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**Inter-Organizational Information Systems for Supply
Chain Management: Critical Success Factors**

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List of abbreviations and acronyms

B2B – Business-to-business

BPR – Business process reengineering

CPFR – Collaborative planning, forecasting and replenishment

EDI – Electronic data interchange

ERP – Enterprise resource planning

HR – Human resources

IOS – Inter-organizational information system

IS – Information system

IT – Information technology

JIT – Just-in-time

R&D – Research and development

RBV – Resource-based view

Sabre – Semi-automated business research environment

SC – Supply chain

SCM – Supply chain management

SET – Social exchange theory

TRV – The relational view

VAN – Value-added network

WWW – World wide web

XML – Extensible markup language

Abstract

Increased competition and market pressures have given rise to inter-organizational cooperation. Through aligning and combining resources and capabilities with business partners, mutual benefits can be gained and lead to competitive advantages. Recent and continuous advances in information technology vastly support such collaborative efforts.

This thesis attempts to merge two highly current research streams in respect to the above reasoning, namely supply chain management (SCM) and inter-organizational information systems (IOS). The purpose is to identify the success factors of an IOS deployment for SCM purposes related to the *inter-organizational* aspect of such a deployment. With a basis on a synthesis of relevant literatures on these two concepts, combined with social exchange theory (SET) and the relational view (TRV), a research model is developed. It postulates that the success of an IOS for SCM purposes is affected by five critical factors: *Long-term orientation, information-sharing, collaboration, integration of key business processes, and history of success.*

The model is evaluated through a literature review comprising a range of different scientific articles. The evaluation results in five pertinent propositions which suggest the following: (i) If the parties have a long-term orientation of their relationship; (ii) mutually share information on their business as well as operational and strategic information through the IOS; (iii) collaborate through mutually sharing risks and rewards, viewing each other as collaborators rather than competitors, and make relation-specific investments in connection to the IOS; (iv) integrate key business processes and carries out inter-organizational business process reengineering (BPR); and (v) have a history of successful interaction, the likeliness of success is greater. The managerial implications are that organizations should not oppose business relationships of collaborative character. Rather, through emphasizing and strengthening relationships organizations can develop a foundation highly appropriate for collaborative practices such as SCM, vastly supported by an IOS, which can foster competitive advantages.

1 Introduction

First in this chapter the background and motivation for the research is presented. Second, the research problem is clarified. Third, the organization of the rest of this thesis is set out.

1.1 Background and motivation

The nature of today's global competitive market has given rise to increased organizational cooperation in form of strategic alliances where organizations no longer compete in isolation, but as value chains. Globalization and increased market pressures lead organizations to enter into strategic partnerships with the overall goal of achieving a competitive advantage.

Through aligning resources and capabilities with business partners, mutual benefits can be gained in form of quality, time, and costs. The realization of such collaborative efforts requires integrated behavior, sharing of information, and appropriate management of business relationships. As a result, the concept of Supply Chain Management (SCM) has been flourishing the last decade. The objective of SCM is in short to coordinate activities between businesses across traditional organizational boundaries to improve the performance of the supply chain partners and the supply chain as a whole.

Another closely related concept which has been reaping increased attention the last decade is the role of information technology (IT) in inter-organizational business activities. The use of such inter-organizational information systems (IOS) has become central for business collaboration, and the different systems range from simple web portals to extensive integrated electronic networks. Recent and continuous advances in these technological solutions offer new ways to collaborate and compete inter-organizationally. And, in view of the fact that these technological solutions are becoming so common and easy to procure, organizations that are late in adopting such solutions might fall behind in the competitive environment of today's markets.

There is an interception between the two concepts of SCM and IOS. As Hannås (2007) notes, IOS are critical in managing operational and strategic activities between organizations as they can provide the supply chain partners with real-time, critical information of demand and supply data. Mabert and Venkataramanan (1998) take it even further by saying that

coordinated business activities, integrated behavior, and sharing of information between organizations requires the use of an IOS. Hence, IOS can be viewed as an essential enabler of effective management of the supply chain (i.e. SCM). However, the majority of IOS projects is costly and might even be the largest investment an organization goes through with ever (Sumner, 2005). The importance of ensuring the IOS's success is therefore unquestionably crucial. Research on the determinants of IOS success is, however, often technical and pay limited amount of attention to other factors that affect IOS success (Finnegan & Golden, 1996), or lack in producing consistent empirical findings as many of the issues are context-sensitive (Alshawaf & Khalil, 2008). Further, as of the rapidly changing and evolving technological solutions, research on IOS should be theoretical and thus not restricted to a certain technology (Robey, Im, & Wareham, 2008). In addition, research on SCM lag in exploring and documenting how IT affects its domain (Hannås, 2007). This thesis is therefore of conceptual nature and aims at integrating relevant research on the two research streams of SCM and IOS to identify the key inter-organizational determinants of an IOS's success when it is to be used for SCM purposes. Specifically, this thesis seeks to identify the critical success factors of inter-organizational nature of an IOS that is being deployed for enabling effective SCM.

1.2 Research problem

As mentioned in the introduction, there is a scarce amount of SCM literature on how IT affects the SCM concept (Hannås, 2007). Giunipero et al (2008) carried out a comprehensive study to develop a conceptual framework which could be used to identify gaps in the SCM literature and indicate in what direction future research should take. Their analysis comprised the nine most popular and well-known relevant academic journals within the field, and by drawing from a pool of 405 articles they identified a number of different subjects investigated within the SCM literature the last decade. Table 1 represents their findings in categories together with a short description, as well as a percentage. The percentage indicates how many articles that fall into the respective category between 1997 and 2006. In other words, the percentage indicates how much each of the categories and subjects has been studied within SCM literature since the concept started receiving academic attention.

Table 1: Subjects covered in the literature between 1997 and 2006 (Adopted and modified from Giunipero et al, 2008)

Category	Description	Percentage
SCM Strategy	Strategic alignment between the SC and the focal firm	23%
SCM Frameworks, Trends, and Challenges	Categorization of SCM Frameworks, Trends, and Challenges	18%
Alliances/Relationships	The relationship between the focal firm and its business partners	16%
E-commerce/WWW	The effect of E-commerce and the Internet on the supply chain	8%
Time-Based Strategies	Managing supply chain inventories and enhancing flexibility	6%
Information Technology	The use of information technology or systems in the supply chain	5%
Quality	Product and service quality output in the supply chain	5%
Supplier Development	Supplier Development, Selection and Management	4%
Environmental/Social Responsibility	Ethical, environmental and social responsibility concerns faced by organizations	3%
Outsourcing	Outsourcing the Supply Chain processes	3%
Buyer Behavior	Inter-firm behaviors and activities	2%
International/Global	Globalization of the supply chain	3%
HR Management	The process of establishing necessary reporting relationships between and among firms	2%

Studying Table 1 it is obvious that IT within SCM is not a well-researched topic. In addition, extant literatures on IT within SCM mainly describe and examine IT in a general sense. For instance, it is widely accepted that today's supply chains are complex networks of interdependent elements, and to optimize the chain, IT is required (Saeed, 2003; Attaran & Attaran, 2007; Morris, 2008). According to Klein, Rai, and Straub (2007) cooperative logistics relationships require the sharing of information which is enabled by IT. Further, the researchers argue that performance increases when parties share strategic information and customize IT. Sanders and Premus (2002) say that the philosophy of SCM is founded on collaboration among supply chain partners. For enabling this collaboration, large amounts of information must be shared along the supply chain. IT is the backbone of supply chain business structures, which is used to acquire, process, and transmit information among the parties for effective decision making. This is in line with Mabert and Venkataramanan (1998) who say that IT can be viewed as serving as an essential enabler of SCM activities. Hence, the

researchers concur that IT is essential, or more or less required, for managing the supply chain, but there is a lack of specificity and details.

Conversely, within the IOS literature little attention is on SCM. Even though SCM and IOS both emphasize the inter-relationships and connections between organizations, IOS research lacks in studying *more than two* types of actors (e.g. where SCM incorporates the supply chain in its whole comprising a customer's customer and a supplier's supplier). The unit of analysis is generally the relationship between two businesses (B2B), or between a buyer and a supplier (e.g. Bensaou, 1997; Fearon and Philip, 1999; Makido, Kimura, & Mourdoukoutas, 2003).

While literature within the field of IOS is limited in taking into account the supply chain as a whole, literature within SCM is limited in how IOS can and should be used to enable and facilitate the large degree of information-sharing, integrated behavior, and tight collaboration necessary for effective SCM. Thus, there is a lack of knowledge within the interception between SCM and IOS where the two research streams are combined or merged to posit how IOS can affect, enable, or support effective SCM.

With a basis on the above reasoning, the research problem of this thesis is to merge the research streams of SCM and IOS to identify the critical factors affecting the success of an IOS being deployed for SCM purposes. To accomplish this, two questions need to be answered:

- *What are the necessary activities for effective SCM?*
- *What are the inter-organizational critical success factors of an IOS deployment?*

1.3 Organization of thesis

The remainder of this thesis is organized as follows: Chapter 2 presents the theoretical framework, constituted by the concept of supply chain management (SCM), social exchange theory (SET), and the relational view (TRV). Chapter 3 clarifies the concept of inter-organizational information systems (IOS). Chapter 4 presents and explains the research model which is a result of a synthesis of relevant literature within the SCM and IOS domains combined with TRV and SET, everything in respect to the research problem. Chapter 5 is a

discussion of the research design revealing that the most appropriate research method for the research problem is of a qualitative explorative nature. Specifically, the research method to be used is a literature review, which is carried out in chapter 6. Chapter 7 is a discussion and analysis of the findings. Chapter 8 is the final chapter and constitutes a conclusion, including a short summary of the findings and discussion on the managerial implications. The chapter ends with a section for limitations and suggestions for future research.

2 Theoretical framework

In this chapter the theoretical framework relevant to the research problem is developed. First, the concept of supply chain management (SCM) is explained and elaborated as it gives a comprehensive explanation and understanding in how inter-organizational cooperation as value chains can and should function to be effective and efficient. Furthermore, two theoretical viewpoints are adopted to explain inter-organizational relations. First, social exchange theory (SET) is included in the theoretical framework as it provides a straightforward and valuable theoretical explanation of how inter-organizational relationships are developed and maintained. Second, the relational view (TRV) is included as it has proven to stand as a solid theoretical contribution in explaining superior inter-organizational performance. Incorporating SET and TRV should help in answering the research problem as they give valuable insight and support in explaining inter-organizational relations and how these can be managed to become a source of a competitive advantage.

2.1 Supply Chain Management

This section explains the concept of SCM. First, a short introduction and relevant definitions is presented. Next, the characteristics of SCM are clarified. Last, it is shown that effective SCM can be constituted through a set of activities.

