2.957	1.474	-2.459	0.017
4.226	1.190	Establish long-term relationships	4.516	0.892	-1.388	0.170
2.140	1.426	Joint planning to anticipate and solve problems	3.161	1.454	-1.248	0.217
2.376	1.481	Share information through information technology	3.065	1.436	-3.536	0.001
2.871	1.408	Involvement in product development processes	3.591	1.369	-6.727	0.000
2.323	1.423	Participation in product design processes	2.591	1.393	-2.200	0.032
2.312	1.459	Set joint goals	2.473	1.388	-2.079	0.042
2.707	1.264	Develop joint responsibilities	3.640	1.199	-1.342	0.185

Source: Own Elaboration based on the collected data.

Table 2.
Statistical summary for integrative activities.

Negative t-values indicate that all variables take higher mean values for customers than for suppliers, which indicates that the difference is always in favor of customers. In the p-value of the significance test, the difference is only statistically significant for six of the nine integrative activities, since the value is less than 0.05.

The following **Figure 1** shows the mean differences between suppliers and customers, together with the corresponding 95% confidence intervals, constructed directly with each difference variable, using the Normal approximation of the mean distribution.

All mean values are located below the zero level (horizontal line in the graph), indicating that integrating activities have systematically higher values for customers than for suppliers. Only two activities have upper interval limits that exceed the zero level, so the mean is not significantly different from zero with a two-sided contrast in those two cases.

If we apply a one-sided test, more appropriate considering that the negative value of the difference is systematically observed in all cases, the statistical significance of the effect extends to all activities except “develop joint objectives”, as indicated in the following **Table 3**.

Table 4 below shows the analysis of individualized associations expressed in percentages or relative frequencies of questions by company for the integrative activities in a recoded form (H = High, M = Medium, L = Low) to understand and

