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Information Technology And Supply Chain Governance: A Conceptual Model

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INFORMATION TECHNOLOGY AND SUPPLY CHAIN GOVERNANCE: A CONCEPTUAL MODEL

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Abstract

In this theoretical essay we apply three theories of governance in proposing a conceptual model of the relationship between information technology (IT) and supply chain governance (SCG) and its conceptions (contractual, transactional, and relational). We argue, theoretically, that with contractual governance, IT is used to control activities and processes across the supply chain and to enforce coordination and contract compliance. IT, in transactional governance, is used to reduce costs and complexity of transactions. This is achieved through the reduction of losses and errors, the minimization of opportunism, and the decrease in total expenditures of the systems. With relational governance, IT can be used to support a closer and more trustful relationship among organizations through the collaboration and integration of supply chain activities. We provide testable propositions that emerge from this analysis and discussion. We also argue that e-procurement, enterprise resource planning (ERP), and electronic data interchange (EDI) could be used with the three conceptions of SCG. Implications for theory and practice are discussed.

Keywords: Theories of Governance, Information Technology, Supply Chain Governance, Conceptual Model.
1 Introduction

There has been unprecedented development, growth, and global diffusion of supply chain activities over the past decade. This expansion of supply chain relationships and activities is directly dependent on the IT used by the companies involved (Ross 2011). Of key importance in the supply chain are the global and long-term benefits that accrue to all supply chain members. Comprehending how those benefits emerge and flow requires a comprehensive understanding of processes and rationale guiding supply chain participation. Up until now, this understanding has been limited because, traditionally, the supply chain has been studied from an operations management perspective, with a focus on inter-functional or intra-organizational integration (Jain and Dubey 2005).

Burgess, Singh and Koroglu (2006) reviewed articles about supply chain management (SCM) and pointed out that the majority of the articles framed SCM as some manifestation of a process. However, with the increased usage of IT in the supply chain today, researchers need to look beyond the operational aspects present in various studies of supply chains (Ketchen and Hult 2007). Current studies should embrace a more systemic, strategic and long-term view of supply chains and analyze factors influencing supply chain performance such as trust, costs, opportunism, commitment, and power, among others.

Recent studies have highlighted the concept of supply chain governance (SCG) (Ruben et al. 2007; Zhang and Aramyan 2009) with a few studies combining SCG and IT. Bitran et al. (2006) argue that IT comes into play as an enabler and has led to fundamental changes in supply chain behavior and further to the changes in their governance. Ghosh and Fedorowicz (2008) pointed out that IT is used for coordination activities and information sharing among supply chain members, depending on the existence of a cohesive set of communications based on governance in the supply chain.

SCG is viewed as a more comprehensive construct, covering more elements and having a different viewpoint from ideas associated with SCM. Chen and Paulraj (2004) highlighted the need for examining the elements of SCG interactively to identify the benefits that are common in the supply chain, because too many studies analyze these elements in isolation (Gereffi et al. 2005; Fawcett et al. 2006; Veen-Dirks and Verdaasdonk 2009; Wathne and Heide 2004). In addition, Terpend et al. (2008) suggested the need for using multiple theories to explain the relationships between enterprises in the supply chain. According to Chen and Paulraj (2004), there are many critical elements necessary for succeeding in supply chain engagements. Moreover, it is necessary to analyze and think about how IT could be used in supply chain governance. Thus, in this theoretical essay we propose a conceptual model that explores the relationship between IT and SCG through the application of multiple theories of governance.

2 The governance theories

A significant portion of the literature on governance is focused on control and definition of roles in organizations. However, other theoretical approaches regarding governance could be used to enlarge understanding of the concept (Cornforth 2003). We present four such theories below.

