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Impact of Supply Chain Relational Interactions on Information Sharing

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Abstract

The environment complexity in which supply chain members are evolving leads them to adopt opposite strategies in a constructive way. In this sense companies tend to create value by cooperation and, at the same time, capture value by competition. This ago-antagonistic behavior generates a relational dynamics in which companies perform on a set of factors to improve their position within the chain. This enables them to progress towards common interests while ensuring on their own ones. In the present paper, this dynamics is analyzed by using ago-antagonistic system theory, which integrates an economic exchange orientation with a social exchange perspective in order to come up with a framework permitting to better understand and justify information sharing antecedents according to supply chain members' behavior.

Key words: Supply chain, information sharing, relational dynamics, Transaction cost theory, Social exchange theory, Ago-antagonistic system.

1 Introduction

The exceptional growth experienced by the global economic environment in recent years has greatly contributed to increased consumption, which in turn resulted in bigger sales. This meteoric rise, coupled with the opening of markets, the shrinking of product life cycles, the acceleration of trade, the unprecedented development of information and communication technologies, the increased demanding customers and also the expansion of transportation networks, represent major consequences of amplification of flows complexity between different actors of the economic system. This meant that these flows have become difficult to rationalize prompted companies to focus on their core competencies, by outsourcing non-generating value activities to face a number of constraints when managing their processes that deal with the product (or service) from its design to its commercialization, incorporating returns and recycling. To handle such constraints, firms implement new business models and organizational configurations integrating the notion of networks. These were achieved by the advent of 'supply chains' which represent central organizing units in nowadays' industries [38].

To claim a relative adequacy between supply and demand, it is necessary to adopt a forward-thinking of integration of relevant generating value processes and activities among all players in the supply chain [32], while maintaining agility, adaptability and alignment between their different interests [33]. In this way, supply chain can be defined as a hierarchical, dynamic and process oriented network, made up of a set of companies (from the first supplier to the end customer), linked by upstream and downstream flows (physical, informational, financial and knowledge) and different level relationships, established in order to satisfy the customer through better coordination and integration, but also greater flexibility and responsiveness [51]. The supply chains can be presented as unavoidable phenomena arising from a need for coordination and flexibility among a set of companies. In this sense, supply chains exist, whether managed or not [37].

Addressing this phenomenon with both organizational and engineering vision leads us to two major issue levels. On one hand, to insure a relative adequacy between supply and demand, it is necessary to adopt a reflection oriented towards the integration of relevant processes and value-added activities among all supply chain members [32], while maintaining agility,

adaptability and alignment between their interests [33]. These objectives cannot be achieved without information sharing. On the other hand, information asymmetry subsists between supply chain members leading to its distortion that is amplified from downstream to upstream tiers causing what is known as the Bullwhip effect [16].

Therefore, if we want to deepen our analysis, we can say that information asymmetry is driven by two paradoxical strategic behaviors, namely cooperation and competition, which are both necessary and complementary at the same time. Constituting an ago-antagonistic system, viz. paradoxical and complementary, makes the issue of integration not as obvious as some think. The integration of a supply chain is not automatic. For Lambert and Cooper [32], an excessive integration could be disadvantageous to the performance of the supply chain members. Also, since the drivers for integration are circumstantial and different from process link to other, the levels of information sharing differ from link to link, and also vary over time. In sum, information sharing between members of the supply chain depends on certain relational factors. Therefore, what are these factors? And how they interact with one another?

To answer this question, we will structure our article as follows: first we will present the supply chain dynamics based on the ago-antagonistic systems theory, integrating the Transaction Cost Theory and the Social Exchange approach in the same paradigmatic context. After that, we will present relational factors that drive information sharing between supply chain members and come up with a framework. Finally, we will discuss such a framework, present limitations and suggest perspectives for future research.