2.1.1 Introduction and definitions

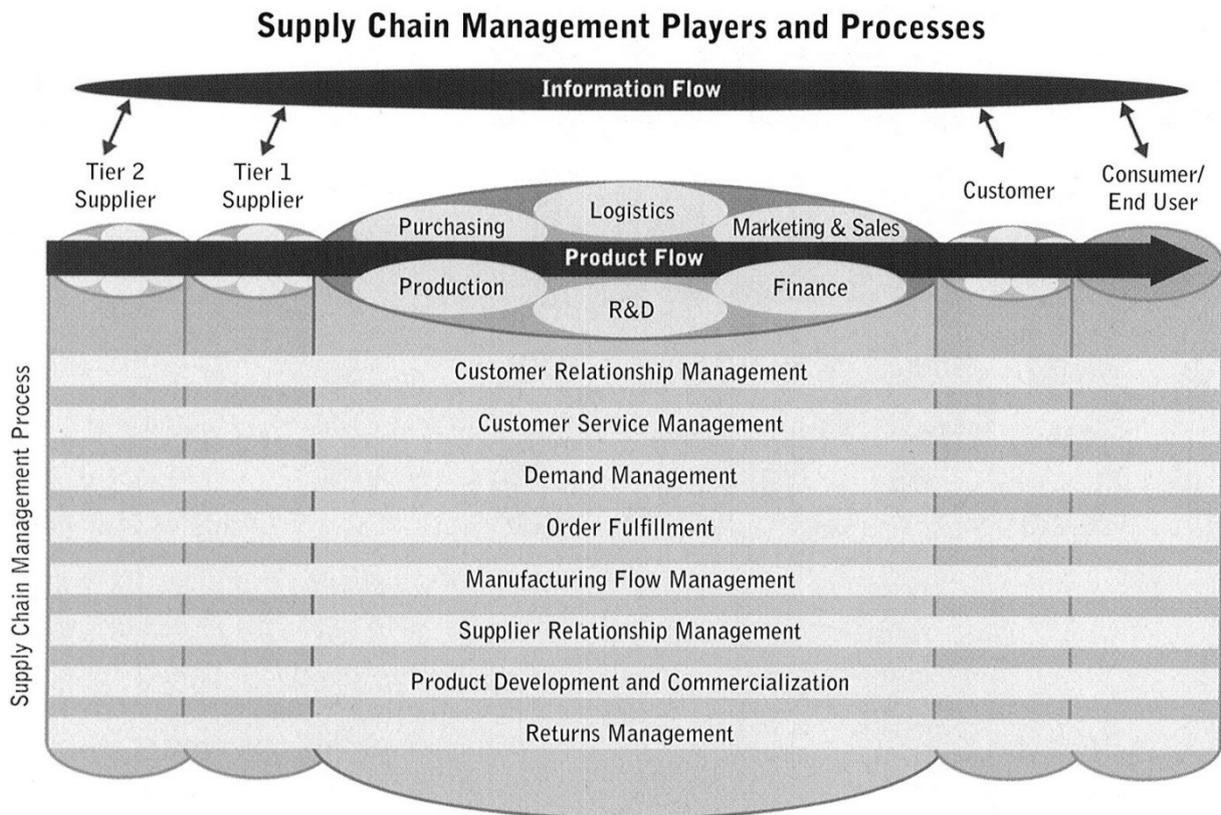
The concept of SCM is relatively new. However, as early as Forrester (1961) the concept was introduced when he suggested that the success of industrial organizations was dependent on the interactions between flows of information, materials, manpower, and capital equipment. The term SCM was coined some decades later by Oliver and Webber (1982), but there were little research in the field up until late 1990s. In 1997 the concept started to receive attention and research was carried out (Lambert, Cooper, & Pagh, 1998). Nonetheless, the articles which were published dealt primarily with definitions and the research were almost solely at a conceptual level.

Lambert et al (1998) sought to further develop the understanding of the concept SCM. They argued that businesses no longer compete in isolation or independently, but as supply chains.

However, the term “chain” can be misunderstood. It is not referred to as a chain of businesses with one-to-one, business-to-business relationship, but as a network of multiple businesses and relationships. In this sense, SCM is a way of managing business and relationships with other members of the supply chain in the context of total business process excellence. But as the researchers point out: *“It is a lot easier to write a definition of logistics or supply chain management than it is to implement that definition”* (Lambert et al, 1998, p. 3). The researchers conclude that the structure of activities and processes within and between organizations is vital for creating superior competitiveness and profitability, and that successful SCM requires integrating business processes with key members of the supply chain.

After a lot of buzz with definitions and confusion regarding separation of the terms logistics and supply chain management (Quinn, 1997), the concept of services was added within the concept of SCM. Ellram, Tate, and Billington (2004) argued that the significance of services is large and growing, and attention should be paid correspondingly by practitioners as well as theorists. They argue that SCM is not only including the flow of tangible products and materials, which might be a common misinterpretation, but also intangible in form of services such as healthcare, entertainment, finance, insurance and consulting. Figure 1 illustrates a simplified supply chain network structure with its appurtenant information flow, products flow, and the eight core supply chain business processes.

Figure 1: Supply Chain Management (Lambert et al, 1998, p. 2)



The definition of SCM in this paper is as follows, and is put forward by Mentzer, DeWitt, Keebler, Min, Nix, Smith, and Zacharia (2001, p.18):

“The systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within a supply chain, for the purpose of improving the long-term performance of the individual companies and the supply chain as a whole.”

Defining SCM this way has four implications (Giunipero et al, 2008):

- A supply chain is defined as a set of three or more entities which is directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer
- This implies that SCM activities should include integration, both with suppliers and customers
- The organizations should share information, risks and rewards, as well as cooperate on activities performed within the chain

- Effective management of a supply chain involves active participation in the building and maintenance of long-term relationships within the chain

2.1.2 Characteristics

According to Mentzer et al (2001) SCM is often regarded as a management philosophy. SCM has a system approach that extends the concept of business partnerships into a multidisciplinary effort to manage the supply chain. Thus, according to SCM, each organization in the supply chain directly and indirectly affects the performance of all the other members of the supply chain, as well as the overall supply chain performance. Further, SCM as a philosophy strives to synchronize and coordinate intra- and inter-organizational operational and strategic capabilities into a mutual unified force. The focus of SCM is on the customer, and all those elements that can enhance customer value.

Based upon their literature review, Mentzer et al (2001) propose the following characteristics of SCM:

- A systems approach viewing the supply chain as a whole, and managing the total flow of goods from the supplier to the customer
- A strategic orientation with cooperative efforts to synchronize and converge intra- and inter-organizational operational and strategic capabilities into a unified whole
- A customer focus to create unique sources of customer value

2.1.3 SCM as a set of activities

While SCM might be regarded as a philosophy, Mentzer et al (2001) found that many researchers focus on a set of different activities that constitute SCM. It is activities which range from integrated behavior to the building and maintenance of long-term relationships, and it is argued that these activities must be performed by the supply chain members in order to achieve effective SCM. The activities are *integrated behavior, mutually sharing information, mutually sharing risks and rewards, cooperation, the same goal and the same focus on serving customers, integration of key business processes, and build and maintain long-term relationships*. These activities are naturally closely related and might overlap in

certain matters, but the interpretation and understanding of the terms will be clarified and elaborated below.

2.1.3.1 Integrated behavior

The information revolution and increased global competition enhances integrated behavior between organizations. To remain competitive in today's environment, the ability to succeed in SCM through integration is critical (Lambert et al, 1998). Bowersox and Closs (1996) argued that organizations must expand their integrated behavior to incorporate both customers and suppliers. This external integration is the essence of SCM according to the researchers. The integrated behavior is in fact the activity of incorporating the whole supply chain, rather than focusing on intra-organizational operations by viewing its organization in isolation.

2.1.3.2 Mutually sharing information

Kakabadse, Kouzmin, and Kakabadse (2001) state that the terms *information* and *knowledge* often are used interchangeably within the academic literature and that there are a great number of varying definitions. Knowledge is, however, broadly speaking, organized reasoning about information. Thus is knowledge something that stems from information, and the concept of information-sharing is consequently covering the concept of knowledge-sharing.

Effective SCM requires the sharing of large amounts of information. The information should be mutually shared among the supply chain members with the overall goal of enhancing the performance of one or more of the participants. The information to be shared is strategic and tactical data like inventory levels, forecasts, business strategies, and knowledge. Sharing this kind of information has proven to reduce uncertainty between supply chain partners and consequently enhanced performance (Mentzer et al, 2001).

Harrison and van Hoek (2005) refer to information-sharing as an activity where business partners are given access to a system that has shared information on it. The information may describe product descriptions, pricing, promotional calendars, inventory levels, and shipment tracking and tracing. Sharing this kind of information will reduce uncertainty because each of

the partners is becoming aware of the others' activities. This is empirically supported by Cheng and Wu (2005) who find that the degree of information sharing is positively correlated with lower inventory levels and costs.

According to Li, Yan, Wang, and Xia (2005) information sharing is indeed valuable in a supply chain, and can include e.g. inventory levels, production plans, sales information, demand forecasts, production quality data, and production capacities. They argue that the information can be shared in partial or complete states, and that potential benefits are greater with the amount of information shared. Amplification in demand from customer to factory, the so-called bullwhip effect, is one type of problem which is known to be reduced by larger amounts of information shared (Chatfield, Kim, Harrison, & Hayya, 2004).

Kulp, Lee, and Ofek (2004) explain information-sharing as an activity where the parties in a supply chain exchange data about demand, inventory levels, and customer needs – stemming from consumer research and providing the manufacturer with information about how customers' preferences are changing. Also included in the information-sharing activity is the sharing of results on research and development (e.g. new ideas regarding product development and design or new services).

In sum, information-sharing is an essential activity to enable effective SCM. Sharing of strategic and operational information may posit advantages like lower inventory levels, reduced operating costs, less stock-outs, and innovation. However, as Kulp et al (2004) state, information-sharing may have given organizations a competitive advantage in the early 90s, but it is not alone a source of competitive advantage today. The need to couple information-sharing with collaboration efforts is emphasized. The researchers conclude that the interplay between activities like information-sharing and integration is a winning proposition for members of a supply chain if implemented correctly.

2.1.3.3 Mutually sharing risks and rewards

The next activity is proposed by several researchers as a necessity for achieving effective SCM. Effective SCM requires that organizations mutually share risks as well as rewards (Cooper & Ellram, 1993; Cooper, Lambert, & Pagh, 1997; Tyndall, Gopal, Partsch, &

Kamauff, 1998). This mutual sharing is important for obtaining and maintaining a long-term focus and cooperation between the supply chain members. The principle of solidarity within the supply chain for the overall effectiveness and competitiveness is emphasized. Business partners that seek a close strategic relationship should participate in this mutual effort.

2.1.3.4 Cooperation

Mentzer et al (2001) and Giunipero et al (2008) have a common understanding of cooperation within a supply chain. Cooperation among the supply chain members is a required activity for effective SCM (Du, 2007; Attaran & Attaran, 2007; Simatupang & Sridharan, 2005).