Agency Theory addresses individuals’ motivations for maximizing utility in a principal-agent relationship within organizations. This relationship is characterized by a separation between ownership and control (Jensen and Meckling 1976). Agents as rational, utility maximizing actors are expected to have different interests from principals. Governance in an agent-principal relationship in organizational settings becomes a set of practices to ensure control of the acts of the managers in relation to the interests of the shareholders. The emphasis is on actions of compliance, designed to protect the interests of the owners, through managers’ assurance of control, rigorous transparency, and accountability (Cornforth 2003). An alternative approach to Agency Theory is Stewardship Theory (Barney 1990). In this theory, the shareholders and directors are seen as partners, with shared and
harmonious interests. Managers are not motivated by their own individual goals or even those of a single organization, but are aligned with the goals of other relevant organizations as well (Davis et al. 1997).

According to the Resource Dependence Theory, organizations rely heavily on their relationship with the external environment to survive (Pfeffer and Salancik 1978). Governance is, in this instance, a set of practices aimed at developing the relationship with the external environment in order to obtain all necessary information and resources that will ensure the survival of the organization. The primary function of companies is securing resources, maintaining relationships with stakeholders, extending boundaries, and creating relevant links with the external environment. It is crucial to consider each member’s ability and bring a relevant network of knowledge to the company.

With Transaction Cost Theory (TCT), the company is seen as a governance structure, serving as a mechanism to minimize transaction costs (Williamson 1979). Value is created from the development of different organizational forms that seek to minimize the adverse effects of bounded rationality and safeguard transactions against the exercise of opportunism on the part of those involved (Cornforth 2003).

3 Information technology in the supply chain

The integrated processes of management, necessary to improve operations in the supply chain, require an increase in the level of communication between the links in the supply chain. Applying IT becomes important because of its ability to support this increase in communication, which may result in enhancing trust, collaboration and commitment among members of the supply chain (Ghiassi and Spera 2003). Furthermore, IT can enable the integration of information as well as physical and financial flows between a company and its partners in the supply chain (Rai et al. 2006). There is an abundance of information systems in use to manage contracts (Bueren et al. 2004) that could reduce costs while improving agreement compliance control. The use of different technologies may be influenced by incentive schemes, including rewards, training and education for users (Gunasekaran and Ngai 2004).

Pereira (2009) discussed important aspects of using IT in the supply chain to better manage information, make the supply chain more flexible, and provide greater interconnectivity between informational and operational systems. Power dynamics is also considered an element in the supply chain, where the technologies used allow for the retention of some of the benefits deriving from the existence of that power (Subramani 2004). The use of IT has changed the patterns of coordination in the supply chain member companies, enhancing the ability to transfer information, provide incentives, and control the stages of the series of activities performed in the supply chain (Silva and Fischmann 1999). Some technologies, moreover, create encoding standards which must be negotiated and incorporated within the supply chain. Depending on the supply chain and the product, more complex transactions may result and it is necessary to be careful with the usage of these technologies.

Gunasekaran and Ngai (2004), emphasize the global long term benefit accruing to all parts of a supply chain as a result of collaboration and information sharing, highlighting the importance of the application of IT. IT, through its capacity to reduce fraud and error, can help to improve relations with suppliers by ensuring the quality of services and products provided as well as assuring that those services and products qualify to be included in the first place (Machado et al. 2004). The presence and quality of IT are also factors to be considered in assessing the capabilities of suppliers and potential suppliers, where facilities, equipment and labor are also taken into consideration (Correia 2002).

IT has a supporting role in relationships among suppliers, buyers, producers, and distributors, benefiting all participants (Mulligan and Gordon 2002). To Gereffi et al. (2005) the key issue in global-scale production is that coordination and control can be achieved without direct participation by individuals. For Chong et al. (2009) the IT tools bring efficiency benefits by reducing external transaction expenses with regard to the costs of internal coordination. Moreover, the technology provides a reduction in communication and transactional costs among the members of the supply chain and also can be used to achieve coordination and integration (Grandori and Soda 1995). Alternatively,
Park and Yun (2004) suggest that adoption of different IT may enable electronic transactions that seem to have increased the perceived vulnerability to opportunism.

