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Assessment of SME Supply Chain Management Best Practices:

A survey in Uruguay

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Abstract

An exploratory survey is presented concerning the main difficulties and issues that Uruguayan managers consider to have the most negative impact on their supply chains within the last 3 years. The survey was carried out within SME manufacturing and retailing companies in Uruguay, yielding 99 valid responses. A statistical analysis of the survey is introduced including a ranking of the difficulties and a grouping of those using factorial analysis. This exploratory analysis showed that the main concerns to supply chain managers are availability and quality of the labor force as well as the lack of integration between the interests of the public and private sector.

Keywords: Supply Chain Management, Survey, Latin America, SME

1. Introduction

We understand, following Mentzer et al. (2001) [1], a supply chain (SC) as a “set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer”. Three different chains co-exist: a direct one, which involves the company, its suppliers and its customers; an extended one, which is the direct one plus the suppliers’ supplier and the customers’ customers; and an ultimate chain, which involves all entities upstream and downstream the firm [1].

Consequently, we understand the Supply Chain Management (SCM) as a systems approach to viewing the supply chain as a whole. In fact, SCM can be defined as the strategic coordination of all traditional business functions and tactics that happen across all entities involved in the supply chain, with the objective of improving the long-term performance of the individual companies and the supply chain as a whole [1].

Firms must recognize the potential that a well-designed and effectively managed system for the chain can do to allow businesses achieve their strategic goals [2, 3]. Nevertheless, frequently companies do not take these thoughts into consideration. For instance, according to Hicks (1999) [4], most top management discussions about the strategy of the company are completely void of facts. Moreover, Harrison & New (2002) [5] stated that three out of five companies reported not having a well defined strategy for the supply chain.

Supply chain management is one of the most important areas for developing competitiveness and sustained growth in industries. Today’s intense competition requires firms to be more aware of their supply chains and achieve excellence in many areas, especially SME enterprises [6]. SC strategy has a key position in shareholder

value creation, stating that management practices can either destroy or help enhance shareholder value [7].

We aim through the conduction of this exploratory survey to ascertain whether Uruguayan firms did recognize the importance of supply chain activities and SCM in order to get better results in term of the company's performance. Moreover, the purpose of this exploratory research was to obtain first-hand information about the main difficulties and issues that Uruguayan managers consider to have the most negative impact on their supply chains within the last 3 years.

Although the geographical area of Uruguay may be modest, Uruguay is recognized in South America as being a strategic regional hub for South America's Southern Cone region. Due to the geographical location, it gives access to MERCOSUR, a US\$2-trillion-GDP free trade zone that also includes Argentina, Brazil and Paraguay. Uruguay has the strongest social and political stability in Latin America¹, with the highest income per capita of the continent.

The following sections present details about the methods applied to this investigation, while discussing survey results and an outline of future research. Conclusions are intended to encourage discussion and allow comparisons of Supply Chains throughout the rest of the world.

2. Survey Methodology

The survey was developed considering as a reference a survey of the Argentinian Supply Chain Summit in 2009, leaded by IAE business school and Expotrade. Once the

¹ *Based on Transparency International's Corruption Perceptions Index 2009, The Economist Intelligence Unit's Democracy Index 2008 and Heritage Foundation's Economic Freedom Index 2010*

questionnaire was developed, a pre-test was carried out where useful comments from experts (academicians and non-academicians) were received before launching the survey. The questionnaire had 17 questions and was designed to be completed in approximately 15 minutes. Survey Monkey[®] platform was used to construct the web survey.

In September 2011 the link was sent by e-mail, with a presentation letter, to over 940 companies in Uruguay. Companies were selected from the Uruguayan Chamber of Industry and ISI Emerging Markets[®] database. The online survey ran from September to November 2011 and was available at a local server, to improve trustworthiness of the survey. The survey was conducted in Spanish, and thus all references to specific questions have been translated. All participants were assured of anonymity, since there was only an optional personal question in the survey.

Many statistical tools were used to analyse the results. First, a one-way ANOVA was used to observe if significant differences existed between the ratings of each difficulty. Next, factorial analysis was used to see if it was possible to clarify the difficulties into fewer groups.