Cooperation refers to similar or complementary, coordinated activities carried out by organizations in a supply chain with the intention to produce superior mutual or singular outcomes. Cooperation is not limited to the needs of a current effort, department or organization, but can involve multiple efforts in a larger picture at all management levels between several organizations. Cooperation efforts in a supply chain are e.g. joint planning and evaluation, joint product development and design, joint research and development, and alignment of business strategies.

2.1.3.5 The same goal and the same focus on serving customers

According to La Londe and Masters (1994), SCM can be successful if all the members of the supply chain have the same goal and the same focus on serving customers. This is a form of policy integration, which is possible if there are compatible cultures and management techniques among the supply chain members (Mentzer et al, 2001). In addition, Lassar and Zinn (1995) propose that successful supply chain relationships aim to integrate supply chain policy to avoid redundancy and overlap, while seeking a form of cooperation that allows the participants to be more effective. This activity is similar to the mutual sharing of risks and rewards, and underpins the long-term solidarity focus which is required to achieve effective SCM.

2.1.3.6 Integration of key business processes

As mentioned earlier, SCM focuses on the integration of all key business processes across the supply chain (Lambert et al, 1997). Zailani and Rajagopal (2005) state that the goal of

integrating operations between manufacturers, suppliers, and customers is to create and coordinate processes seamlessly across the supply chain in a way that is not easily matched by competitors.

According to Lambert and Cooper (2000), business process integration and supply chain integration involve collaborative work between buyers and suppliers, common systems, and shared information. Kim (2006) further elaborates the supply chain integration concept by saying that this kind of integration can be achieved through efficiently linking the various supply chain activities, and having them subject to the effective construction and utilization of various supply chain practices for an integrated supply chain. In other words, an organization that is pursuing in SCM practices must pay attention to and attend in supply chain integration efforts. An organization does not operate in isolation, and to achieve the potential benefits of effective SCM, there is a need for internal cross-functional integration within an organization and external integration with suppliers and customers. The idea of a cross-functional team with staff from various departments and multiple organizations as integration efforts is also supported by Lambert (2004). He states that a cross-functional team should be responsible for the development of procedures and processes at a strategic level and the implementation of them. The team should also work with identifying how external partners can and should be integrated in the chain.

Donk, Akkerman, and Vaart (2008) relate integration to such activities as vendor-managed inventories, packaging customization, joint planning and forecasting, dedicated planners, use of inter-organizational planning systems, and use of point of sale data. They argue that the more complex business activities, which usually is the case with effective SCM efforts, the more need for integration. They state that high level of integration typically requires close cooperation, daily communication and joint problem solving. While the researchers identify some barriers towards supply chain integration, like lack of coordination and information-sharing, they concur with Kim (2006) who clearly states that the potential benefits of supply chain integration can no longer be ignored. This is also supported by Lee and Whang (2001), who investigate the concept of supply chain integration and list a number of benefits incurring from successful supply chain integration, which is summarized into reduced costs, increased flexibility, and faster response times. In addition, Zailani and Rajagopal (2005) argue that the

concept of integration stems from the process reengineering literature which has proven to be a successful way to a competitive advantage.

In sum, integration in a supply chain is clearly a required activity which every relevant actor must take part in to achieve effective SCM. This is also straightforwardly in line with the definition of SCM by several researchers (La Londe & Masters, 1994; Cooper et al, 1997; Monczka, Trent, & Handfield, 1998).

2.1.3.7 Build and maintain long-term relationships

Several researchers emphasize the importance of having a long-term focus. The long-term focus should also be present when considering supply chain relationships. Ideally, the relationship's time horizon should exceed the actual life of the formal contract (Cooper et al, 1997). According to Ellram and Cooper (1990), effective SCM is made up of a series of partnerships and SCM thus requires the supply chain partners to engage in the building and maintenance of long-term relationships. Langley and Holcomb (1992) argue that forming strategic alliances with supply chain partners (e.g. suppliers, customers, intermediaries) can enhance customer value and thus provide the supply chain with a competitive advantage.

2.2 Inter-organizational relations

One of the main premises of SCM is that organizations now compete as chains or networks rather than alone. Social exchange theory (SET) and the relational view (TRV) are two theoretical explanations of relational behavior and how inter-organizational aspects can breed a competitive advantage. The theories are grounded, well-known, and provide valuable insight into the research problem. In addition, they will give support in the development of the research model as well as the later analysis.

2.2.1 Social exchange theory

SET has been used by academicians within a number of different research fields. The theory has its roots in anthropology, sociology, social psychology, behavior psychology, philosophy, as well as economics. It is one of the oldest theories of human social behavior, and is

consequently a mature, well-known, and grounded theory (Lambe, Wittmann, & Spekman, 2001). Lambe et al (2001) argue that one of the main reasons why SET has received increased attention within fields such as marketing the last decades, is because the theory of transaction cost economics is considered to be “*limited in its capacity to explain exchange governance in exchange relationship in which the partners are able to develop relationship-based governance over time*” (Lambe et al, 2001, p. 3). The researchers thus challenge transaction cost economics’ assumption of universal opportunism (Heide & John, 1992; Morgan & Hunt, 1994). Moreover, transaction cost economics has been criticized for having operational weaknesses (e.g. difficulty of measuring transactions costs), lack in empirical evidence that support the assessment of its guidelines, fail to take into account personal and psychological factors, and is inadequate in explaining long-term orientation in exchange (Jarillo, 1988; Joshi & Stump, 1999; Wulf & Odekerken-Schröder, 2001). Furthermore, research has shown that norms and personal relations can be an effective means of governance in opposition to contracts (Dwyer, Schurr, & Oh, 1987).

Within SET, any interaction between individuals is considered as an exchange of resources. The resources exchanged are not only tangible, but also intangible such as social amenities, friendship, emotional satisfaction, spiritual values, pursuit of personal advantage, humanitarian ideals (Lambe et al, 2001). The basic premise of SET is that parties enter and maintain relationships with the expectation that doing so in some way will be rewarded (Blau, 1964). Griffith, Harvey, and Lusch (2006) describe this main assumption as that individuals and corporate groups interact for reward or with the expectation of a reward from their interaction with others. Further, SET implies that a basic motivation for interaction is the seeking of rewards or avoidance of punishments. The premise of maintenance of the relationship is explained by Thibaut and Kelly (1959) through their concept of CL and CL_{alt}. Here, CL represents the level of benefits, social and economic, spurring from the active relationship. CL is then constantly compared to the best alternative relationship, CL_{alt}. The active relationship, CL, is then maintained as long as the benefits incurring from it is greater than the potential benefits from the alternative relationship, CL_{alt}.

In applying SET within the supply chain management context, Griffith et al (2006) provide the following example: A supplier makes a contribution to its distributor via its supply chain management policies. With this contribution, the supplier expects some form of positive

contribution in return at a later time. When the distributor receives and acknowledges the contribution as valuable, it develops a sense of obligation and reciprocates with appropriate attitudinal and behavioral responses.

Lambe et al (2001), propose the following four foundational principles of SET:

1. Exchange interaction results in economic and social outcomes
2. Economic and social outcomes are compared to alternatives
3. Positive outcomes over time increases trust and commitment
4. Positive outcomes over time produces relational exchange norms

The interpretation is the following: SET views exchange as a social behavior that may result in both economic and social outcomes. Individuals enter into new relationships and maintain them because they expect some reward from it. The social or economic outcomes, or both, are compared against available alternatives. As long as the outcome (i.e. benefits minus costs) is greater than the potential outcome of the alternatives, the relationship will remain. Then, when providing another with a benefit, one must trust that the other will return that benefit. And, “*the mutual reciprocation of beneficial action over time through multiple interactions creates trust*” (Lambe et al, 2001, p. 10). Commitment results from the casual relationship with trust, which results from the principle of generalized reciprocity. Finally, positive outcomes over time produce norms between the parties. These are explicitly or implicitly mutually agreed upon rules of behavior, which is developed over time within the relationships.

In sum, SET is a theory which emphasizes the relationship between organizations and states that the creation and maintenance of these business relationships is determined by the perceived outcomes from it from every participating organization. Trust and commitment, as well as relational norms, are developed over time within the relationship.

2.2.2 The relational view

Dyer and Singh (1998) in their paper, “The relational view: Cooperative strategy and sources of interorganizational competitive advantage” outline a theory for considering dyads or

networks of organizations as key units of analysis for explaining superior individual organizational performance. It is an alternative theory to two prominent views which has dominated since the 80s; the *industry structure view* and the *resource-based view* (RBV). The industry structure view is best associated with Porter (1980) and states that supernormal returns are first and foremost a function of an organization's membership in an industry with favorable structural characteristics. These are for instance characteristics like relative bargaining power and barriers to entry. As a consequence, researchers adopting this view have been focusing on the industry for explaining why organizations differ in performance. RBV, on the other hand, put focus on the organizations and its resources. Some organizations perform higher because of heterogeneity rather than industry structure. Specifically, organizations that are able to obtain and secure resources and capabilities that are rare, valuable, non-substitutable, and hard to imitate will achieve a competitive advantage (Wernerfelt, 1984; Barney, 1991; Rumelt, 1991). Thus, extant RBV theory has been focusing on the organization as the primary unit of analysis and those resources housed *within* the organization.

What Dyer and Singh (1998) did was to propose a theory which state that an organization's critical resources may cross organizational boundaries and may be embedded in inter-organizational resources and routines. Thus, the idiosyncratic inter-organizational linkages may be a source of relational rents and competitive advantage. Relational rents are defined as above-normal returns which cannot be achieved in isolation, but through joint contributions of the partners. The theory explains interorganizational competitive advantage through four potential sources: (i) *relation-specific assets* (ii) *knowledge-sharing routines*, (iii) *complementary resources endowments*, and (iv) *effective governance*.

Relation-specific assets are defined as assets, e.g. production facilities, tools, and knowledge, deployed by two or more organizations in a relationship. Knowledge-sharing routines are defined as “*a regular pattern of interfirm interactions that permits the transfer, recombination, or creation of specialized knowledge*” (ibid, p. 665). Complementary resource endowments are defined as “*distinctive resources of alliance partners that collectively generate greater rents than the sum of those obtained from the individual endowments of each partner*” (ibid, p. 666). Effective governance is defined as third-party enforcement of

agreements, or self-enforcing agreements, which lower transactions costs or providing incentives for value-creation initiatives.