4 Supply chain governance

It is important to differentiate SCM and SCG. SCM refers to the integration of all activities associated with the control, planning, processing and flow of goods and services from companies that supply raw material to the end user, including the flow of information internally and externally (Chen and Paulraj 2004). Besides the focus on integration and flow between the companies and the end customers, SCM focuses on operations and on efficiency related to the final customer (Ketchen and Hult 2007).

SCG analysis, on the other hand, expands upon that of SCM. It focuses on understanding different aspects supply chain engagement, giving less importance to the end customers and the material flow itself. It is worth noting that SCG does not ignore these aspects; it expands the analysis and the elements are treated together, because, in previous studies, these elements were analyzed in an isolated form (Chen and Paulraj 2004). However, there are several studies analyzing different conceptions of SCG: relational (Wathne and Heide 2004), transactional (Enderwick 2009; Liu et al. 2009) and contractual (Zhang and Aramyan 2009). Because these studies use different nomenclature related with each conception it is necessary to have studies that analyze these elements together and draw relationships with the conceptions in a concise way.

Our methodology for identifying SCG studies proceeded in three stages (Webster and Watson 2002; Melville et al. 2004). First, we identified a series of articles related to SCG through an extensive review of the literature in different databases (Emerald, Ebsco, ISI Web of Knowledge, and Science Direct) and Google Scholar (no time period constraint). We used the following keywords in the research: supply chain governance, governança da cadeia de suprimento, inter-organizational governance and governança interorganizacional. Second, we used citations of identified articles as further sources. Prior to the writing of this paper, 65 articles were found in Ebsco, 24 in Science Direct, 22 in Emerald, 13 in ISI Web of Knowledge and 8 in Google Scholar, for a total of 134 from 1999 to 2011. After eliminating editorials and executive briefings (8), as well as any articles that appeared in more than one of the databases (16), 110 articles about SCG remained. Others (33) were eliminated because the keywords appeared only in the references or just in items cited within the text. Note that this process excluded book chapters, working papers, and other articles not subjected to the peer-review process. So, the final sample is 77 articles published in several journals, such as Supply Chain Forum: an International Journal (6), Journal of Business Logistics (4), and, importantly, IJOPM (2) and JOM (2).

After identifying these articles, we used a concept-centric approach (Webster and Watson 2003). All papers were analyzed at least by two researchers of this study. We carried out a classification and identification of the elements and conceptions used in the papers and created a matrix with this data. The elements identified in this research literature that addressed the SCG were: capacity, transaction codification, collaboration, complexity of the transaction, commitment, trust, contracts, control, coordination, transaction cost, flexibility, incentives, integration, opportunism, power, qualification of suppliers and relationships (Fawcett et al. 2006; Gereffi et al. 2005; Ruben et al. 2007; Veen-Dirks and Verdaasdonk 2009; Wathne and Heide 2004; Zhang and Aramyan 2009). From this concept-centric approach we identified these concepts or elements studied by different authors and we elaborate a conceptual model presented in the next section.

5 A conceptual model based on theories of governance, SCG and IT

Having identified the theories of governance and the elements of SCG, we now present an integrated model that will provide a better basis upon which to analyze and group the elements of
SCG, and to understand how IT can support activities related to these elements (Figure 1).

Figure 1. Conceptual model of supply chain governance.

Different types of IT used in connection with the supply chain were identified: barcode, electronic data interchange (EDI), enterprise resource planning (ERP), e-procurement, radio-frequency identification (RFID), tracking systems, vendor managed inventory (VMI) and warehouse management systems (WMS). EDI is an inter-organizational system, which transmits standard business documents electronically between trading partners (Ratnasingam 2001). According to Akkermans et al. 2003, ERP as an umbrella term for integrated business software systems that power a corporate information structure providing the glue that binds management functions across geographic sites and complex heterogeneous networks. E-procurement to Ronchi et al. (2010) is the technology solution addressing the buying process by using the internet, implying a change in relationships with suppliers. VMI is a supply chain strategy where the vendor or supplier is given the responsibility of managing the customer’s stock (Disney and Towill 2003). Finally, WMS is a database driven computer application, which is used by logistics personnel to improve the efficiency of the warehouse (Shiau and Lee 2010). It is noteworthy that the same technology can be used for different purposes and may be associated with different governance in the supply chain.