3. Response Characterization

A total of 130 questionnaires were received, leading to an initial response rate of 13.6%. Since some questionnaires were not considered valid or complete, it yielded in 99 valid responses (response rate of 10.5%). This response rate, leads to a survey-wide sample error rate of 9.3%².

² With $p=q=0.5$ and a significant level of 95%.

Sixty-eight per cent of responses came from local industries, 20% for retailers and 12% accounted for other activities. Industry size consisted of four groups: large companies with more than 250 employees, medium companies with between 101 and 250 employees, small companies with between 20 and 100 employees, and micro SMEs with fewer than 20 employees. As shown in Table 1, most respondents were small (44%) and medium (25%) enterprises. Moreover, each of the responses to the questions were analysed with a table of contingency for a possible correlation with industry size. In those cases where the correlation is statistically significant, the results are also presented stratified by industry size. On the other hand, when there is no correlation no stratification is made.

Industry Size	%	Nº
< 20	18.2	18
20-100	43.4	43
101-250	25.3	25
> 250	13.1	13
Total	100%	99

Table 1 - Amount of responses classified by industry size

The majority of survey respondents were CLO- logistic managers (27%), CEO - general managers (25%) and COO- operations managers (22%). Finally, 87% of answers were about the whole company supply chain, while the remaining 13% answered over a single business unit.

4. Supply Chain difficulties

a. General ranking of difficulties

In order to identify the difficulties that Uruguayan supply chain may come up with, firstly a brainstorming session was carried out among our group of researchers, based on the theoretical and practical experience of researchers. Finally, a pilot test was

carried out with specialist in the areas from the academic and business environment.

The resulting problems (variables) are stated below:

V1- Telecommunications infrastructure

V2- Warehousing infrastructure

V3- Air transportation

V4- Maritime transportation

V5- Road transportation

V6- Efficiency and effectiveness in custom clearance processes and similar paperwork

V7- Lack of integration between the interests of the public & private sectors

V8- Availability and quality of the labour force

V9- Relationship with employees (Union conflicts)

V10- Changes in the regulatory systems and political environment

V11- Market and economic instability

V12- Problems with suppliers' deliveries

V13- Problems with deliveries to customers

V14- Systematic delays in own production

V15- Lack of integration between SC and other functional areas

V16- Lack of skills for managing the SC

V17- Lack of commitment of top management towards the SC

V18- Problems with Information technologies

Respondents were asked to rate each difficulty using a Likert scale from 0 (insignificant) to 4 (very significant). The average results obtained for each difficulty are presented graphically in Figure 1.