According to TRV, the four sources of inter-organizational competitive advantage are:

- *Relation-specific assets*: The greater the alliance partners' investment is in relation-specific assets, the greater the potential will be for relational rents
- *Knowledge-sharing routines*: The greater the alliance partners' investment is in inter-organizational knowledge-sharing routines, the greater the potential will be for relational rents
- *Complementary resources endowments*: The greater the proportion is of synergy-sensitive resources owned by alliance partners that, when combined, increase the degree to which the resources are valuable, rare, and difficult to imitate, the greater the potential will be to general relational rents
- *Effective governance*: The greater the alliance partners' ability is to align transactions with governance structures in a discriminating (transaction cost minimizing and value maximizing) way, the greater the potential will be for relational rents

An example of how TRV differs from RBV is that of knowledge-sharing. According to RBV, an organization should attempt to protect, rather than share, valuable knowledge to prevent knowledge spillovers, which could weaken its competitive advantage. According to TRV, however, an organization should systematically share valuable knowledge with partners in return for access to valuable knowledge which reside within its alliance partners. The organization must willingly accept some spillover to competitors, but this strategy makes sense only when the expected value of the in-flows of knowledge is greater than the expected loss due to knowledge spillovers.

Another example is that of number of business partners. TRV suggests that organizations can increase its profits by increasing its dependence on a smaller number of suppliers. The incentives of suppliers to share knowledge and make relation-specific investments will as a consequence increase, and thus generate above normal returns. By committing to a small number of partners, the organization can guarantee them greater ex post bargaining power and

therefore greater ex ante incentives to make investments in R&D, responsiveness, and information-sharing.

In sum, TRV takes the relationship between a pair or a network of organizations as the unit of analysis and state that it is the relationship between them that determine their competitive advantage. The organizations can achieve above-normal returns through joint relation-specific investments, knowledge-sharing, resource endowments, and effective governance.

3 Inter-Organizational Information Systems

This chapter describes the use of information systems between organizations. Specifically, the concept of inter-organizational information systems (IOS) is elaborated. The chapter starts by providing a short introduction together with relevant definitions of IOS. Second, different forms of IOS are categorized. Third, a general literature review within the IOS domain is conducted, identifying what kind of area and focus which are interesting and relevant within the IOS literature in respect to the research problem. Forth, research on IOS success factors is examined. Last, a few practical and well-known IOS success projects are presented.

3.1 Introduction and definitions

Information technology has without a doubt taken a central part of an organization's daily business activities. The use of IT is, however, not limited to intra-organizational operations. In modern inter-organizational operations the use of inter-organizational information systems is increasing and widespread in various forms. This usage varies from simple exchange of information to close collaboration in form of private and integrated electronic networks between business partners.

The distinction between information systems (IS) and information technology (IT) is unclear and the terms are often used interchangeably both within academic research and by practitioners. In this thesis the following definitions will be used (Hannås, 2007, p. 6):

“IS are a set of inter-related components, such as people, software, hardware, and databases, which work together to store, process and distribute control within and between organizations.” As such, IS are used to support decision-making, coordination, and control within and between organizations.

“IT is the mechanism that facilitates the activities of gathering and processing data and disseminating information to users.” Hence, IT can be considered as a subset of IS, where the focus within IT is on the technology aspect, and the scope of IS refers not only to technology, but also includes how technology is applied and managed to contribute to the business. In this thesis the focus is on the concept of (IOS) which is defined as:

“Digital information systems used across firms, whereby IT is an implicit part and thus plays a significant role.”

3.2 Categorization and characteristics

In this section IOS will be categorized together with descriptions of the different characteristics such a system could have. First, the different historical phases of IOS development will be described, showing that the development can be divided into four different phases. Next, based on these phases, IOS will be categorized into three types: *elementary*, *intermediate*, and *advanced*. These types will be presented together with characteristics based on technology, use, and partner factors. Last, the four different functional structures an IOS can have are described.

3.2.1 Phases

In terms of historical IS development, IOS can be categorized into four phases (Shore, 2001; Williamson, 2007). Phase one is *manual systems*, phase two is *electronic data interchange systems*, phase three is *enterprise resource planning systems*, and phase four is *internet-enabled systems*. The four phases will be described below including a description of the appurtenant technologies and is primarily based on the work of Williamson (2007).

Phase one: Manual systems

This is the phase where paper documents are used, such as purchase orders, bills, and invoices. The information processing is manual, and therefore IT plays no or an insignificant part to these systems. The disadvantages of this phase are obvious – e.g. time-consuming procedures, manual errors, expensive maintenance, and inaccuracy. These systems are still in use in some organizations, mainly due to lack of expertise, resources, or other organizational or environmental pressures (Papazoglou & Ribbers, 2006).

Phase two: Electronic data interchange systems

Electronic data interchange systems (EDI) was developed in the 1980s and had a dramatic effect on the automation of large flows of information and data, and consequently eliminated many business processes that demanded a large amount of resources in form of time, money, and labor. Paper documents were replaced by electronic transmission of information between computers, and EDI became the main electronic trading technology in use in many sectors.

However, there were some barriers to EDI implementation. Early EDI systems used value added networks (VAN), which are a service on public networks made available by subscription. The VAN provides organizations with data communication facilities, and is normally controlled by one organization. As such, the controlling organization is totally responsible for managing the network, including data conversion between different systems. Consequently, VANs were expensive to implement and limited EDI use to the larger organizations.

A second generation of EDI technology, internet EDI, helped in overcoming some of the disadvantages and barriers associated with the early EDI systems. Now, organizations became able to use existing EDI systems through Extensible Markup Language (XML). The organizations could transfer information over Internet rather than using subscription to a VAN, and consequently entry costs and telecommunication costs are minimized. Maybe the most advantageous part of the EDI technology compared to earlier technologies is the possibility of transferring information in real-time.

In the third stage of EDI in the mid 1990s, the technology was further developed, and now the users were given access to selected parts of the alliance partners' production and delivery schedules. The results were tighter collaboration and more integration (Laudon & Traver, 2008). Today, EDI is viewed as an enabling technology that facilitates the exchange of business information between organizations in real-time.

Phase three: Enterprise resource planning systems

The phase where Enterprise resource planning (ERP) systems made its entry represents a more integrated IS approach. ERP systems integrate and coordinate operations across the organization. The ERP system can assist in controlling business activities such as sales, delivery, billing, production, inventory management, and human resource management (Williamson, 2007). With an ERP system in place, orders from customers are translated into bill of material, production schedules, and human resource and financial requirements, including notifying the finance department to issue invoices to customers and pay suppliers (Laudon & Traver, 2008).

The reach of an ERP system can be extended to include partners within the supply chain. This is carried out through SCM software transferred onto the new integrated system (Williamson, 2007). However, ERP systems were not originally designed to coordinate the large degree of information flow between a large set of supply chain partners. This would require expensive modification, and ERP is not likely to be used as a solely enterprise-wide system (Laudon & Traver, 2008).

Phase four: Internet-enabled Systems

Phase four is the phase where the Internet is the enabling factor for the new systems. Integration of information resources is enabled by the use of web development technologies such as XML and Java, which allows business partners to integrate their information resources. These systems also provide platforms for communication in a fast and reliable manner between business partners, regardless of physical barriers (Bandyo-padhyay, 2002).

The applications and information mechanisms available in this phase is many. For managers deploying SCM there are virtual auctions, purchasing groups, electronic agents, electronic market places, SCM systems, and so forth. These examples are online supply chains which enables the sharing of real-time information through XML, such as prices, production plans, strategic plans, and delivery information. The use is e.g. conduction of a business transaction, purchasing, and information-sharing to coordinate the flow after the purchase has taken place. These are collaborative mechanisms that are a part of the collaborative planning, forecasting and replenishment (CPFR) initiative, which goal is to closely integrate the business partners (Williamson, 2007).

Some of the problems that need to be addressed using such systems are choosing the appropriate level of integration with the different business partners, deploying business process change, and sharing the suitable level of information with the partners (Garcia-Dastugue & Lambert, 2003). Nonetheless, the Internet is today the main networking platform in use by organizations of all sizes in the upstream, downstream, and internal supply chain.

3.2.2 Types of IOS

Based on the preceding phases, Williamson (2007) developed a categorization of IOS into three different types: Elementary, intermediate, and advanced. These types were identified based on characteristics of technology, use, and partner factors. The types correspond with Harrison and van Hoek's (2005) transaction, information-sharing, and collaborative views on IOS. However, Williamson's (2007) typology is chosen for use in this thesis. Table 2 below presents the types and characteristics of IOS.

Table 2: IOS types and characteristics (Adopted from Williamson, 2007)

Type of IOS	Characteristics		
	Technology	Use	Partner factors
<i>Elementary</i>	<ul style="list-style-type: none"> - Many different IS in use (including EDI and 3rd party networks) - No/little internal systems integration - Technology seen as an operational tool, rather than as a key strategic component 	<ul style="list-style-type: none"> - Transactions only - Limited information communication and coordination - Collaboration at operational level 	<ul style="list-style-type: none"> - Organizations may be working towards their own agenda and for their own benefit - Trust exists, but is limited by the nature of the IOS - Partner collaboration is weak
<i>Intermediate</i>	<ul style="list-style-type: none"> - More than one IOS are used, but internal integration between IS gives integrated data flows - Role of technology moves from operational to strategic - Technology is used for a larger range of tasks, e.g. planning and strategy 	<ul style="list-style-type: none"> - Functional transactions and management - Some integration of IS to form links with parent organization - Improved level of communication between functions - IOS is replacing some face-to-face communications - IOS supports communications with partners - Collaboration at operational and tactical levels 	<ul style="list-style-type: none"> - Organizations may be working towards their own agenda and for their own benefit - However, some improvement in partner confidence due to increased communications and collaboration - Increased level of trust between partners - Integration of partnerships increasing

<i>Advanced</i>	<ul style="list-style-type: none"> - Technology viewed as a key strategic component with information as a key resource - Internal and external integration between information systems, using one or more Internet systems and portals 	<ul style="list-style-type: none"> - IOS used at all levels within the organization, from operational through to strategic - Technology is used for an extensive range of tasks within all functions - Integration of communications, functions, and processes is carried out by sophisticated technologies 	<ul style="list-style-type: none"> - Advanced IOS allow partners controlled access to extensive organizational information
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In sum, with elementary IOS, there is a low level of systems integration, information coordination, and partner collaboration. With intermediate IOS, there is some systems integration, information coordination, and partner collaboration. With advanced IOS, there is high level of systems integration, information coordination, and partner collaboration.

The implication of the preceding categorization is the following (Williamson, 2007): For higher level of IOS (i.e. elementary through advanced):

- Communication and coordination with the business partners increases;
- Partner integration increases;
- Confidence and trust in partners increases.

For delimitation purposes, this thesis study advanced IOS for collaborative purposes in a SCM context. It is acknowledged that an IOS, even it is simplest form, can give operational or even strategic benefits. However, for an IOS to enable effective SCM where there are supply chain integration and strategic collaboration there is a need for an advanced IOS as described above in this section.

