ASYMMETRIES IN THE SUPPLY CHAIN MANAGEMENT PROCESSES AND THEIR INFLUENCE IN THE CASE OF COLLABORATIVE AGREEMENTS IN VIRTUAL ENVIRONMENTS

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Abstract: The efficiency in the supply chain, as in other types of organizations structured as a network depends largely on the relationships that bind each and every participant [27.]. The influences, the achievement of the goal, the power reflected in the decision making process and access to technology and information are some of the factors upon which the degree of interdependence, the performance and position market supply chain. From this perspective, obtaining mutual benefits so that the process requires, management of the supply chain should be symmetrical [3.]. However, in reality the traditional business relationships between organizations in the supply chain are rarely symmetrical [19.]. The asymmetries can influence differently in the individual elements and the entire process of managing the supply chain. In some cases, the influence is a positive sign, since it can provide a source of additional income and improve the competitive position of the organization in the market. In others, has a negative sign, since it can be a source of creation and emergence of problems and conflicts at different levels of management process and in relations between the partner organizations [12.], [9.], [18.], [22.]. The aim of our research was to ascertain whether the conduct of directors in the asymmetric conditions in traditional environments and locations may vary in the case of collaborative virtual environments related to the Internet.

Keywords: supply chain management, asymmetries, virtual environments, managers behaviours

1. Introduction

The development of collaboration agreements between companies during recent years has focused on the need to increase the integration of the processes. The focus of the analysis has been on the following:

- improvement in the response to customer demand,
- the rationale for of levels of stock,
- the reduction of operation costs

The concentration of business activities around the above three factors requires a change in the structure of relationships among participants in the market.
Achieving this change proved difficult, due to the fact that the alliances made in the majority of cases with asymmetrical environments or conditions were not sufficiently motivating for management executives to change their priorities in the management process. Specific objectives, a concern for maintaining the competitive edge of their own business in addition to their dominant position in the market continued to be managers' primary objectives [17.]. The existing asymmetries can have influence in a variety of ways on individual elements and

on the total management process of the organization. In some cases, the influence has a positive sign; in others, it has a negative sign [12.].

Based on our observations, we have identified 5 groups of asymmetries:

- asymmetries of information and communication,
- asymmetries of knowledge and technology,
- asymmetries of structures and power,
- asymmetries of negotiation,
- asymmetries of costs and benefits.

In the majority of cases, "critical" assets such as information, the capacity for innovation and for creating trust, which made it possible for organizations to achieve a position of privilege on the market, have been used primarily to reduce operating costs for the organization to which they pertained. Does the asymmetrical reduction of costs continue to hold the same value in the case of collaboration agreements made in virtual spheres?

In the research we have undertaken [16.], it has been possible to observe how the asymmetrical behavior of participants in collaboration agreements related with costs, information, innovation, power and trust have promoted uncertainty in their relationships. A high level of uncertainty hinders integrating initiatives, reduces trust and transparency, all of which are so necessary from the standpoint of the efficiency and efficacy of the total results of collaboration agreements.

Can virtual spheres be converted into a tool to reduce the uncertainty related with collaboration agreements?

Lastly, if we look at supply chain management models, could we consider asymmetries to be factors that hinder or promote the development of collaboration agreements in virtual spheres?

2. Asymmetries in the Supply Chain Management Process

Asymmetries of information and communication, asymmetries of costs and profits, asymmetries of knowledge and technology, asymmetries of structure and power and asymmetries in the negotiation process are the ones we believe have the most influence on efficiency, efficacy and results in the supply chain management process. These asymmetries produce behaviors in organizations such as lack of trust and commitment in the processes of collaboration and integration, an unnecessary increase in supervision and monitoring of operations, differences in goals and objectives, resistance to the synchronization of information systems, and excessive focus on immediate results [17.]. All of this creates barriers to and hinders the development of the management process, turning into a pattern that is characterized by strong operational and business inefficiencies whose results end in the disintegration of the supply chain.

The existence of an asymmetry of information and knowledge leads partners in the supply chain to overprotect their information or to even limit access to it, in order to gain advantage over the other members. On the one hand, the provider does not fully reveal his knowledge of the operations, product quality and processes, which involve possibilities for improvement. On the other hand, the manufacturer does not share the greater knowledge it has of demand trends, market possibilities or customer preferences. In fact, due to this type of behavior, the decisions taken by each one of the parties have a greater possibility for being erroneous, which creates conflicts, an unjustified increase in costs, delays in delivery and lower quality [26.].