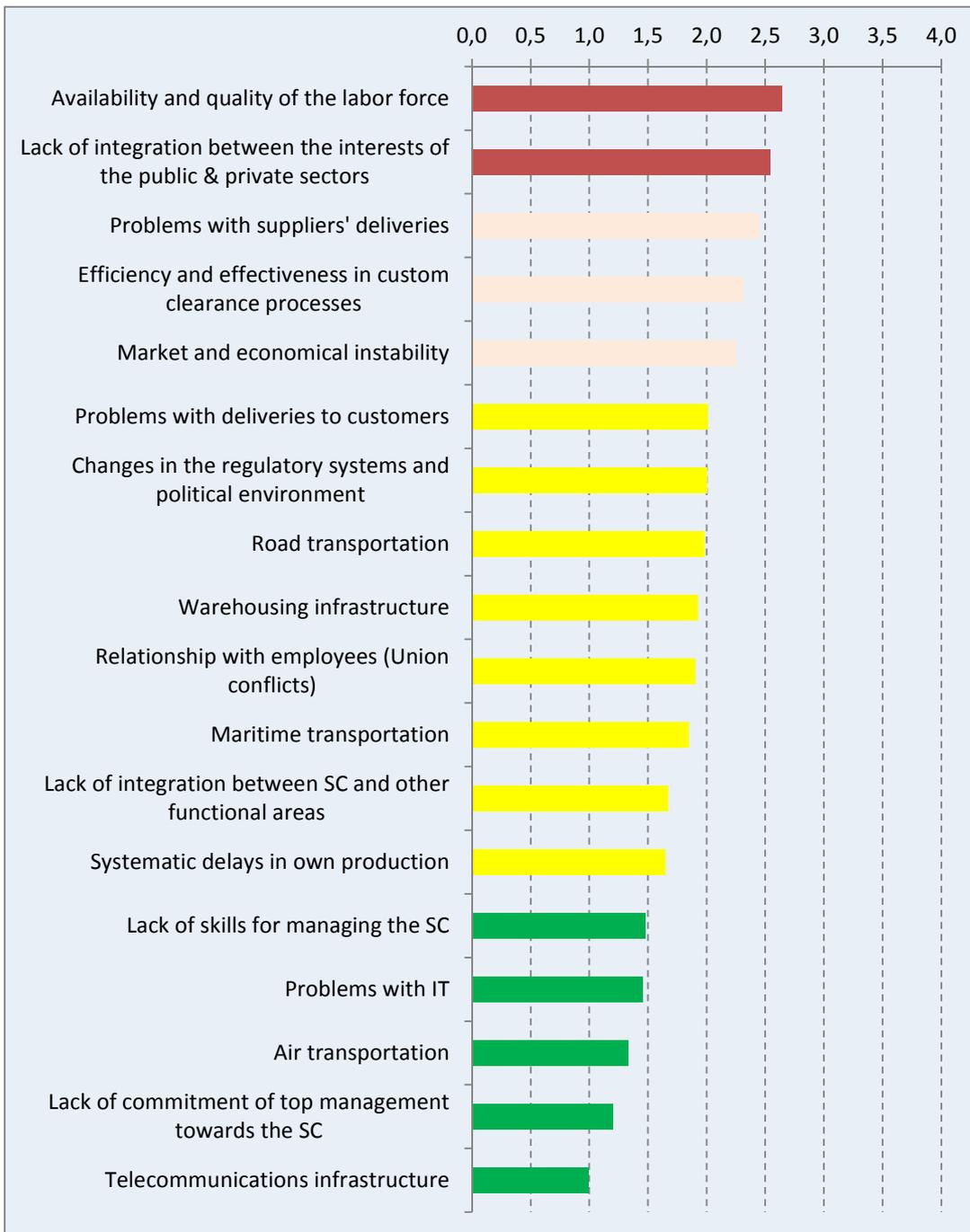


Figure 1 - General rating of Uruguayan SC difficulties, from 0 (insignificant) to 4 (very significant).

Four different color groups were identified according to significance in ANOVA.

A one-way ANOVA was used to detect if the rating given to each difficulty was significantly different from the others. The analysis carried out allowed us to divide the difficulties into four main groups, which are displayed in different colours in Figure 1. According to the survey, “Availability and quality of labour force” (V8) and “Lack of

integration between the interests of the public & private sectors” (V7) are the main concerns of Uruguayan supply chains. Statistical tests show that both difficulties, which make up group one, are significantly greater than more than ten other difficulties. The second group is formed by “Problems with suppliers deliveries” (V12), “Efficiency and effectiveness in custom clearance processes and other similar paperwork” (V6) and “Market and economic instability” (V11). This group was formed by those who are at least significantly greater than more than five difficulties. The third group is formed by the largest group of difficulties, including difficulties ranked from number 6 to number 13, as shown in Figure 1. The ANOVA demonstrated that each difficulty of this group is significantly greater than at least one of the difficulties of the last group. Consequently, the final group includes “Lack of skills for managing the SC” (V16), “Problems with Information technologies” (V18), “Air transportation” (V3), “Lack of commitment of top management towards the SC” (V17) and “Telecommunications infrastructure” (V1). These difficulties appear to be less important for surveyed companies.

Although, the “Problems with Information technologies” (V18) rated low in the degree of importance, this was the only difficulty that presented significantly differences between the ratings, considering industry size. Bigger companies state higher problems with IT compared to micro and small companies. This could be due to the degree of IT implementation in company main activities.

b. Grouping of difficulties

Once difficulties were ranked it would be useful to narrow them down into a few groups. The full component analysis, a kind of factorial analysis, was considered the most adequate statistical method to complete the task.

Factorial analysis is a generic name to a class of statistical multivariate methods with the goal of representing the interrelationships among a set of variables V by a number of underlying, linearly independent reference variables called factors F , with $F < V$. The main goals of factor analytic techniques are: (1) to reduce the number of variables and (2) to detect structures in the relationship between variables [8].