3.2.3 Functional structure

Hannås (2007) takes the work of several researchers (e.g. Cash & Kosynski, 1985; Bakos, 1991; Weele, 2002) as a basis when she proposes four functional structures of IOS:

- Multiple suppliers and multiple buyers – a many-to-many relationship

- Multiple buyers and one seller – a many-to-one relationship
- One buyer and multiple sellers – a one-to-many relationship
- One supplier and one buyer – a one-to-one relationship

The many-to-many relationship is typically characterized as a virtual market exchange. Here, organizations communicate with a large number of trading partners through a single, inter-organizational link, e.g. a hub or a third party (Hannås, 2007). The one-to-many and many-to-one relationship is typically a relationship where there are many buyers and one seller or many sellers and one buyer. The one-to-one relationship is often characterized as two organizations having a strategic and collaboration-oriented view on the IOS.

3.3 Literature and focus

The focus and the theoretical foundations used within the IOS literature are diverse. In their comprehensive review of IOS research, Robey et al (2008) find three main issues which have received the most focus:

- Adoption: What factors influences the organizational adoption of IOS
- Transaction governance: The impact of IOS on governance over economic transactions
- Organizational consequences: The organizational consequences of IOS

Robey et al (2008) further address each of the three issues and finds the different theoretical foundations used. What is obvious is that the theoretical foundation used is varying and numerous. First, studies of IOS adoption by organizations rely primarily on the classical theory of diffusion of innovations. Second, the research which addresses the transaction governance issue mainly utilizes transaction cost economics. Other theories which are applied in this area include game theory, network externalities, the property rights perspective, and industrial organization. Third, research on organizational consequences is based on a number of theories. The most used theories include the resource-based view, organizational information processing, resource dependence, social network theory, population ecology, political economy, organizational learning, relational exchange theory, and stakeholder salience theory. Table 3 summarizes the different main issues addressed within the IOS

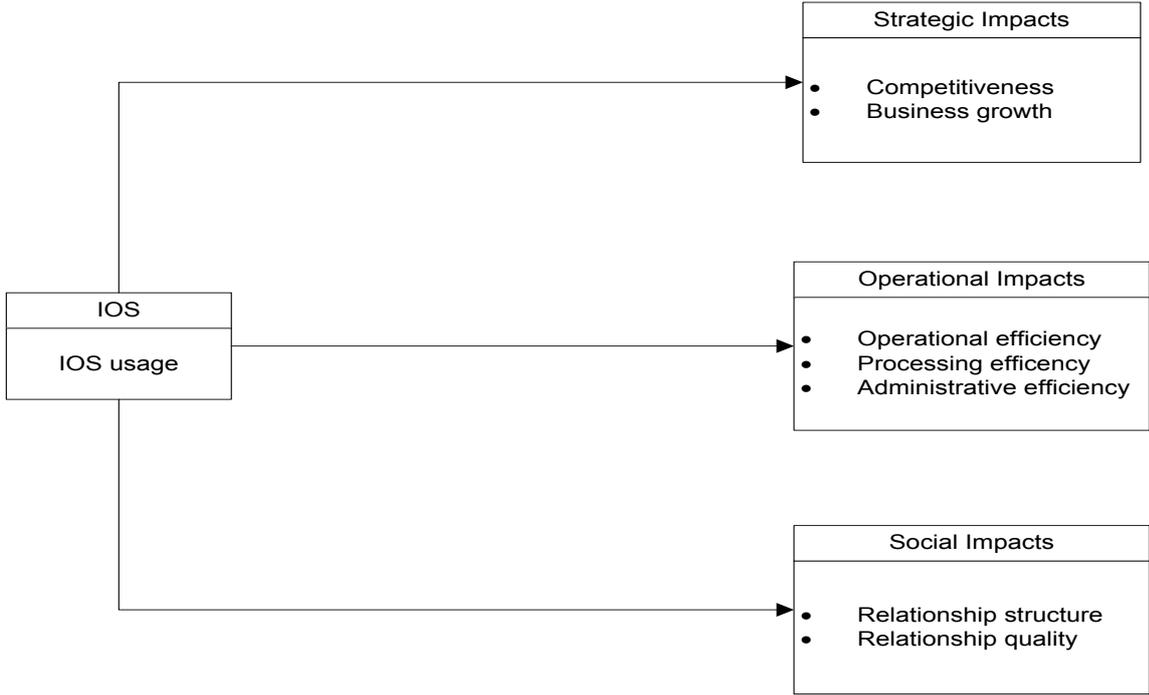
literature and the appurtenant research's theoretical foundations, together with selected IOS research within the respective areas.

Table 3: IOS literature

Main issue	Theoretical foundation	Selected IOS research
<i>Adoption</i>	Diffusion on innovations	(Premkumar & Ramamurthy, 1995; Chau & Hui, 2001; Kauffman & Mohtadi, 2004)
<i>Governance</i>	Transactions cost economics, Game Theory, Network Externalities, The Property Rights Perspective, Industrial Organization	(Clemons & Weber, 1996; Bakos, 1997; Holland & Lockett, 1997)
<i>Organizational consequences</i>	Resource-based View, Organizational Information Processing, Organizational Learning, Relational Exchange Theory, Stakeholder Salience Theory	(Porter & Millar, 1985; Johnston & Vitale, 1988; Bensaou, 1997; Sanders & Premus, 2002; Delmonte, 2003; Makido et al, 2003; Klein et al, 2007)

Research within the *adoption* domain focuses on the antecedents to IOS adoption – what causes organizations to adopt an IOS. Research within the *governance* domain focuses on how IOS can change governance structures. Finally, research within *organizational consequences* focus on what consequences (i.e. strategic, operational, and social impacts) that incurs from using such systems. Figure 2 below represents the research on the organizational consequences of IOS use. In addition, a body of literature within this area focuses on the success factors of IOS – how organizations can make use of IOS to achieve the greatest potential benefits in strategic, operational, and social terms.

Figure 2: Research on organizational consequences



Strategic impacts refer to the effects of IOS on the mission and scope of organizations, including the opening of new markets and development of new products and services. Choudhury, Hartzel, and Konsynski (1998) found that IOS are shown to reduce prices in the aircraft parts industry. Other studies identify strategic benefits of service quality and improved organizational image (Fearon & Philip, 1999; Iskandar, Kurokawa, & Leblanc, 2001). Barriers that hinder organizations using IOS to realize the potential strategic benefits is typically industry standardization, organizational routines, and lack of resources, knowledge, and system usage (Robey et al 2008).

Operational impacts refer to the efficiency of operations, such as ordering, delivery, productivity, and control. A number of studies have found operational benefits from the use of IOS. Selected benefits found include transaction efficiency (Reekers & Smithson, 1996; Vijayasarathy & Robey, 1997), improved order lead-time, service levels, and inventory levels (Clemons & Row, 1993; Vijayasarathy & Robey, 1997), efficiency of new business policies (Venkatraman & Zaheer, 1990), enabling of change in business processes (Chatfield & Bjørn-Andersen (1997), more openness in form of easier acquisition of channel information, (Wareham, 2003), increased amount of information available in the distribution channel

(Clemons & Row, 1993), and increased vertical interactions (Ramamurthy and Premkumar, 1995).

Social impacts refer to changes within the organization adopting IOS as well as in the interorganizational relationship between business partners. Pouloudi and Whitley (1997) find that IOS may expand the number of stakeholders in a business network. Christiaanse and Venkatraman (2002) find that a knowledge management system allows the focal organization to create specific incentives for horizontal business partners, thereby fostering learning. Other research points to change in bargaining power among the parties involved in an IOS adoption (Clemons & Row, 1993), reinforcement of existing power structure of a relationship (Webster, 1995), increased channel information intensity and channel formalization (Vijayarathy & Robey 1997), and increased relationship quality between business partners (Bensaou, 1997; Nakayama, 2000; Scott, 2000).

As mentioned, there is a body of literature within this research area that focus on identifying the success factors of IOS (e.g. Finnegan & Golden, 1996; Wang & Huang, 2004; Alshawaf & Khalil, 2008). The next section presents relevant research on IOS critical success factors.

3.4 IOS critical success factors

The research on IOS critical success factors is basically divided in two. The first body of research focuses on finding and proving empirically the success factors of the traditional IS where the focus is internal within the certain organization. The other, and smaller, body of research put focus on identifying IOS critical success factors, thus elaborating the *inter-organizational* aspect.

3.4.1 General success factors

IOS implementation success cannot be taken for granted (Wang & Huang, 2004). An IS project is usually costly, time-consuming and requires considerable efforts for the full completion. When an organization implements an IS for intra-organizational purposes, there are a number of considerations that need to be addressed of both technical and organizational concerns. Moving from an intra-organizational IS towards an inter-organizational IS (i.e. IOS)

the considerations increases. The problems to be addressed is now not only of intra-organizational nature for all participants, but also inter-organizational. There is a need not only for internal cooperation, but also external.

Rockart (1979, p. 5) defines critical success factors in respect to information systems as “*a shorthand statement of those limited number of areas where ‘things must go right’ for the IS function to be success and for the IS executive’s goals to be attained*”. He further says that the purpose behind identifying critical success factors is to help managers and system designers to identify the key areas that will lead to the achievement of the objectives of the project. The research on success factors of IOS implementation reflects the vast number of considerations that incur regarding such a project. The list of different factors is extensive, and there is no one universal consensus on which factors that is the most critical ones. Table 4 represents a few examples of success factors identified in the literature. As can be seen, the critical success factors can be events, circumstances, conditions, or activities (Boon, Corbitt, & Peszynski, 2004).

Table 4: Research on IOS success factors

Researchers	Success factors
Boon et al (2004)	Top management support, clear goals and objectives, business process reengineering, project management, information technology, knowledge management, outcomes, users, resources, competence, interdepartmental cooperation
Wang and Huang (2004)	Incentive drive, clear articulation of business strategy, cross-organizational implementation team, high integration with internal information systems, technical innovation, advanced legacy system, shared industry standards
Alshawaf and Khalil (2008)	The age of the IS unit, the organizational level of the IS unit, clarity of IS strategy, top management involvement in IS strategy formulation, locus of IS financial decisions, IS resources, end-user support, IT training, end-user involvement in systems development, IS sophistication

Lu, Huang, and Heng (2006)	Strong internal and external commitment, shared motivation and vision, cross-organizational implementation team, high integration with internal information systems, inter-organizational business process re-engineering, advanced legacy information system and infrastructure, shared industry standards
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3.4.2 *Inter-organizational success factors*

According to Lu et al (2006), the previous research on success factors within the IS domain has been focusing on *intra-organizational* information systems. The researchers point out that a number of well-known factors like top management commitment, adequate funding, communication, leadership, investment, and training naturally are applicable to IOS since it is a sort of IS. However, “*IOSs are more complex and multi-faceted than traditional information systems in terms of their technological and management issues*” (Lu et al, 2006, p. 396) and focus should thus be on the success factors distinct for IOSs to enhance the hitherto understanding of them. As such, the researchers acknowledge the factors that typically have been identified as critical in respect to traditional *intra-organizational* information systems, but now emphasize the *inter-organizational* aspect of information systems.