2 Ago-antagonistic supply chains dynamics: economic and social perspective

Supply chain presents a specific type of network. As we have seen above, it is a process oriented, dynamic, and hierarchical network. This hybrid governance structure explained by the proponents of the Transaction Costs Theory (TCT) integrates the sum of three fundamental features of exchange between economic actors. Broadly speaking, these elements are the costs of coordination between different actors, risks relating to operations and risks of opportunism [9]. Incorporated in such governance structures, companies remain legally independent, retaining their identity, their culture and their capabilities, and also a structural

flexibility, while being in close collaboration with other companies in pursuing their common goals.

In a supply chain, firms search for common benefits by pooling complimentary resources, skills, and capabilities [29]. Hall and Potts [24] show that cooperation between a producer and its supplier may reduce the total cost, which depends on their scheduling objectives. However, benefits generated by cooperation must be fairly distributed among members, otherwise regulations and adjustments are needed to rebalance the whole chain [3]. This added to the fact that relationships between companies entail a complex interaction between ex-ante cooperation to mutually create value and ex-post self-interest bargaining to capture value [20]. So we can understand from this that there is always a part of competition in a given cooperative relationship.

As we have seen above, cooperation and competition represent an ago-antagonistic couple in the supply chain, since on one hand they are viewed as a paradox, and on the other hand this paradoxical combination has positive and non-destructive effects [51]. Ago-antagonistic system approach combines concepts that were usually opposed. The notion 'ago-antagonistic' is composed of the term 'antagonistic', which is employed to indicate the obstruction of the couple's poles (opposite or only different), and 'agonistic', means that conflict has positive and non-destructive effects [7]. In fact, it represents the association of cooperation and conflict in the same phenomenon and implicates bipolar strategies [6].

In supply chains, both competition and cooperation are important, and two logics are necessary. The first one is a transactional logic, which is generally characterized by competition behaviors, and the second one is relational, and is characterized commonly by cooperation strategies. So, cooperation and competition coexist ago-antagonistically in a supply chain. The fact that the supply chain represents a dynamic network, made it more exposed to variations and instabilities giving rise to conflicts or opportunistic behaviors, because of the uncertainty and ambiguity of certain situations. This generates paradoxically a certain need for cooperation and collaboration. In this sense, the social exchange theory can better elucidate this phenomenon.

Initiated by authors like Blau [8], the Social Exchange Theory (SET) represents a theoretical corpus which argues that individuals or organizations are in a social exchange logic looking for rewards and benefits, and avoiding punishment [15]. In this way, companies establish relationships with others to warrant mutual advantages. Thus, in contrast to economic exchange theory, which define an actor as a *homo economicus*, which is rational egoist, utilitarian and hedonistic, the SET highlight the fact that this actor is also characterized by altruism, social values and even subjectivism. Blau [8] stipulates that the SET is characterized by indefinite individual engagement and trust such as intrinsic rewards, hence situated between rational calculation of gain and pure affective behavior. Moreover, social exchange theory insists more on insuring long-term social relations, than on a short-term transaction in the marketplace.

Furthermore, in a SET approach, future actions and behaviors are conditioned by former ones. In this sense, the more beneficial is the result of a member's action, the more likely this one is to perform the action again [8]. So when a partner does not receive an expected benefice or incurs an unpredicted punishment, will behave negatively in future actions [27]. These benefits are not fixed with a rational calculation; they are evaluated compared to a certain number of quantitative and qualitative elements, which generally cannot be easily determined. So it's difficult to evaluate them on a transaction approach basis [36].

For the SET proponents, power is seen as a significant factor that interferes within a relationship. Power has been defined as the ability of a member to influence or to control the decisions and the behavior of other members [18]. But, relational attitudes and behaviors are conditioned by the perceived justice established by the more powerful member of the exchange and that the enactment of such policies allows the member to retain and protect its power [22]. These elements stimulate the nature of the relationship between members that will guide the future exchange.