Information technologies are directly related with the processes of innovation the supply chain: the processes of reengineering necessary for starting up projects to improve

integrating activities and their results depend to a great extent on the application of adequate information systems [28.]. In practice, few supply chains are observable in which all members are connected to each other. The lack of connection in and between the various links in the supply chain, and the resistance to create it on the part of managers in spite of potential benefits is a sign of the existence of asymmetries of knowledge and technology [11.].

At present, the pressures of quantitative indicators, above all financial, have crucial influence on managers' decision-making processes [2.]. This tendency forces them to constantly reduce costs and to increase effectiveness by using the cheapest ways or methods possible [4.]. The practice of *benchmarking*, although effective in that it makes it possible to "copy" best practices, seldom ends up being adequate from the standpoint of collaboration [25.], since this involves the creation of dependence in the relations between organizations and the appearance of opportunistic behavior. In this way, the original balance of power between partners is thrown off, and relations between buyers and sellers become asymmetric [8.]. The relation between asymmetry of structures and power and asymmetry of information and communication significantly reduces efficiency in the decision-making process. Managers that do not have information depend – when making decisions – on situations created without their participation, which not only ends up being detrimental for the results of the supply chain, but also creates an imbalance in power relations and has negative influence on trust, collaboration and the development of the process of integration of the supply chain.

In each one of the four elements that form part of the negotiation process (participants, strategies, roles and scenarios), we can observe their asymmetrical nature or tendencies that lead to asymmetrical behaviors [30.]. In general, this process can be considered as asymmetrical *a priori*. The relations between the buyer and the seller are affected by the various negotiation processes [7.] whose primary objectives are the prices. Each one of the parties attempts to maximize their own interest by negotiating them. If the conditions for negotiation are characterized by a high degree of knowledge of the preferences of the parties involved and if the negotiators' behavior is rational, there is hope to expect the achievement of equality or balance in terms of earnings among the parties [20.]. These conditions, however, are rarely observable, due to the fact that the basis of negotiation is mostly made up of private information, capable of giving organizations a competitive edge in a negotiation process that, under these conditions, becomes asymmetrical.

The loss of symmetry in negotiations and the reduction of trust in the relations in the heart of the supply chain[1] also produces other types of negative behavior: it hinders the establishing of common goals among partners, it creates difficulties for individual organizations to identify with the supply chain and creates disloyalty [10.].

One of the indicators of the existence of an asymmetry of costs and profits is the prevalence of a system of individual measurement of costs and benefits on a global evaluation of the supply chain. The application of an individual system excludes the organization from the chain, causing the former's disintegration, since it begins to be managed as an independent entity [24.]. Individual measurements, in the majority of cases, focus on cost reduction. To achieve this goal, the easiest and most frequent way utilized to do this is the transfer of one supply chain member's costs to other members in the chain, instead of eliminating them directly [1.]. The asymmetry of costs and benefits can distort the process of rewards to organizations, which in their cost reduction have not obtained the expected profits, but instead have brought an increase in the total profit of the chain. The lack of adequate reward

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[1] Asymmetrical behaviours of this type have negative influence on relations in the long run or on repetitive negotiations that are characteristic of the supply chain. It is possible, on occasion, to accept asymmetrical behaviours in one-time negotiations, which in the majority are a "zero sum game" (if one gains, another loses) [13.].

may motivate managers to sub-optimize the economic interests of their own organizations instead of stimulating a concern for the profits of the supply chain they belong to [23.].

3. Virtual spheres of collaboration

Business activities under these conditions require making a change in the forms of relations between the participants in the collaboration agreements. The change must include, or in many cases introduce, in particular, innovation processes and new operational knowledge related with the TIC. A very precise definition of the entire system of change that is apparently needed is presented by Malerba who states: "An array of new and other already-known products, aimed at certain specific uses, and the network of agents carrying out interactions in and out of the market for the creation, production and sale of these products … created by a specific base of knowledge, technologies, productive factors and an arising demand and potential … in the heart of specific ways of organization" [15. p.: 250.]. The development of the proposed system required, on the one hand, a very broad application of information and communication technologies, which should be converted into the base for collaboration agreements and into a guarantee of solidity and trust. On the other hand it makes possible the access and exchange of what is known also as *core* knowledge and capacities by all participants in the abovementioned agreements. The best way for these types of developments seems to be a virtual organization, whose absence of structural borders would facilitate the distribution of knowledge.