Lu et al (2006) further categorize the critical success factors identified in their literature review in the following categories: *Psychological factors* (e.g. trust, motivation, and consensus), *organizational factors* (e.g. cross-organizational teams, preparation and coordination, project management and maintenance, and business process reengineering), *IS/IT factors* (e.g. advanced/integrable IS/IT infrastructure), and *industry standard* (e.g. shared industry standard). The researchers empirically test the factors that are identified through their comprehensive literature review, and identify the following factors as critical in respect to an IOS’s success, represented in Table 5:

Table 5: IOS critical success factors

Category	Success factors
<i>Psychological</i>	<ul style="list-style-type: none">- Strong internal and external commitment- Shared motivation and vision
<i>Organizational</i>	<ul style="list-style-type: none">- Cross-organizational implementation team- High integration with internal information systems- Inter-organizational business process reengineering
<i>IS/IT infrastructure</i>	<ul style="list-style-type: none">- Advanced legacy information system- Shared industry standards

Regarding *psychological* factors, organizations should have a *strong internal commitment* within their organizations, as well as an *external commitment* towards their business partners. Also, the importance of organizations having a *shared motivation and vision* is emphasized. When the participating organizations have a shared motivation and vision of the IOS, the divergences of opinion is reduced which in turns lowers risk and shorten the implementation time (Lu et al, 2006). All participants should have a clear feeling of their *raison d'être* - why they want to engage in the project (Finnegan & Golden, 1996), and when this is true the success of the IOS is more likely.

For the *organizational* aspect, three factors are identified. First, using a *cross-organizational implementation team* is critical for an IOS project's success for several reasons. Differences in the understanding, planning, and goal for the IOS is reduced. And, parties jointly solve difficulties which may arise during such a project. And when the team, which should include members from all relevant departments in every organization, works together, they enhance each others' knowledge. Second, the IOS should have a *high level of integration potential with internal information systems*. As Lu et al (2006) state, if an organization has no way of integrating the IOS with the internal IS to utilize and handle exchange information, then the value of the IOS would be lowered to a large extent. The internal information system foundation of an organization should be integrated with the IOS in such a way that it is able to effectively share and make use of valuable information. Third, *inter-organizational business process reengineering* (BPR) is identified as maybe the most important factor. Here, non-value adding activities should be eliminated, enhancing inter-organizational value-adding activities to operate seamlessly, facilitated by the IOS. BPR seeks to realign an organization's business processes in a way that create more value for its customers. Business processes are logically related tasks that help in achieve defined business outcomes. Reengineering is the

realignment of those processes to reach a more desired outcome. These efforts aim to identify and eliminate tasks that do not add value for the customer, and BPR thus creates a common focus within the organization on customers and their preferences (Davenport & Short, 1992). Davenport and Stoddard (1994) identified five primary elements of reengineering: a clean slate approach, cross-functional orientation, a need for radical change, IT, and willingness. One of the most important features of BPR is the identification of the organization's core business processes. These processes should be radically redesigned to eliminate steps that do not add value for the customer. Consequently it creates a radical change in an organization's business processes and its environment. In respect to BPR, IT plays an enabling role. As IT continues to evolve, it allows more and more radical solutions to be implemented in new business processes, also making possible an inter-organizational focus on BPR.

Considering the *IS/IT infrastructure* factors, two factors are identified. If the organizations already possess an *advanced information system*, the difficulty of implementing an IOS will be less (Lu et al, 2006). And last, having a *shared industry standard* provides the participating partners a common language.

3.5 Practical examples of IOS success projects

Bose Corporation is a Danish producer of high-end audio products. They have been employing a JIT II-initiative – an initiative where several major suppliers have in-plant representatives at Bose's facilities replacing the traditional salesperson at the supplier and purchaser at the buyer. These representatives use Bose's facilities, including their IOS. It is the IOS that have enabled Bose and their business partners to restructure their business relationships into a more benefitting one. The large degree of information-sharing is enabled by the IOS, and Bose strongly encourage their partners to make use of the system. Both Bose and the seven suppliers which have been involved in this project conclude the project as successful. Bose states that their benefits include (i) the liberation of the purchasing staff to attend another area of the business, (ii) the cost of inventory is reduced, and (iii) EDI capabilities create links with suppliers for enhanced learning. The suppliers' benefits include (i) sales efforts have been eliminated, replaced by a full-time in-plant representative, (ii) there is a long-term contract with no end date and no rebidding activities, (iii) supply is streamlined, and (iv) invoicing and payments are more efficient (Venkatraman, 1994). The numbers

reported from the project was 50 % improvement in on-time deliveries, damage, and shortages, 6 % reduction in material costs, and 26 % improvement in equipment utilization (Harrison and van Hoek, 2005).

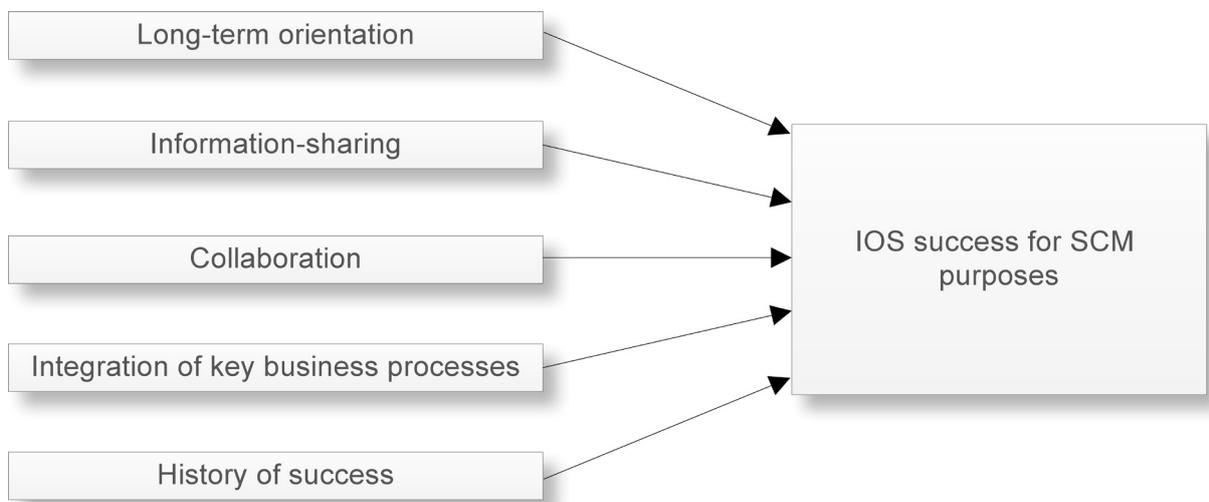
The reservation system of American Airlines, Semi-Automated Business Research Environment (Sabre) is highly cited within the literature as one of the most successful IOS projects in history (Copeland & McKenney, 1988; Venkatraman, 1994; Siau, 2003). Sabre was initially developed to improve American Airline's reservation system. However, showing to be a successful system, it was extended to include travel agencies. The integration of relevant business partners has only continued, and today Sabre links and connects approximately 30000 travel agencies, 3 millions of customers, 400 airlines, 50 car-rental organizations, 35000 hotels and several railways, ferry organizations, cruise lines, and so forth (Goff, 1999). As early as 1985 the operating profits from Sabre were reportedly \$143 million on revenues of \$336 million (Copeland & McKenney, 1988). Siau (2003) reports that the underlying cause for Sabre's success is a mindset that focuses on customer values and continuous change through developing the system. The most important factor, however, is American Airline's ability to manage changes in structure and work processes to take full advantage of the technology.

Another famous organization employing IT in SCM solutions is Wal-Mart. It is one of the largest US grocery organizations and has succeeded in a number of SCM projects (e.g. Grean & Shaw, 2002; Siau, 2003; Harrison & van Hoek, 2005). Harrison and van Hoek (2005) outline Wal-Mart's CPFR system as a main reason behind Wal-Mart's success the last decades. In 1980, Wal-Mart initiated a project using an EDI-based SCM system with their suppliers. The system was further developed to connect their largest suppliers to its inventory management system and requiring them to track sales by stores and to replenish supplies as dictated by Wal-Mart's system. In 2000 the system was extended to become a CPFR system where Wal-Mart's purchasing agents can aggregate demand from Wal-Mart's 4000 separate stores in the US easily and share the information with the suppliers. In addition, suppliers can access information on inventories, purchase orders, invoice status, and sales forecast, based on real-time, item-level data. Siau (2003) emphasizes Wal-Mart's ability to share information in real-time with its supply chain members through the IOS as one of the most important reasons behind its success.

4 The research model

In this chapter the research model is presented. The research model is a result of a synthesis of reviewed relevant literature within the SCM and IOS domains combined with the theories of TRV and SET in respect to the research problem. In summary, it is postulated that the success of an IOS for SCM purposes is affected by five critical factors: *Long-term orientation, information-sharing, collaboration, integration of key business processes, and history of success.*

Figure 3: Research model



4.1 Long-term orientation

Long-term orientation refers to an organization's willingness to exert effort in developing long-term relationships and committing resources to a mutual goal. The achievement of effective SCM requires the partners to have a long-term perspective on their partnerships and projects (Ellram & Cooper, 1990; Langley & Holcomb, 1992; Cooper et al, 1997). According to Cooper et al (1997) the supply chain partners should, ideally, consider their supply chain partnership's duration as indefinite. And as Ellram and Cooper (1990) point out, one of the essential activities that enhances effective SCM is the building and maintenance of long-term relationships. This is in line with the work of Lu et al (2006) regarding IOS critical success factors where the importance of the participating organizations having a shared motivation and vision is emphasized. When the organizations have a common and long-term vision of the IOS and its expected consequences the likeliness of its success is greater.

And from a theoretical viewpoint, SET supports a long-term focus as the theory states that trust, commitment, and relational norms are something that are developed over time within a relationship (Lambe et al, 2001). Having a long-term orientation could also breed a competitive advantage as TRV suggest that if the organizations have a feeling of mutual commitment it would open up for relation-specific investments and the willingness to share knowledge which in turn results in relational rents (Dyer & Singh, 1998).

4.2 Information-sharing

Sharing of information and knowledge are activities that have received a lot of attention within academic literature (Kakabadse et al 2001). Within the SCM literature it is a general agreement that sharing of information between the supply chain partners is necessary for effective SCM (Mentzer et al, 2001; Harrison & van Hoek, 2005). The success of an IOS for SCM purposes is thus dependent on information-sharing for two reasons: To realize an IOS that every party is satisfied with, and to achieve SCM through the IOS.