Principal components analysis was used as the extraction method. One of the first steps of the factorial analysis was to check the hypothesis, although most are conceptual rather than statistical [8].

Basically, as the researcher must ascertain whether or not the variables are independent, the data matrix must have enough correlations to justify the application of the factorial analysis. Consequently, the correlation matrix (Table 2) was calculated and analysed to determine the suitability of the method. The determinant of 0.00014, the p-value of the Bartlett test of 0.00 and a Kaiser–Meyer–Olkin index of 0.66, indicated that this technique could be adequately applied [9]

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	
V1	1.00	0.48	0.40	0.37	0.30	0.16	0.19	0.13	0.14	0.32	0.28	0.18	0.19	0.21	0.17	0.21	0.16	0.19	
V2		1.00	0.13	0.12	0.17	0.03	0.04	-0.11	0.02	-0.01	0.14	0.04	0.06	-0.03	0.23	0.25	0.15	0.10	
V3			1.00	0.67	0.51	0.43	0.38	0.09	0.10	0.37	0.28	0.19	0.29	0.25	0.11	0.04	-0.05	0.11	
V4				1.00	0.66	0.40	0.23	0.18	0.16	0.24	0.10	0.25	0.31	0.48	-0.01	0.01	-0.05	0.07	
V5					1.00	0.49	0.23	0.11	0.09	0.03	-0.04	0.33	0.31	0.36	0.18	0.16	0.12	0.15	
V6						1.00	0.54	-0.03	-0.09	0.24	0.13	0.28	0.26	0.07	0.03	0.00	-0.06	-0.13	
V7							1.00	0.11	-0.04	0.44	0.29	0.03	0.02	0.08	0.05	-0.05	0.02	-0.11	
V8								1.00	0.57	0.33	0.27	0.12	0.21	0.43	0.18	0.15	0.16	0.25	
V9									1.00	0.35	0.12	0.01	0.09	0.38	0.03	0.11	0.05	0.17	
V10										1.00	0.52	-0.11	-0.08	-0.05	-0.22	0.03	-0.01	0.10	
V11											1.00	-0.09	-0.08	0.00	-0.09	-0.01	-0.07	0.05	
V12												1.00	0.59	0.25	0.36	0.25	0.18	-0.03	
V13													1.00	0.53	0.39	0.38	0.22	0.11	
V14														1.00	0.35	0.32	0.25	0.17	
V15															1.00	0.64	0.59	0.51	
V16																1.00	0.73	0.53	
V17																	1.00	0.42	
V18																			1.00

Table 2 - Correlation Matrix

There is no lack of criteria to determine the number of factors to keep. Most of them use, in some way, the resulting “scree plot” shown in Figure 2. We use the Kaiser rule, which selects only the principal components with an “eigenvalue” greater than unity. Consequently, as can be seen in the graph, there are only five components with “eigenvalues” greater than 1. Therefore, the difficulties can be represented by five principal components, which make up 68% of the total variance³. Moreover, the resulting communality index for each difficulty (variable) describes which proportion of the variance is explained by the principal components selected. Since values of communalities for all difficulties are greater than 0.5, the continuation of our analysis was justified.

³ 60% is usually considered as sufficient in social sciences.

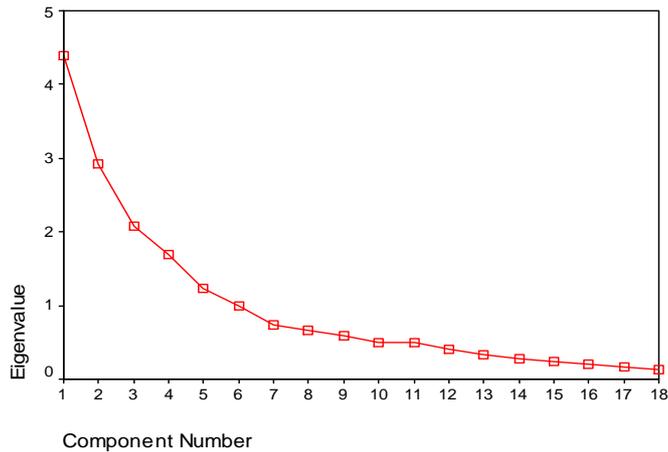


Figure 2 - Scree Plot

The next step, after having selected the number of factors to keep, was to choose a method for the rotation of the components in order to obtain a better interpretation of the groups. We decided to make an orthogonal rotation, which guarantees that components remain orthogonal (not correlated) to other components. The technique used was the “vari-max”, which is the most common among those that make orthogonal rotations. This result in a rotated components matrix, which represents the relationship between the variables (difficulties) and the rotated components, called factorial loads. Important rotated components matrix coefficients are shown in Table 3.