5.1 Contractual Governance and IT

With agency theory we observe that in the context of the supply chain, the members have different interests. Contractual governance is a set of practices to ensure control and compliance among these members. Contracts are used as a way to provide service or product guarantees for firms and allow for monitoring compliance in work activities. The existing power is also crucial to ensure the control and structuring of contracts in order to satisfy the interests of different companies, sometimes using incentives to reach the goals. Systems such as WMS, ERP, e-procurement, EDI, barcodes, RFID and tracking systems can be used to accomplish and manage these activities and elements.

WMS is used to optimize the storage area, control customers’ activities, assets used and their costs (Liviu et al. 2009). ERP also allows companies to monitor and regulate more of their inventory, using contracts between suppliers to avoid problems of stock shortfall. According to Akkermans et al. (2003), ERP, through the structured information it generates, provides increased power for the company to control a wide range of activities (financial and inventory) as well as to control the shop floor.

Another technology used to help companies increase control of the processes of buying and selling is e-procurement, where reports can be produced with information pertaining to these processes and control expenditures (Ronchi et al. 2010). Furthermore, the use of incentives can reduce the misuse of these systems, for example, the use of phantom bids or unqualified providers (Yu et al. 2008). The
EDI trading partner agreement is a legally binding contract that outlines the litigation procedures and aims to provide day-to-day guidance on what trading partners are expected to do (Ratnasingam 2001). For instance, thanks to EDI automated warehouses, barcodes can help to control the productive actions and behaviors of subcontracting partners (Chassagnon and Baudry 2009). According to Markus and Jacobson (2010) when inter-organizational processes become larger in scope, encompassing more organizations or more organizational types, there is a need for complex combinations of personal and impersonal governance mechanisms to control and coordinate the activities. The use of RFID and barcode are helpful in this process.

Tracking systems allow companies to monitor and coordinate the transport used in the logistics chain between the members (McFarlane and Sheffi 2003). Also, transport companies can track and verify compliance with contracts signed between the participating member companies in the supply chain. The technologies used in supply chains or more formal contracts have as their focus controlling and regulating the stock, expenses and means of transport used by companies to deliver, purchase and sell products. This illustrates the important role of contracts in exercising the power to control these activities and to enforce compliance with what was agreed. Hence:

**Proposition 1a:** In contractual governance, IT are used for control and for structuring of contracts in order to satisfy the interests of different companies (Bueren et al. 2004; Ratnasingam 2001).

**Proposition 1b:** In contractual governance, IT are used to control activities and processes such as transportation, delivery and purchase (Akkermans et al. 2003; Liviu et al. 2009; Ronchi et al. 2010).

**Proposition 1c:** In contractual governance, IT are used for coordination and to enforce compliance with what was agreed in the contracts (Markus and Jacobson 2010; McFarlane and Sheffi 2003).

**Proposition 1d:** In contractual governance, IT are used to coordinate incentives, improve control and reducing the misuse of systems (Akkermans et al. 2003, Ronchi et al. 2010; Yu et al. 2008).

### 5.2 Transactional Governance and IT

In transactional governance, which is underpinned by Transaction Cost Theory (TCT), the company is seen as a governance structure, serving as a mechanism to minimize transaction costs. Value is created from the development of different organizational forms that seek to minimize the effects of bounded rationality and safeguard transactions against the exercise of opportunism on the part of those involved. Transaction costs are influenced and determined by complexity and transaction codification.

Some IT embody various positive affordances that allow for reducing the complexity of transactions and providing encoding standards that can reduce these transaction costs. These include EDI, VMI, RFID, barcode, ERP, WMS and e-procurement.