3 Information sharing antecedents in supply chain relational dynamics

When reviewing the most relevant relational information sharing antecedents that intervene within a supply chain, we first incorporate the hierarchical relationship between different

actors and their respective weights, namely the power they have [10], [5]. The exercise of this power creates an instinctive reaction of the one who undergoes it, resulting in a level of satisfaction [5]. This level of satisfaction presents, therefore, a second major factor and has a direct impact on the nature of the relationship (conflict, cooperation, coordination, collaboration) between different supply chain actors, which also depends on trust, commitment of actors and interdependencies between their different processes [39], [37]. Finally, the relational antecedents determine the degree of information sharing [43] which presents another factor in this relational dynamics. On this basis, these factors will be detailed and analyzed in order to constitute a framework explaining the relationship dynamics that governs the supply chain.

3.1 Power

One of most used definition of power is that of Dahl [12, p.290]. He stipulates that “A has power over B to the extent that he can get B to do something that B would not otherwise do”. Also, cited by Friedberg [17], Crozier [11] defines “the power of an actor A as its ability to impose on an actor B terms of trade that are beneficial to him”. So power is a relative force, justified or not, a player can have on another within a given relationship.

For Benton and Maloni [5], the power plays a decisive role in the supply chain. It allows the determination of relational influences between actors, especially since the identification of its sources shows that it can have a varied effect on inter-organizational relationships but also on the behavior of each actor. Moreover, the power allows the hierarchy of structural dominance, defined by Cox [10] as situations in which there are one or several dominant players, who are able to capture or control the key resources that generate value. In the same vein, Munson et al. [42] state that a player has the power in a supply chain if he is in possession of a strong market position, he has access to a major part of financial resources; he has access to important or critical information or he has an irreplaceable position. They add that the exercise of power within the supply chain revolves around price, inventory, operations, channel structure, and information controls.

Moreover, the typology of French and Raven [16] identifies five sources of power: reward, coercion, legitimacy, reference and expertise. Another source added by Raven [44], which is information. However, Hunt and Nevin [28] classify power in coercive and non-coercive

power. Molm [40] states that this classification is more relevant because the other four sources of power determined by French and Raven [16] (reward, legitimacy, reference and expertise), considered as non-coercive, include benefits of the promotion of desired behaviors while the coercive power source is mainly based on the exercise of force. Consequently, this latter type will be taken into account in our research, since it is sufficient to distinguish the behaviors in a supply chain. This has been studied before by Beier and Stern [4] who found that non-coercive power is an alternative that can increase satisfaction for weakest members. Consequently, the latter type will be taken into account in our research, since it is sufficient to distinguish behaviors in the supply chain. Even though, the typology of French and Raven [16] updated by Raven [44] may provide some explanation, since it allows to have more information on the sources of power.

3.2 *Satisfaction level*

The exercise of power by an actor on one or more other players, whatever its source, is not without consequences. In other words, the exercise of power in a coercive logic or not has not the same echo. Thus, the satisfaction of partners presents a major factor in building relationships and making decisions in the supply chain. Anderson and Narus [2] defined satisfaction as a positive emotional state resulting from the evaluation of all aspects of the relationship between a company and its partner. Through our research, we adopt the definition of Benton and Maloni [5], which stipulate that partner satisfaction is a feeling of fairness in the relationship whatever existing power imbalance. In this line, the work of Benton and Maloni [5] shows that the coercive power (reward, coercion and legitimacy) has a negative impact on the satisfaction of the partner who undergoes it. By cons, non-coercive power (reference, expertise and information) has a positive impact on the level of satisfaction of the same partner.

Hunt and Nevin [28] outlined six main benefits arising from the satisfaction of the partner that undergoes power. When satisfied, this partner has a high level of morale, cooperate better, avoid to deliberately terminating contracts, is less likely to file individual or class action suits against who has the power and is less likely to seek protective legislation. Therefore, partners' satisfaction greatly improves the relationship between them. So we can say that the level of satisfaction has a greater or lesser impact on the nature of the relationship that binds the different actors. In this line, quoted by Benton and Maloni [5], Guneshan and Harrison [23]

showed that the level of satisfaction represent a significant factor in the performance of long-term relationship. Similarly, Skinner et al. [48] have demonstrated that the level of satisfaction has a positive relationship with the cooperation, and a negative relationship with conflict.