i. Group interpretation

To finalize the factorial analysis, each of the principal components was analysed by studying which variables saturate and contribute to each factor. To accomplish this task, we used rotated components matrix coefficients, shown in Table 3. Values lesser than 0.5 have been omitted in order to facilitate interpretation [8].

	1	2	3	4	5
V1					0.7234
V2					0.7884
V3	0.5608				
V4	0.7133				
V5	0.7373				
V6	0.5825		0.5588		
V7			0.7996		
V8				0.7929	
V9				0.8286	
V10			0.7806		
V11			0.6390		
V12	0.6562				
V13	0.6968				
V14	0.5732				
V15		0.8239			
V16		0.8681			
V17		0.8447			
V18		0.6286			

Table 3 - Simplified Rotated Matrix

Next, the resulting five components are presented with subsequent names and explanations. The order in which they are presented is due to the number of components. The lower the number of components, the higher the amount of variation it explains. However, this ranking does not accurately reflect the significance of each difficulty.

Sourcing and distribution material flows (1): This component considers problems that affect the correct transit and movement of either materials or information along the SC. On the one hand, we have problems related to air, maritime and road transportation. On the other hand, we can find problems referring to the efficiency and effectiveness in custom clearance processes and other similar paperwork, problems with suppliers' deliveries (delays, quality, lead times), problems with customers' deliveries (delays, quality, lead times) and systematic delays in own production processes.

Integration and management of SC (2): Problems related to lack of integration among different areas or activities along the SC are considered as well as some management problems such as: lack of integration between SC and other functional areas, lack of

skills within the company to manage the SC, lack of top management commitment toward the SC and problems with information technologies (IT) along the SC (ERP, tracking systems, etc.).

Economic and political environment (3): This group includes problems generated in the SC environment such as: efficiency and effectiveness in custom clearance processes and other similar paperwork, lack of integration between the interests of the public & private sectors, changes in the regulatory systems and political environment and economic and market instability.

Workforce (4): This component involves problems related to the working force such as: availability and quality of the work force and relationship with employees (Union conflicts).

IT's and warehousing (5): Finally, this last component considers the problems generated by the auxiliary infrastructure needed to develop some of the main activities of the SC. In particular, it involves: telecommunications and warehousing infrastructure.

ii. Group ranking

Once the groups were named and explained, they were ranked: the difficulties that most impacted negatively the supply chain were ranked first, and so on. Figure 3 shows the overall ranking, considering the general difficulties ratings with factorial punctuations obtained from the rotated components matrix.