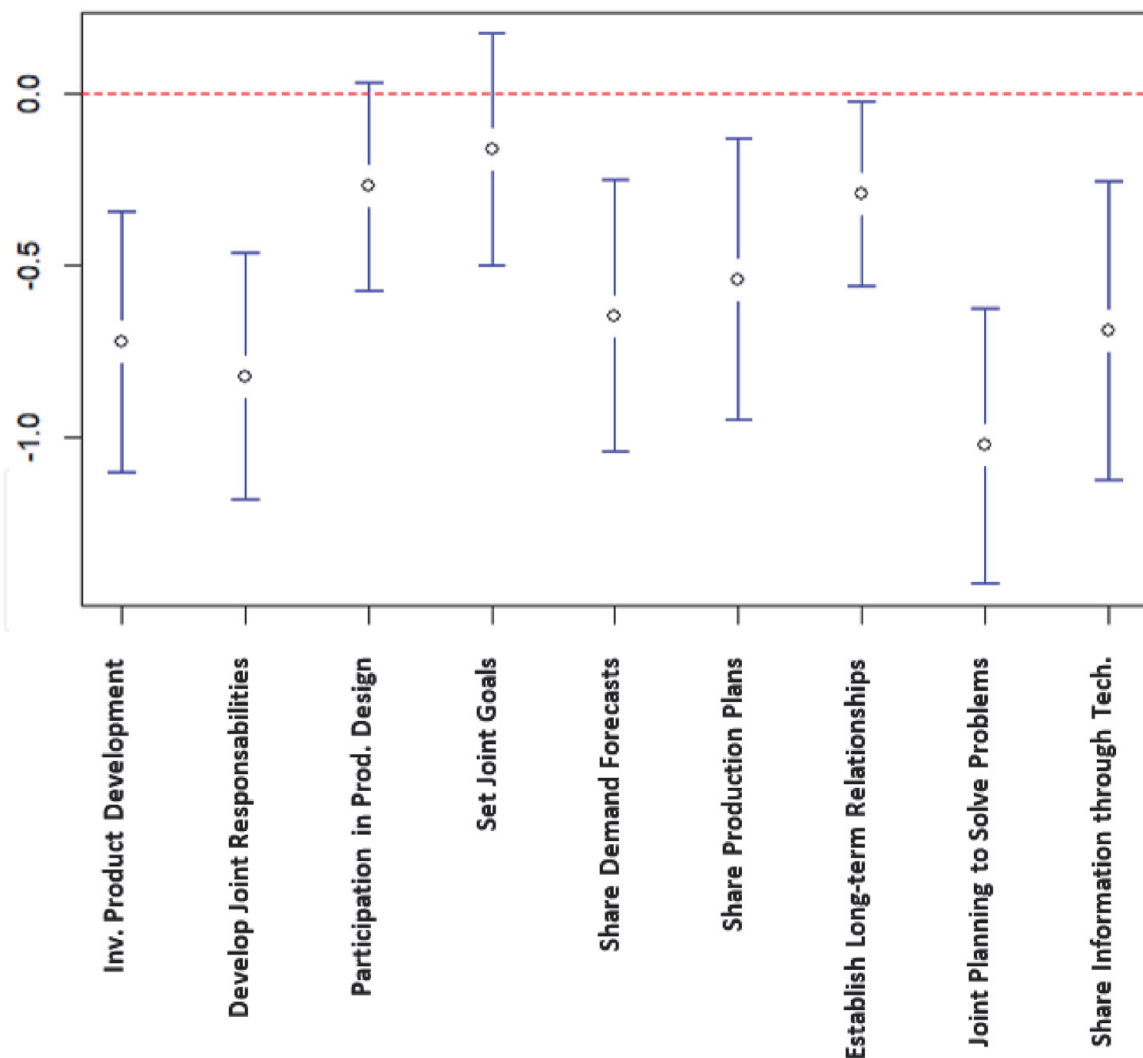


Figure 1. Differences of means (suppliers - customers) of the integrative activities and confidence intervals. Source: Own elaboration based on the collected data.

Activity	Integrative Activities	Mean Difference	One-sided <i>p</i> value
1	Share demand forecasts	-0.645	0.0008327
2	Share production plans	-.538	0.005186
3	Establish long-term relationships	-0.29	0.01685
4	Joint planning to anticipate and solve problems	-1.021	0.000001044
5	Share information through information technology	-0.689	0.001149
6	Involvement in product development processes	-0.72	0.000139
7	Participation in product design processes	-0.268	0.04112
8	Set joint goals	-0.161	0.1723
9	Develop joint responsibilities	-0.933	0.000008366

Source: Own Elaboration based on the collected data.

Table 3.
Unilateral contrast for integrative activities.

Activity 1. Share demand forecasts					Activity 2. Share production plans				
How often do your <i>customers</i> provide your company with <i>information about their demand forecast</i> , which is key to your production planning?					How often does your company share <i>its production plans</i> with its main <i>customers</i> to achieve operational standardization?				
How often does your company share <i>its demand forecasts</i> (prediction of future demand) with its main <i>suppliers</i> ?	H	M	L	Total	How often does your company share <i>its production plans</i> with its main <i>suppliers</i> ?	H	M	L	Total
H	10.8	8.6	19.4	38.7	H	26.9	8.6	10.8	46.2
M	5.4	6.5	9.7	39.8	M	3.2	2.2	7.5	12.9
L	18.3	8.6	12.9	21.5	L	12.9	10.8	17.2	40.9
Total	34.4	41.9	23.7	100.0	Total	43.0	21.5	35.5	100.0
Pearson's Chi-squared test, <i>p</i> -value = 0.3742					Pearson's Chi-squared test, <i>p</i> -value = 0.05858				
Activity 3. Establish long-term relationships					Activity 4. Joint planning to anticipate and solve problems				
How often does your company <i>seek a long-term relationship</i> with your <i>clients</i> to achieve operational consolidation?					How often does your company do <i>joint planning</i> with key <i>customers</i> to anticipate and solve problems?				
How often does your company establish <i>long-term relationships</i> with your <i>suppliers</i> ?	H	M	L	Total	How often do you <i>plan together</i> with your key <i>suppliers</i> to anticipate and resolve issues?	H	M	L	Total
H	47.3	*	14.0	61.3	H	23.7	19.4	5.4	48.4
M	10.8	*	5.4	16.1	M	4.3	7.5	3.2	15.1
L	11.8	*	10.8	22.6	L	11.8	9.7	15.1	36.6
Total	69.9	*	30.1	100.00	Total	39.8	36.6	23.7	100.0