To achieve an IOS that satisfy every party in terms of design and functionality, literature on IOS success factors emphasizes the use of a cross-organizational implementation team (Lu et al, 2006). Here, differences in opinions and understandings are smoothed out, and information about each party's need or requirement is shared together with general information about their business (e.g. production facilities, business processes, capacity, or strategy). Existing knowledge residing within each organization is also shared and the level of knowledge of every party is in general increased. And to ensure that the IOS enables effective SCM, sharing of operational and strategic information, as well as knowledge, reduces uncertainty and costs and makes the supply chain work more effectively (Mentzer et al, 2001). What is also pointed out as an important aspect of an IOS's success is that it is highly integrated with internal information system, such that sharing of information and utilization of shared information is facilitated (Wang & Huang, 2004; Lu et al, 2006).

TRV clearly states that knowledge-sharing is a source of competitive advantage (Dyer & Singh, 1998). According to the theory, an organization should systematically share knowledge with partners in return for access to valuable knowledge residing within their partner's

organization. This is also supported by SET in which the theory states that if an organization makes a contribution (e.g. share knowledge) to its business partner, the business partner will return the favor. In addition, when the organization is able to share information with their partners, it is, according to SET, reducing their partner's uncertainty and increasing their trust (Kwon & Suh, 2005).

4.3 Collaboration

Collaboration refers to the activities of tight cooperation to reach a common agreed-upon goal where potential rewards are shared mutually as are the associated risks. Moreover, it is the ability to work across organizational boundaries in close partnerships of strategic nature (Fawcett, Magnan, & McCarter, 2008). To achieve effective SCM the supply chain partners should have the same overall goal (La Londe & Masters, 1994). There is a solidarity principle involved in these efforts, where the rewards and risks are shared mutually between the involved partners. With a clear overall goal and the same focus within the supply chain, coordination and cooperation is easier. Regarding IOS success factors, having the same motivation is critical. If the motivation is to reduce costs, this should count for every party. And likewise, if the motivation is to be more flexible, the same motivation should be held by every party. If one supply chain partner seeks cost savings through the IOS while another partner seeks to be highly flexible, collaboration can be difficult. From IOS literature the use of a cross-organizational implementation team is pointed out as a critical matter. Close collaboration in form of these teams can bring about trust and improve spirit of cooperation.

From the theoretical viewpoint of SET, collaboration between the involved parties is necessary to preserve the relationship. If the parties work towards a common goal then trust and commitment will be produced incrementally as long as there are positive outcomes resulting from the collaboration efforts. Considering TRV, if the supply chain members join forces and share complementary resources it can be a source of a competitive advantage.

4.4 Integration of key business processes

Integrated behavior where operations between manufacturers, suppliers, and customers are integrated is one of the main ideas of SCM. Through efficiently linking the various key

business processes within a supply chain, the overall goal is to have the operations coordinated and running seamlessly in ways that are not easily matched by competitors (Zailani & Rajagopal, 2005). The role of an IOS should thus be to enable or facilitate these integration efforts. IOS research points out inter-organizational BPR as a key success factor. At the minimum, inter-organizational BPR is efforts where the organizations establish smooth exchange of data and information between themselves. However, the goal of inter-organizational BPR is to achieve seamless integration of key processes between the business partners. Regarding IOS, inter-organizational BPR should include modification of current IS applications to interface with the new IOS and establish procedures and adjustments so to align internal business processes with the IOS. Thus, through inter-organizational BPR, key business processes should be integrated between the involved supply chain partners.

It is obvious, however, that such radical redesign efforts of inter-organizational nature is easy to explain, but difficult to carry out, as it, among other barriers, requires a high level of trust between the partners, as well as the sharing of sensitive information (Pitts, 1994). Even though there are obstacles to such efforts, research within the IOS domain still holds inter-organizational BPR as a key factor (Clark & Stoddard, 1996; Siau, 2003; Lu et al, 2006). TRV also underpins the importance of integration between business partners. Complementary resource endowments, where resources between the partners are combined, can be a source of a competitive advantage (Dyer & Singh, 1998). From the theoretical viewpoint of SET, integration of key business processes through inter-organizational BPR is more likely when the partners have a history of success. This concern is discussed in the following section.

4.5 History of success

One of the main activities that constitute SCM is the building and maintenance of long-term relationships (Ellram & Cooper, 1990). Strategic alliances or partnerships is not restricted to provide advantages for cooperating organizations at that certain point of time, but could help in future inter-organizational cooperation. According to SET, interaction over time that gives positive outcomes strengthens partnerships through the creation of trust and commitment (Lambe et al, 2001). With trust and commitment present, TRV suggests that the presence of self-enforcing agreements may arise, which is a source of competitive advantage. Further, TRV suggests that if organizations have a feeling of commitment and trust between each

other, the incentives to share knowledge and make relation-specific investments are increased. Considering trust and commitment, research on IOS success factors highlights the importance of having a strong external commitment (Lu et al, 2006).

5 Research design

A qualitative research design is appropriate when the research seeks to explore and gain understanding and knowledge within an area where little is known (Stern, 1980; Strauss & Corbin 1998). Moreover, choosing a qualitative approach is appropriate when emphasis is on describing, understanding, and explaining complex phenomena (Yin, 1994). In addition, exploratory qualitative methods are suitable when the goal is to develop theories, conceptual frameworks, or pertinent propositions for further inquiry through quantitative methods (Strauss & Corbin, 1998). According to Ellram (1996) qualitative methods can be classified as either a case study or a topical study. Whereas case studies focus on holistic situations in a real life setting with clear boundaries of interest, topical studies investigate a topic with less distinct boundaries.

With a basis on the above the most appropriate research design for the research problem is qualitative as the interception between SCM and IOS is scarce in terms of scientific research and thus can be described as a little known and complex phenomena. Further, the research model comprises five factors which are considered to be critical in affecting the success of an IOS for SCM purposes, thus implying that the goal of this research is to develop pertinent propositions for further inquiry. As such, this thesis is of a qualitative and exploratory nature where the goal is to develop pertinent propositions concerning a specific topic (i.e. the interception between SCM and IOS). This is in line with what Golobic, Davis, and McCarthy (2006) call for when they state that logistics and supply chain phenomena are becoming increasingly complex and should be studied using qualitative methods in order to accurately describe, understand, and explain them.

The research method which is chosen in order to evaluate the research model and consequently develop propositions is a literature review. According to Hart (1998) a literature review can be an initial part in a research process or constitute a research project in itself. In this thesis the literature review is the latter – it is the research method which will be used to examine and evaluate a predefined research question. Using a literature review as a research method in this manner enables the researcher to relatively effectively study and examine large bodies of academic literature and identify connections and similarities across different

academic domains. As such, a researcher should be able to answer a relatively broad research question, crossing academic disciplines, without performing own experiments or field studies.

Hart (1998) further argues that synthesizing existing scientific evidence is a powerful and recognized tool in building new knowledge. For the literature review as a research method to be valid, however, it is required to be clear, objective, and concise. In addition, it must satisfy the requirements of breadth and depth in that it must comprise an adequate amount of studies with varying research problems within varying academic disciplines. Last, for an article to be included in the literature review it must satisfy the following: It must explicitly examine, discuss, or identify the factor it is compiled under, preferably be of an empirical nature, and, it must have been published in a well-known and recognized academic journal. Articles are found primarily through two electronic search engines, ABI/Inform Global and Science Direct, with the use of relevant key words.

The data used within this thesis is secondary external data. This is primarily articles published in academic journals, but some PhD-dissertations and textbooks are also used as sources of information. For the literature review the data is restricted to be published academic articles.

6 Literature review

This chapter constitutes the literature review. Here, articles are compiled under the relevant and appurtenant factor, as in the research model, for simplicity. Efforts are made to represent each article objectively and with information on the research method, empirical data, and the findings. The majority of the articles are of empirical nature. An overview of the articles included in the literature review can be found in Appendix A.

6.1 Long-term orientation

Paulraj and Chen (2007) explore how strategic business relationships using IT affect an organization's external logistics integration and agility performance. The research draws on TRV and SCM literature and develops a model which proposes that organizations having a limited number of suppliers with whom they regard the relationship as long-term and participate in close inter-organizational communication, have higher levels of performance and external logistics integration. To empirically test the model, data was gathered from 221 members of the Institute for Supply Management through a cross-sectional mail survey in the United States.

The empirical analysis suggests that the impact of strategic business relationships and IT is significant in respect to improved levels of logistics integration through relational and technological initiatives. Specifically, strategic relational partnerships could lead to superior external logistics integration. Also, strategic relationships foster collaborative behavior. As organizations maintain and develop a long-term relationship they develop interaction routines and coordination mechanisms that help them to better utilize shared information. In sum, relationships characterized by a limited number of suppliers, long-term orientation, and inter-organizational communication increase performance and integration between the partners through reducing communication errors, facilitation information sharing, and fostering learning.

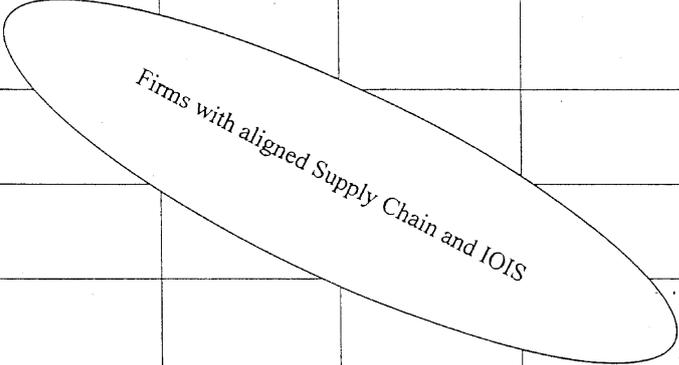
Davis (2008) takes a relationship approach, utilizing relationship marketing literature, to explain relationship-related factors' impact on supply chains. Specifically, a questionnaire with 898 respondents is used to extract information about commitment, trust, and satisfaction within supply chain relationships. The empirical evidence suggests that value is created within

a supply chain through collaborative efforts and long-term commitment. Results also suggest that there is a preparedness to commit to long-term business relationships. It is evident from the empirical findings that relationship-based supply chain activities are closely linked to improved SCM through forming more satisfying long-term business partnerships and developing the social aspect of the relationship. In sum, the research indicates that when organizations pursue in long-term relationships the likeliness of meeting strategic organizational objectives are higher. A limitation to the study is pointed out, however, as the data is gathered from a specific industry (i.e. the construction industry), and the researchers also point out that the success of SCM are dependent on many aspects, relationship-specific factors being one of them. Nonetheless, the study is valuable in providing insight into how business relationships and their characteristics can affect SCM success.

Shah, Goldstein, and Ward (2002) have a starting point where they establish that the research streams of SCM and IOS have been developing independently. Therefore the researchers seek to identify and generate a framework which should guide practitioners in choosing the right type of IOS to align with their certain SCM efforts. A SCM-IOS matrix is developed from a literature review and is shown in Figure 4.