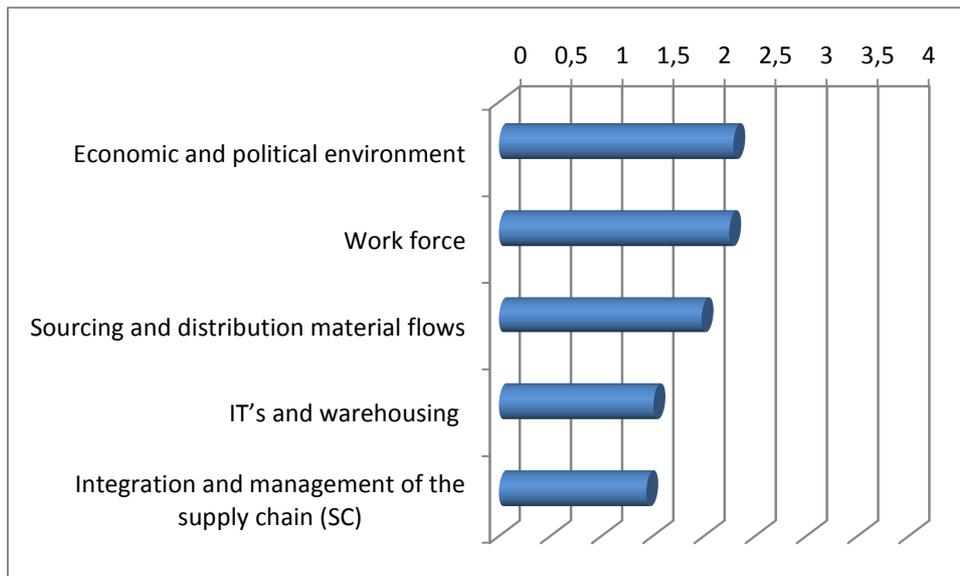


Figure 3 - Difficulties group rating punctuation

The two strongest groups of difficulties detected are: Problems related to the work force and Problems related to economic and political environment. With regard to the first problem, managers stated that there is a lack of government policies that encourage and promote better education and qualification among workers. Moreover, it has been said that they find a deficiency in the training programs available for some of the activities and specific areas along the supply chain. Finally, managers believe that companies are facing a cultural problem, since there is a negative tendency in young people that are developing bad working habits and high absenteeism.

With respect to the economic and political problems, it has been argued that the main issue is the lack of integration between the public and private sector. Although there are some recently created institutions and organizations, such as INALOG (National Institute of Logistics), there is still a long way to go in terms of mutual agreements and improvements for the logistics' sector. One subject in particular, is the road transportation infrastructure which, according to the managers' opinion, has been quite neglected by the government. The main problem is the lack of serious investment in the

required infrastructure which should have been made by the government years ago. Furthermore, managers believe that multimodal road transportation should be developed, in order to optimize the whole logistics' sector. For instance, investment in rail transportation would help to decongest traffic and slow down the damage of roads.

5. Results Overview

In this section we present some other survey results. Although they may not be the aim of this paper, it helps to conceptualize Uruguayan supply chains status. According to survey's results, Uruguayan companies show great interest in both logistics and supply chain topics.

One positive aspect found with the survey is the degree of integration that Uruguayan companies have with their key customers. According to the data gathered with the survey, 60% of managers have declared to share relevant information, 58% maintain adequate information channels between company/customers, and 68% of companies have their goals and strategies aligned with those of their key customers.

With regard to their relationship with suppliers, 52% of Uruguayan companies do not perform periodical performance evaluations to their key suppliers. This result could negatively affect the performance of the whole SC, since the objective of these evaluations is to provide the supplier with the necessary feed-back to correct their defective processes and try to eliminate any waste activity which does not create value for the final customer, as well as fixing any misunderstanding with the companies on the downside of the chain.

Another relevant aspect found in the results shows that less of 30% of companies use improvement methodologies, such as Continuous Improvement (32%), Lean Logistics (10%) and Six Sigma (7%).

Finally, the results show that very few companies have specific scorecards for the SCM. Despite the fact that 63% of the companies stated to have specific goals and strategies for the supply chain, only 25% admit to use metrics and scorecards to corroborate whether these goals were achieved and strategies successfully implemented. Furthermore, less than 20% of companies get involved in benchmarking processes. Moreover, some managers pointed out the risks of having a disconnection between the metrics used by the operation managers (mainly operational) and the ones used by the top management (mainly financial). They explained that by doing this, companies can face serious problems when trying to align top management strategies with the supply chain capabilities and operations.

6. Conclusions

The survey analysis shows that the main difficulties that hinder supply chain performance were the availability and quality of labour force and the lack of integration between the interests of the public & private sectors. These difficulties present significant differences in the rating over the others; however, there are no differences between the characteristics of survey respondents.

A factorial analysis was carried out in order to narrow down the group of difficulties, taking into account the existing correlation between them. It was possible to group all the difficulties into five main groups: Sourcing and distribution material flows, Integration and management of the SC, Economic and political environment, Work

force and IT's & warehousing. The most important groups were problems related to the work force and problems related to economic and political environment.

Our research aim was to get first-hand information about the main difficulties and issues that Uruguayan managers consider to have the most negative impact on their supply chains within the last 3 years. Besides the limitations of this study, conclusions are intended to encourage the scientific, business and political community to focus on overcoming the most troublesome difficulties. Future research could focus on developing strategic guidelines and methodologies to help companies find the way to overcome those difficulties towards a better business performance.

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