3.3 Inter-organizational relationship nature

Within a supply chain, the nature and intensity of the relationship that links the different actors can be approached with a dichotomous logic. Indeed, either the factors that influence this relationship are more or less positive leading to an agreement position, which can result in cooperation, coordination or collaboration. Or, they are relatively hostile, and here companies are facing a situation of conflict and opposition.

In supply chains, conflicts can arise between partners from differences relative to certain elements. Hocker and Wilmot [25] defined the conflict as a disagreement expressed between at least two interdependent parties who perceive incompatible goals, poor rewards and interference of the other party in achieving their goals (mutual). These conflicts can arise from a difference of power, competition for scarce resources, a tendency to differentiate a negative interdependence between entities, an ambiguity about the legal responsibility or authority, a deterioration of the image of one of them or its value [13]. Being in conflict, members of a supply chain tend naturally to a local optimization to the detriment of the overall performance of the chain. To address this, members of a supply chain cooperate, coordinate or collaborate in the sense of common interest.

Moreover, supply chain integration depends, among others, of organizational factors such as trust, commitment, interdependence, organizational compatibility, vision, core processes, leadership and support of top management [37]. Thus, we can say that in addition to previously invoked satisfaction level, trust, commitment and interdependence are critical determinants of the relationship nature between different partners [39].

Trust can be described as a belief that the company would accomplish only actions that will yield positive results [2]. This trust arises when one party believes in the reliability and the integrity of its exchange partner [41]. For Högberg [25], this trust is gradually developed with the gradual deepening of the relationship through a process of mutual adaptation, although not necessarily in a symmetrical manner, to the needs of the other partner. Likewise, commitment

is defined as an implicit or explicit pledge on the continuity of exchange between partners [14]. By linking these two concepts, Morgan and Hunt [39] state that a company can expand cooperation by increasing trust and commitment. However, trust has a major influence on the players' commitment in the relationship [1], [46].

In the same line of Kambil and Short [29], Kumar and van Dissel [30] state that the interdependence in the sense of Thompson [49], determines the level of relations between the different actors. The levels of interdependence, namely pooled interdependence, sequential interdependence and mutual one, as they have been determined by Thompson [49], have a greater or lesser extent on the level of relations between actors.

3.4 Information sharing level

At the supply chain level, information is critical to coordination and flow optimization. Retention or bad reporting can cause distortion and loss of visibility; and thus amplifying the Bullwhip effect [34] and decreasing the supply chain performance. Furthermore, it should be noted that the fact of sharing information between companies has an impact on performance [35] depends on a better consideration of the antecedents of this sharing [47]. That said, Patnayakuni et al. [43], shows that information sharing is influenced by previous relationships, then the nature of relationships that link the various players in the supply chain.