EDI provides a structured way of communicating and transferring information regarding purchase orders, sales orders, shipping and billing, providing a number of benefits such as cost reduction, reduction of uncertainty, quicker return, improved customer and supplier service (Gunasekaran and Ngai 2004). This IT helps companies that are members of the supply chain to reduce the complexity of these transactions because all information is standardized and easy to understand (Narayanan, Marucheck and Handfield 2009). It also helps to reduce opportunism by encoding the information so that data from purchasing, sales and billing cannot be changed or modified. VMI has been used to avoid waste and better manage inventory, helping companies to reduce costs through more precise control as well as minimizing their stock levels (Arora et al. 2010).

Although the initial investment in RFID is high compared to using barcodes, it has the advantage of facilitating the monitoring of goods, reducing the time and facilitating the processing of transactions. Therefore, with the prospect of costs declining in coming years (Fedorowicz et al. 2007), RFID can reduce the costs of transactions and increase the efficiency. ERP helps in reducing costs of operations
and transactions of companies through their integration, enabling a minimization of the total costs of
the systems used (Kelle and Akbulut 2005). Tracking systems also can reduce costs because they help
to follow the transactions from wholesale and spot markets to the end consumers (Rohracher 2009).

WMS is used to increase the efficiency of warehouses through cost cutting and recording of
transactions (Shiau and Lee 2010). E-procurement helps to decentralize the procurement process,
increases efficiency, helps businesses to obtain better quality information, reduces the risk /
uncertainty related to shipping, reduces transaction costs and administrative costs, allows the
realization of real-time bidding, decreases the opportunity cost of capital and allows transparent
procurement processes (Ronchi et al. 2010). Thus, these technologies, besides reducing transaction
costs between firms in the supply chain, reduces the possibility of opportunism by such organizations
as the use of IT creates an environment of transparency in the transactions made by companies.
Additionally, transactions conducted in real time reduce the possibility of any of the companies
participating in procurement operations and sales gaining advantage over others. Thus, in more
transactional supply chains, IT is used to: reduce the cost and complexity of transactions through the
reduction of losses and errors; increase information processing; minimize opportunism, decrease total
expenditures of the systems; and standardize shared information. Hence:

Proposition 2a. In transactional governance, information technologies are used to reduce costs
achieved through the reduction of losses and errors (Arora et al. 2010; Gunasekaran and Ngai 2004;
Fedorowicz et al. 2007).

Proposition 2b. In transactional governance, information technologies are used to reduce the
complexity of transactions through standardized information and ease of understanding (Narayanan,
Marucheck and Handfield 2009; Silva and Fischmann 1999).

Proposition 2c. In transactional governance, information technologies are used to minimize
opportunism (Park e Yun, 2004; Ronchi et al. 2010).

5.3 Relational Governance and IT

According to resource dependence theory, organizations rely heavily for their survival on the
relationship with the external environment, especially with the other parties in the supply chain and its
suppliers. In this context, governance is a set of practices to develop the relationship between the
organization and its environment in order to obtain all necessary information and resources that will
ensure the survival of the organization. It is noteworthy that IT plays a supporting role in ensuring that
relationships between members of the supply chain benefit all participants. Flexibility, quality of
suppliers and ability of companies to deal with environment members are important elements of
governance that strengthen these relationships among participants.

Stewardship theory postulates that the different members of the supply chain are viewed as partners, with
interests that are in harmony. To ensure that the members of the supply chain remain partners with
common interests and to increase supply chain performance, it is necessary that organizations trust each
other, are integrated, and compromise and collaborate. One way to establish these relationships is the
usage of different technologies, because they enable the establishment of these necessary elements. As
well, they facilitate communication between these companies, and can act as an integrator to manage the
interdependence within and among companies. We highlight usage of e-procurement, ERP, EDI and
VMI as important in relational governance based in this two last theories presented.