Pearson's Chi-squared test, p-value = 0.1014					Pearson's Chi-squared test, p-value = 0.02578				
*This variable does not have mean values, since more than two thirds of the respondents marked the maximum value of 5 in that question in a 5 point Likert scale. There are therefore only two groups, those with a value of 5 (high level, H) and those with less than 5, less than a third of the total (low level, L, or medium / low level ML).									
Activity 5. Share information through information technology					Activity 6. Involvement in product development processes				
How often do you <i>share information</i> with your main <i>customers</i> through <i>information technology</i> ?					How often do you involve your <i>customers</i> in your <i>product development processes</i> ?				
How often does your company and its <i>suppliers</i> share technical, general, relevant, commercial <i>information</i> through <i>information and communication technologies</i> ?	H	M	L	Total	How often do you involve your <i>suppliers</i> in <i>joint product development processes</i> ?	H	M	L	Total
H	17.2	12.9	4.3	34.4	H	26.9	4.3	4.3	35.5
M	5.4	22.6	7.5	35.5	M	2.2	3.2	6.5	3.2
L	10.8	12.9	6.5	30.1	L	28.0	10.8	14.0	52.7
Total	33.3	48.4	18.3	100.0	Total	57.0	18.3	24.7	100.0
Pearson's Chi-squared test, p-value = 0.0513					Pearson's Chi-squared test, p-value = 0.01393				
Activity 7. Participation in product design processes					Activity 8. Set join goals				
How often do your <i>customers</i> participate in your <i>product design processes</i> ?					How often does your company <i>set joint goals</i> with key <i>clients</i> to achieve organizational restructuring?				
How often do you communicate closely with your <i>suppliers</i> about <i>design change considerations</i> in joint product development?	H	M	L	Total	How often does your company <i>set joint goals</i> with your key <i>suppliers</i> ?	H	M	L	Total
H	18.3	20.4	3.2	41.9	H	30.1	5.4	3.2	38.7
M	4.3	6.5	3.2	14.0	M	9.7	7.5	2.2	19.4
L	15.1	10.8	18.3	44.1	L	12.9	2.2	26.9	41.9
Total	37.6	37.6	24.7	100.0	Total	52.7	15.1	32.3	100.0
Pearson's Chi-squared test, p-value = 0.009764					Pearson's Chi-squared test, p-value = 0.00000009252				
Activity 9. Develop joint responsibilities									
How often do you <i>develop joint responsibilities</i> with key <i>clients</i> to achieve organizational restructuring?									

How often does your organization develop joint responsibilities with your key suppliers?	H	M	L	Total
H	24.7	6.5	6.5	37.6
M	7.5	9.7	1.1	44.1
L	11.8	6.5	25.8	18.3
Total	44.1	33.3	22.6	100.0
Pearson's Chi-squared test, p-value = 0.000006277				
<i>Source: Own Elaboration based on the collected data.</i>				

Table 4.
Analysis of associations for the integrative activities.

interpret the questions easily of the instrument for measuring the activities referring to integrative activities.

When the p-value is greater than 0.05, we must accept that there is no relationship -for this activities- between suppliers and customers (they behave independently), or more exactly there is not empirical evidence that this relationship exists (perhaps because the sample is not big enough), those are the cases for activities 1, 2, 3 and 5. When the p-value is less than 0.05 it can be accepted that the two characteristics crossed in the table are associated or related to each other, those are the cases for activities 4, 6, 7, 8 and 9.

5. Limitations, future research directions and conclusions

This paper has a number of limitations. First, there were no official institution with the exact number of food companies of Michoacán, so we tried to look on the internet, to visited every store, bazar, event, market, to checked labels of products, and we found that there were a lot of new creation companies, some others that had a lot of years, some others that disappeared but their information remained valid on the internet, some others shell companies with fictitious information, some others that were not legally registered. We also got in touch with leaders of some state and local Institutions but they did not know of the existence of any registry or database for companies in Michoacán, so we took as base the registry of the national statistical directory of economic units, [42] but we found companies that did not belong to the food industry sector, so we had to do a thorough review. Besides the willingness of companies to respond to the measurement instrument due to the insecurity of the state of Michoacán or apathy or lack of availability of time or desire to help research, so an important limitation was the number of companies surveyed.

Future research may consider looking at integrative activities in different industries or different states or countries, in order to make a comparison. The application of new statistical techniques such as multivariate analysis and data mining to the study of the data under investigation. The preparation of a manual of good integration practices that can be used by companies to improve their results.

In general we can conclude that the results were always in favor of customers, maybe because literature and practice always pull through customers trying to understand what customers want, need, how to satisfy them with studies of

customer satisfaction, customer loyalty, customer relationship management, marketing that usually works for customers and with customers; but hardly ever work with suppliers or for suppliers, almost never hear of suppliers process, suppliers selection, supplier relationship management, or activities were suppliers are involve, like parties, trainings or events, but is more often to include customers in this kind of activities. Also, it is odd for manufacturers to were asked about their daily activities with suppliers, but so it is with customers too, because normally there is no relationship with them, so this was the case for the food industry companies of Michoacán.

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