A virtual organization in a new *marketspace* that enters into one-time collaboration agreements, thereby breaking with the classic value chain model and substituting it with a matrix of values in which information and knowledge are considered as the primary source of value [29.]. In this new environment, collaboration, integration and innovation make it possible to reduce costs – especially when the organization wants to drastically lower the costs related with the buying and selling contract, to improve results – personalizing products and clients thanks to an analysis of their preferences prior to entering into the contract, as well as efficiency and efficacy in management processes – thanks to the possibility of personalizing prices. In these conditions the individual relations between the players, who most of the time are one-time participants, make it possible at the operational and strategic levels to establish true "partnering" relations. The virtual market stops being a set of segments and becomes a set of clients, providers and facilitators.

However, the virtualization of the sphere of collaboration agreements does not eliminate risk and uncertainty. Both factors are related with perceiving the possibility for errors and especially with their consequences when the time comes for making business decisions. The level of uncertainty and the risk value / risk evaluation in this new market depends directly on the trust that exists among the agents participating in it. Its importance is best described by Liikanen: "No trust, no transactions" [14.].

4. Research and analysis of the results

We have carried out research on two different markets, the mature market in Spain and the emerging market in Poland, taking into consideration the probability of different behaviors of organizations and their managers. With the application of statistical tools: linear regression analysis and structural equations, to data gathered in the questionnaires, we intended to get an estimate of these behaviours' and relationships.

The answers to the questionnaire and their subsequent analysis have shown a strong and significant relationship between asymmetries and trust in both markets. The results of the structural equations show a negative relationship between asymmetries and trust (E = -

1.218)[2] in the case of emerging markets, which means reductions of the trust in collaborative relationships with each increasing level of asymmetries. In emerging market in Poland managers valued especially the activities related to the image of your organization in this market. They are considering that it improves together with an increase in trust. With the increased trust they also sees the opportunity to establish relationships type " WIN to WIN" and reduce the level of conflict. The asymmetric conditions in traditional and "virtual" markets significantly impede it.

For mature markets negative effects of asymmetries (E = -2.056) and behaviours related to them have the same sign as in Poland, i.e. reduce the level of trust between partners in supply chains. In Spain, the Managers consider trust as an essential element in improving relations within supply chains. For them, the trust is especially important from the standpoint of searching of solutions of the problems by mutual agreement, in the implementation of behaviours "win to win" relationships between partners in the supply chain, irrespective of cost. In the mature market in Spain trust is particularly important in the process of construct the relationships based on honesty and transparency.

Trust is also strongly correlated with the results in both markets (E = 3.818 in Poland and E = 6.293 in Spain), confirming the view quoted above Liikanen: "No trust, no transactions" [14.]. However we must not forget that the term of the trust is understood differently in different markets and organizations depending on the organizational culture, a very influential on the behaviours of managers [21.], which possibly can be moderated so determinant in their responses.

Regarding costs, the analytical approach yields a seemingly weak and not significant relationships between the asymmetries and the costs (E = 0.029 and p = 0.619) in the case of Poland. From a purely statistical standpoint, we could even consider the lack of relationship. In Spain, however, this relationship was stronger and significant (E = 1,263 and p <0.05).

However, it must stress the importance in both samples the relationship between costs and asymmetries in the regression analysis. Noting the results of the analysis, we can consider that the two variables have the same trend and a similar force in their development. Values were obtained in the case of Poland $\beta = 0.297$, t = 2.390, p <0.05, and Spain's case, $\beta = 0.277$, t = 3.395, p <0.05. This implies that, in both markets, when asymmetries increase, the activities costs of the members of supply chains also increases, especially the cost of inventories, costs of production and purchases in the case of Spain. The data confirm empirically the use by managers of the known "trade offs" practice in the asymmetrical conditions of management, within the supply chain. Thanks to the "trade offs" organizations attempting to improve their individual costs and asymmetric conditions are favourable for this.

"Virtual" environments of collaboration create opportunities to consider that in mature markets asymmetrical reduction of costs not only compensates for the increase in the total costs in the supply chain but even exceeds it. In this way the tendency of reducing or eliminating opportunistic behavior in relationships built on the network by collaborating organizations can also be observed.

5. General conclusions

Cox [2.] suggests that a relationship exists between power and assets that are deemed "critical" in the supply chain. Our observations have confirmed that information and trust can be viewed this way in dynamic and unstable spheres, especially in the virtual environment. We have been able to observe that only a few organizations involved in the

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[2] The results of statistical analysis are in tables in Appendix A

process of supply chain management in both types of spheres have all at the same time. In the majority of cases, "critical" assets that make obtaining a position of privilege in the market and/or in the supply chain have been used mainly for reducing operating costs of the organization to which they belong. This asymmetrical cost reduction does not entail an associated tendency towards total costs of the supply chain; nor is this true in virtual spheres. During our research it has been possible to establish that among the determining factors when the time comes to enter or refuse to enter into a collaboration agreement in the virtual sphere, the size of the organization and the scale of operations conducted by the same enter into the decision. The organization's size and scale are related negatively with power, trust, information and costs from the standpoint of balance in supply chain relationship. The best known effects are the reduction of competition in the markets, the creation of barriers with respect to dedication due to the concentration of power in a only a few organizations, and a reduction in possibilities for collaboration.