E-Procurement is used to put producers and suppliers in contact (Chang and Wong 2010) and for
providing a stronger relationship in the supply chains. A close relationship between businesses results
from trust, commitment, collaboration, qualification as a supplier, capacities, skills and abilities to use
technology; and it promotes survival of the enterprise, enabling increased competitive advantage
(Chang and Wong 2010). Information sharing is necessary in VMI, according to Angulo et al. (2004),
so trust and collaboration are essential elements. Thus, the relationship between companies that use this IT requires a link to make the available information reliable and accurate so that it can support effective decision-making. Webster (1995) highlights the usefulness of EDI in supporting collaboration and resolving conflict in a supply chain. ERP helps to control a range of activities, allowing flexibility to adapt in response to changes faced by the business (Akkermans et al. 2003). This type of system allows for a closer relationship between organizations through the integration of different business activities in the supply chain. Hence:

**Proposition 3a.** In relational governance, information technologies allow for a closer and trusting relationship among organizations (Angulo et al. 2004; Chang and Wong 2010).

**Proposition 3b.** In relational governance, information technologies are used to integrate different business activities of the supply chain (Akkermans et al. 2003; Rai et al. 2006).

**Proposition 3c.** In relational governance, information technologies are used to help in collaboration, through supplier flexibility, qualification of suppliers and supplier capacities (Angulo et al. 2004; Chang and Wong 2010; Webster 1995).

Table 1 summarizes the information provided above, showing the relation of IT to relational contractual and relational governance and its elements.

<table>
<thead>
<tr>
<th>IT Used</th>
<th>SCG conceptions and its elements</th>
<th>Contractual</th>
<th>Relational</th>
<th>Transactional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barcode</td>
<td>Control</td>
<td></td>
<td></td>
<td>transaction costs</td>
</tr>
<tr>
<td>EDI</td>
<td>Control and contracts</td>
<td>Collaboration</td>
<td></td>
<td>transaction costs, opportunism, complexity of the transaction and transaction codification</td>
</tr>
<tr>
<td>e-procurement</td>
<td>control and incentives</td>
<td>trust, commitment, collaboration, qualification and capabilities of suppliers</td>
<td>transaction costs and opportunism</td>
<td></td>
</tr>
<tr>
<td>ERP</td>
<td>contracts, control and power</td>
<td>flexibility, relationships and integration</td>
<td>transaction costs and transaction codification</td>
<td></td>
</tr>
<tr>
<td>RFID</td>
<td>control and coordination</td>
<td></td>
<td></td>
<td>transaction costs</td>
</tr>
<tr>
<td>Tracking Systems</td>
<td>contracts, control and coordination</td>
<td></td>
<td></td>
<td>transaction costs</td>
</tr>
<tr>
<td>VMI</td>
<td>contracts and control</td>
<td>trust, collaboration and relationship</td>
<td>transaction costs</td>
<td></td>
</tr>
<tr>
<td>WMS</td>
<td>contracts and control</td>
<td></td>
<td></td>
<td>transaction costs</td>
</tr>
</tbody>
</table>

Table 1. **Relationship among IT, SCG element and conceptions**

### 6 Discussion: implications to theory and practice

Different theories have been used to analyze the elements of SCG, advancing the discussion proposed by Terpend et al (2008), which suggested the need for using multiple theories to explain the relationships between enterprises in the supply chain.

A couple of theoretical points should be mentioned here. We proposed, in this essay, to use different theories to group the elements of SCG in order to provide a better understanding of the subject. Although there are points of convergence between the theories and elements used, the elements were treated separately and linked to different theories to better capture the differences between the concepts.

For example, there is a convergence between agency and transaction cost theories because they are part of a common theoretical family: institutional economics or organizational economics (Bakos and Kemerer 1992). Another example is that in some studies about contracts, relational aspects such as trust and collaboration are discussed (Poppo and Zenger 2002; Ritchie and Brindley 2007). In this paper, however, the elements have been grouped and associated with different theories to capture the nuances of these elements and provide a better understanding of the topic, as mentioned earlier.
Various components of SCG were treated jointly, increasing the understanding of the topic (SCG) and minimizing the deficiencies of previous studies (Chen and Paulraj 2004). There are several studies analyzing the way in which governance is present in the supply chain, but they do not cover all facets of this multidimensional phenomenon. For example, Wathne and Heide (2004) analyzed relational aspects; Ferguson et al. (2005) focused on contractual and relational elements; Enderwick (2009) studied more transactional issues; and Liu et al. (2009) the relational and transactional aspects. We observed that no study identified the analysis of governance in the three conceptions mentioned above; an objective accomplished in this essay.