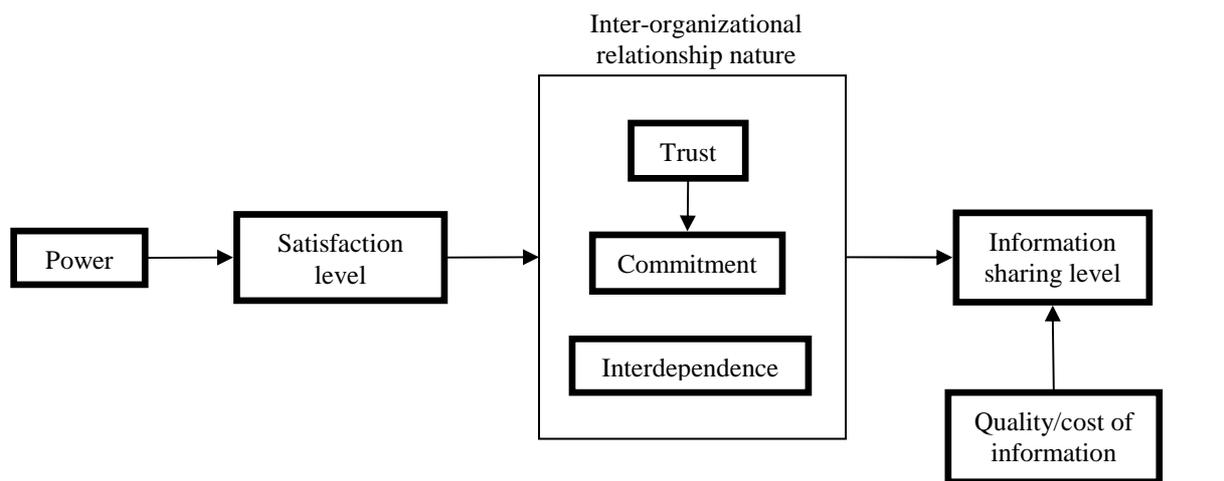


Fig. 1. Information sharing antecedents framework

Through inter-organizational setting, three situations of sharing can be presented, namely a situation where no information is shared, a situation where certain information is shared and a final in which nearly all information is shared [19]. Moreover, the degree of information sharing also depends on two key elements, namely the information quality and the cost that allows access to it. Zhou and Benton [50] state that the quality of information shows the degree to which the information exchanged between companies coincides with their needs. The quality of information is determined by its completeness, accuracy (the absence of noise), its reliability, smoothness and accuracy, timeliness, punctuality, its shape and richness, and finally to its accessibility [45]. This quality is desired just for the cost that allows its availability. If the cost of information is too high some quality criterion can be set aside. Therefore, before sharing information, members of a supply chain evaluate the quality/cost ratio in a precise or approximate manner. Consequently, this ratio has a direct impact on the degree of information sharing between different supply chain partners.

All the elements previously invoked are in continuous interaction with one another and have relative impact on information sharing within supply chains. Generally, we cannot avoid integrating these elements because of their influence. This may help supply chain members to minimize relational risks and reduce uncertainty by mastering such an apprehension. These information sharing relational antecedents can be consolidated in the framework presented in Figure 1.

4 Conclusion

The framework presented does not pretend to completeness, most important elements were highlighted to make the supply chain community, and especially engineering oriented members, aware of the importance of the social part when apprehending supply chain issues. More specifically, this framework allows us to go through information sharing antecedents by underlining the importance of notions such as power, partner satisfaction, the nature of inter-organizational relationships, trust, commitment, interdependence, but also the quality/cost of information in the analysis of the informational orientation of supply chain members.

Nevertheless, like all research works, our framework presents a number of limitations. We can cite two main ones. The first is related to the conceptualization of the supply chain relational

dynamic. Our conceptualization is quite specific to particular situations; as in some sectors and businesses, this dynamics remains dependant to the economic and technical guidance which governs inter-organizational relations. In these industries, companies integrate our framework as an optional element of decision making, avoiding, consequently, the risk of bias that may arise from the relationship. The second limitation is related to the lack of empirical validation for the proposed framework. Our reflection is based on previous research on the field, but does not include any development on how these variables will be measured in a supply chain context. This can constitute a perspective for future research.

Information sharing presents one of the responses that permit mitigating the bullwhip effect is between supply chain members. Supply chain dynamics is driven by a set of factors that evolve depending on complex environmental changes. A change in one of these factors downstream the supply chain is inevitably translated by amplified one upstream. Called the Bullwhip effect, Lee et al. [34] defines it as a phenomenon which “occurs when the demand order variabilities in the supply chain are amplified as they moved up the supply chain”. This effect provokes a lot of inefficiencies and unbalances within the supply chain, and happens depending on several causes. Lee et al [34] highlight four principal ones: demand signal processing or demand forecast updating, order batching, price fluctuation, and rationing and shortage gaming. Actually, most of researchers attribute the bullwhip effect to the irrational behavior of supply chain members [16];[34]. But as we can see in the literature, most of research focuses more on the causes and the consequences of this effect and not much on factors that can generate these causes. So, this can also present an interesting future research direction.

Finally, we conclude by saying that both technical/economic and social logics have to be included in the cognitive map of a supply chain manager. We can hardly reach performance just by basing our decisions on technical/economic variables and elements. Supply chain performance is conditioned by social relationships that represent in the main its essence, in contrast to logistics, which focuses more on technical factors. Although, this can obviously, be subject to discussion.

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