Finally, we must recognize that there is a tendency for rapprochement in managerial behavior in both types, the classic and virtual sphere, which makes it possible to consider the possibility of applying similar management tools in relationships of collaborations. The strategic considerations related with the asymmetries and their influence on both types of spheres also oblige, especially high level managers, to reconsider their standpoint in relation with their business strategy, giving first priority to the specialization of activities and to give up a position of dominance in favor of the elements of control of collaboration relationships.

6. Appendix A. Tables

Table 1. Model sumary - Spain

Model	R	R squared	R squared adjusted	Standard error of estimate	Estadísticos de cambio				
					Change in R squared	Change in F	gl1	gl2	Sig. of change in F
1	,736(a)	,542	,493	,684	,542	11,225	4	38	,000

a) Variables predictors: (Constant), Integration, Costs, Collaboration, Innovation
b) Variable dependent: Results

Table 2. Coefficient - Spain

Model	Coefficient no estandard		Coef. estandar	t	Sig	Confidence interval for B to 95%		Correlations			Statistical collinearity	
	B	Error tip.	Beta			Lower Limit	Upper Limit	Order zero	Partial	Semiparl	Toler.	FIV
1 Constante	-,004	,543		-,008	,994	-1,086	1,078					
Collaboration	,584	,105	,487	5,579	,000	,376	,793	,743	,539	,367	,568	1,759
Innovation	,225	,083	,241	2,698	,009	,059	,391	,563	,296	,178	,545	1,833
Costs	,319	,094	,295	3,395	,001	,132	,506	,683	,363	,223	,573	1,746
Integration	-,116	,066	-,136	-1,748	,084	-,247	,016	,207	-,197	-,115	,711	1,406

Table 3. Model sumary – Poland

Model	R	R squared	R squared adjusted	Standard error of estimate	Estadísticos de cambio				
					Change in R squared	Change in F	gl1	gl2	Sig. of change in F
1	,819(a)	,671	,653	,585	,671	38,686	4	76	,000

a) Variables predictors: (Constante), Integration, Costs, Collaboration, Innovation
b) Variable dependent: Results

Table 4. Coefficient - Poland

Model		Coefficient no estandard		Coef. estandar	t	Sig.	Confidence interval for B to 95%		Correlations			Statistical collinearity	
		B	Error tip.	Beta			Lower Limit	Upper Limit	Order zero	Partial	Semiparl	Toler.	FIV
1	Constante	2,123	1,085		1,957	,058							
	Collaboration	,184	,140	,168	1,319	,195	,441	,209	,145	,740	1,352	,740	1,352
	Innovation	,543	,157	,643	3,458	,001	,462	,489	,380	,349	2,866	,349	2,866
	Costs	-,405	,136	-,497	-2,976	,005	-,009	-,435	-,327	,432	2,313	,432	2,313
	Integration	,356	,150	,297	2,370	,023	,559	,359	,260	,769	1,300	,769	1,300

a) Variable dependiente: Results

Table 5. Estimates by the method of full information maximum likelihood (FIML) – Spain Results

		Estimate	S.E.	C.R.	P
con	<--- Asim	-2,086	0,088	0,413	***
cost	<--- Asim	1,263	,066	,336	***
Results	<--- con	6,293	0,242	1,382	***

*** = p<0,05[3]

Table 6. Estimates by the method of full information maximum likelihood (FIML) – Poland Results

		Estimate	S.E.	C.R.	P
con	<--- Asim	-1,218	0,113	10,757	***
cost	<--- Asim	,029	,058	,497	,619
Results	<--- con	3,818	1,111	3,437	***

*** = p<0,05

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[3] The values in the column "Estimate" indicates the value of influence, this being greater the higher the value, and taking its direction by positive and negative values. The CR column indicates critical relationship between the variables. When CR> 1.96, the result is significant at the 0.05, with CR> 2.58 the result is significant at the 0.01, and if CR> 3.29 to 0.001 [6]. The P values in the column reporting on the significance of relationships between variables. The relationship is significant if the indicator takes a value of p <0.05. In the tables this consideration is marked by asterisks (***).

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