Regarding the linkage of IT with different conceptions of SCG, it is noteworthy to point out that our analyses were conducted on the basis of previous work. The elements of each of the conceptions were analyzed and related to the benefits provided and activities performed by each technology. IT, one of the most important activities and processes in supply chains (Chong et al. 2009), was related to each element of SCG and how it could be used in the different SCG conceptions presented in this essay. We also advanced ten testable propositions that emerged in this study that could be used by companies to verify how these technologies works in practice.

Although several SCG conceptions exist, one usually predominates in each supply chain configuration. Therefore, the same IT may be related to more than one conception, depending on the one that is exerted between the supply chain companies and how IT is used in these relations, whether to support transactions, contracts, or controls. The different conceptions of SCG were related to the use of different types of IT. We identified how the same technology could be used for different purposes. We also identified theoretically that e-procurement, ERP and EDI could be used in all three conceptions of SCG.

Analyzing the more transactional supply chains, these three types of IT could help companies to reduce operational costs through shared information between supply chain members who use these technologies. They can also enable enhanced transparency in commercial activities between enterprises, especially those using e-procurement. It may be noted that the use of e-procurement can be more involved with contractual governance, where the focus is on controlling the activities of sales and purchases between companies. Moreover, the presence of a centralized database, using ERP and EDI allow for the coordination and control of all information relating to the company's operations. We also emphasize the use of VMI in supply chains where relational governance predominates, because there must be information sharing among organizations with a long term relationship.

We argue that the use of IT in the supply chain influences the classification of SCG conceptions. For example, according to Kelle and Akbulut (2005), the most important ERP tools and concepts which help in the supply chain are shared information and cost reduction, emphasizing elements of different SCG conceptions. Another important point is that in many cases two or three types of IT are used together. RFID, for example, is a powerful new technology which, in combination with others, offers great potential for supporting inter-organizational activities (Fedorowicz et al. 2007). According to Helo and Szekely (2005), ERP and WMS use may be complementary. (There are some instances of ERP which have WMS as one of their modules.) This combination of technologies allows companies to optimize the collection of data, storage and transport routes, and to offer tools to provide information to the supply chain companies that use these kinds of IT.

SCM includes components with a greater focus on operations and on efficiency related to the final customer (Ketchen and Hult 2007), framed as some form of process (Burgess, Singh and Koroglu, 2006). Thus it is necessary to observe usage of IT in the supply chain today beyond the operational aspects embracing a systemic, strategic and long-term view using a expanded approach that is SCG. IT should be used to help companies relate to different elements of SCG at the same time as achieving the benefits of SCG. For example, using ERP just to cut costs of transaction or control activities is related to SCM. However, a more extended use of this systems could help companies achieve additional proposes at same time. This would benefit the companies in supply chain and, with the support of senior management, the companies will use IT to help and achieve more robustSCG.
7 Conclusion

In this theoretical essay we proposed a conceptual model combining several governance theories, SCG conceptions, and types of IT. This conceptual model was based in different theories (agency, stewardship, resource dependence and transaction cost) advancing the discussion proposed by Terpend et al (2008). We presented and analysed different components of SCG.

The conceptual model and the discussion of it can hopefully be the first step in exploring ways to treat the subjects SCG and IT. It points out important aspects of the supply chain for which we can develop a better understanding. We considered which forms of IT were related to the three SCG governance conceptions (contractual, transactional and relational), after which we proposed ten propositions that could be used in future research.

For future research we propose to empirically test propositions presented in this essay, using firstly case studies in different companies within supply chains. Each proposition could be used to identify, more specifically, which IT is related to which forms of governance and how IT is used in the different conceptions. We can then compare the findings with what we presented theoretically in this essay. Subsequently, we hope to carry out a survey about what technologies within different conceptions are most used by companies. This will allow us to identify how these technologies are being used, how IT can support them, and how they are related to the conceptions of SCG.

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