Figure 4: The SCM-IOS matrix (Shah et al, 2002, p. 284)

IOIS Stages / Supply Chain Stages	No Electronic Integration	Level 1 Low Integration	Level 2 Moderate Integration	Level 3 High Integration
Arm's length				
Type I Short-Term				
Type II Long-Term				
Type III Coordination				



Relationships within the supply chain are divided in three: Type I, Type II, and Type III. Type I relationships are characterized by having a short-term focus and involves a limited number of divisions or functional areas from each organization. Type II relationships are characterized by having a long-term focus, coordinated activities, and multiple divisions and functions

within each organization is involved. Type III relationships are very long-term in nature and no end for the partnership is envisioned. Regarding the level of IOS, it ranges from level 1 where the IOS is of transactional nature, through level 2 where the focus is more operational, to level 3 where there is complete systems integration with a strategic and collaborative focus. The matrix is tested empirically with data from 1757 manufacturing organizations through a survey. Following the reasoning from the matrix and the empirical results, it is suggested that supply chain partners attending partnerships with a long-term focus and integrative nature should align their SCM efforts with an IOS that support high level of integration through strategic and collaborative elements.

Ryu and Cook (2005) investigate international supply chain relationships and how these are managed effectively. The study takes culture as a macro factor and aim to identify how a certain cultural dimension, specifically long-term orientation, affect contractual relationships between supply chain members. *The first hypothesis* is that when there is a high level of long-term orientation, the parties relies on soft contracts (i.e. an implicit, mutual understanding of expected roles and behaviors). The hypothesis is developed through the following argumentation: First, supply chain members who have a long-term orientation of their relationship may accept short-term disadvantages since these may be outweighed by longer-term advantages. Further, throughout a relationship the parties develop a mutual understanding, and with a long-term perspective they tend to build up implicit guidelines for behavior through soft contracts. *The second hypothesis* is that when there is a high level of long-term orientation there is a low reliance on hard contracts (i.e. a formal and written agreement). The hypothesis is based on the following reasoning: Hard contracts may be ineffective in prohibiting parties from seeking self-interest for short-term benefits because the specific rules in a hard contract cannot cover all possible contingencies. And in a culture where the existence of a long-term orientation is evident, continuity is regarded as the source of a mutual long-term pay-off which cannot be explicitly stated in a hard contract. Therefore, the more the parties show tendencies of long-term orientation, the less they will be to rely on hard contracts.

The two hypothesizes were found to be supported through empirical testing. The data used was gathered through a survey which was completed by 101 randomly selected Korean manufacturing organizations. The results underscore the importance of having a long-term

orientation in effective management of inter-organizational relationships within a supply chain context. Through having a long-term orientation of a relationship the parties are likely to develop a mutual understanding and commitment, and the presence of soft contracts is a contributing factor.

6.2 Information-sharing

Klein et al (2007) conducted a study where their starting point was that cooperative logistics relationships require the sharing of information which is enabled by IOS. Based on empirical data from 91 dyadic relationships gathered through a survey they find that performance increases when the parties share strategic information and customize IT. Moreover, the empirical findings indicate that in some aspects of a relationship, cooperative disclosure is useful in form of sharing strategic information. In other aspects, parties must competitively settle as to who will make what kind of IT investments. The conclusion is that an exclusive focus on either competition or cooperation is not effective. Rather, a focus where the parties compete on resources in regards to the investments and cooperate in sharing information through the IOS is the most successful strategic consideration. Following such a strategy would enable organizations to achieve mutual success within the supply chain partnership by balancing and understanding both competitive and cooperative stances. In sum, the findings suggest that through Internet-based technology solutions, strategic information is more easily shared and consequently result in positive performance increases.

Li et al (2005) performed a study which objective was to critically review representative information-sharing models within SCM literature and carry out a comparative analysis. The analysis is based on mathematical modeling and the goal is to find whether information-sharing within a supply chain is valuable or not. Based upon a literature review it is claimed that the deeper the information-sharing level is the more benefit is implied, but also the higher risk is associated. The conclusion of the study is that information-sharing is indeed valuable within a supply chain. However, the analytical methods, variable selections, and assumptions vary greatly and thus make the comparison of numerical values difficult.

Fawcett, Osterhaus, Magnan, Brau, and McCarter (2007) did a large-scale survey of 588 organizations and semi-structured interviews of 144 organizations in their study to determine

the role of information-sharing within supply chains. Information-sharing is the core of collaborative SCM and IT enables the possibility to share strategic and operational data which can make a supply chain work efficiently and effectively. There are, however, two distinct dimensions of information-sharing within a SCM context, connectivity and willingness, which need to be considered. Connectivity refers to the technical ability to connect across functional and organizational boundaries to share information. The researchers claim that the connectivity dimension is the better-understood and more-invested-in capability, while the construct of willingness needs to be emphasized. The latter refers to a party's willingness to share the information which is possible through the connectivity dimension.

The empirical analysis that was carried out to measure the two constructs of connectivity and willingness in respect to information-sharing revealed the following. Most business leaders credit new technology for fostering and facilitating effective SCM. Shared information fosters process redesign and facilitates collaborative relationships. What is evident from the findings is that organizations put a lot of focus and resources into the connectivity construct – the technical ability to connect, while the willingness construct is overlooked. The study concludes that if organizations should obtain the “full” return on their technological investments they must put focus on developing the willingness to share the necessary information for effective management of a supply chain.

Grean and Shaw (2005) studied the partnership between Procter and Gamble as a manufacturer and Wal-Mart as a retailer over a ten-year period. Both are major organizations in their industries and have been adopting IOS for collaborative purposes. The study finds that over the period, Procter and Gamble and Wal-Mart have through adopting an IOS created a common language, driven down costs, and provided an avenue for increased sales. Retailer data is usually used for quick decision support, while manufacturer data are used for analytic decision support. When merged, these data can give remarkable gains for both organizations. The conclusion is that the partnership started with a simple desire to improve their business relationships, and has gradually been enhanced by information-sharing. Through committing to sharing point of sales data, marked data, and consumer data among channel partners for joint decision making, organizations can achieve a successfully integrated supply chain.

Kulp et al (2004) conducted a study that through an extensive survey in the food and consumer goods industry identified several interesting aspects to information-integration. A model where information-sharing is constituted by sharing information on consumer needs, store inventory levels, and warehouse inventory levels is created. Collaboration is constituted by VMI, working together on new products and services, and reverse logistics systems. The model proposes that information-sharing and collaboration increase joint profits. Empirical data was gathered from 54 completed surveys.

The empirical findings reveal that every aspect of collaboration is positively associated with increased profits. Specifically, through the different forms of collaboration the parties are able to charge higher prices and experiences less stock-outs. In contrast, solely sharing information on inventory levels or customers needs is associated with higher profits up to a certain point; sharing this information is evident among the organizations that achieve industry-average profits. The results indicate that the majority of benefits are related to collaborative efforts rather than information-sharing. While information-sharing on store inventory levels is related to higher profits, sharing information on warehouse inventory levels or consumer needs is not significantly associated with higher profits. The paper's conclusion is that these findings are consistent with an evolutionary process of SCM. Sharing information may have provided organizations with a competitive advantage in the 90s. However, information-sharing is today not alone sufficient to achieve above-normal profits. Joining information-sharing with collaboration practices can lead to the greatest benefits.

6.3 Collaboration

Lefebvre, Cassivi, Lefebvre, and Léger (2003) conducted a study that examined electronic collaboration within a supply chain for achieving a sustainable competitive advantage. The researchers develop three hypothesizes with a basis in existing literature within the IOS domain. *Hypothesis 1* proposes that electronic collaboration within a supply chain is positively related to inter-organizational innovativeness. *Hypothesis 2* proposes that electronic collaboration within a supply chain is positively related to an organization's performance. *Hypothesis 3* proposes that an organization's innovativeness and performance through electronic collaboration are influenced by the size and position of the organization within a supply chain. The three hypothesizes are tested through a methodology that comprises a

multi-case study and two electronic surveys. Based on the multi-case study the electronic surveys were developed and received 53 responses, yielding a response rate of 40.8%. The empirical data comprised both upstream and downstream perspectives for organizations having different positions within a supply chain.

Hypothesis 1 and hypothesis 2 find support in the empirical analysis. Specifically, electronic collaboration is positively related to inter-organizational innovativeness and an organization's performance. Hypothesis 3 is not supported, suggesting that an organization's size or position within a supply chain is not significantly affecting the innovativeness or performance through electronic collaboration. However, the findings suggest that the benefits incurring from electronic collaboration is higher for the upstream side of the chain than for the downstream towards customers. Nevertheless, the central premise of the paper is that electronic collaboration within a supply chain plays a major role in achieving a sustainable competitive edge.

Johnston and Vitale (1988) develop a framework that can guide organizations in their search for a competitive advantage through an IOS. A competitive advantage is achieved through for instance lower costs, tighter links to customers and suppliers, and increased product differentiation. The focus in their study is the relationship between the users of the IOS, and they claim that because the benefits incurring from such a system may vary across the users, there are certain important issues that must be addressed for successful IOS usage.

Specifically, an IOS must provide incentive for use to all intended participants. By the nature of the phenomenon of IOS it is obvious that participating organizations somehow must have some perceived benefits of using the system. If the system is utilized in a way that favors only certain users, it will be ineffective. When a participating organization is not receiving any form of payoff for using the system it will eventually dismiss or at least reduce its amount of time and resources spent on the system. The result is that none of the participating organizations will achieve the potential benefits which can take place with tight and holistic cooperation among and between every party. Thus, the search for the competitive advantage through IOS usage must not only consider the payoffs for one organization, but everyone.

In their study of Japanese manufacturing organizations, Makido et al (2003) applied a multi-regression analysis on the 215 responses of a survey regarding IT and competitive advantage.

The organizations were asked if IT had been implemented and if it had impact on market shares. The result was that IT has an indirect positive correlation with competitive advantage, specifically; IT is not being used for searching out low cost suppliers but as a tool for making voluntary arrangements between organizations for supplying strategic components. IT contributes to achieving a competitive advantage through accommodating empowerment and strategic alliances. The conclusion in their study is that stand-alone IT systems that can be acquired and implemented with little customization and cooperation internal and external does not breed a sustained competitive advantage. Rather, IT systems that require a high degree of cooperation, internal and external, have a high probability of providing a sustained competitive advantage.

The study of Chang and Shaw (2004) argues that a lot of attention has been on the value of IT within organizations. However, there is a need to grasp the value of supply chain collaboration within the IT valuation efforts. The study develops a set of metrics for evaluating the economic impacts of IT-enabled supply chain collaboration. The set is then applied on data gathered from 53 completed large-scale surveys of organizations being members of RosettaNet. The empirical assessment indicate that improvement in extended supply chain partnerships is the most beneficial impact of supply chain collaboration, and thus having a good relationship with the partners in the supply chain becomes more important than ever. The paper's main contribution is however the proposed framework that extends earlier work of IT valuation research through considering the impact of collaboration. By using the valuation model organizations can find the most appropriate strategy to achieve greater supply chain collaboration.

Angeles and Nath (2003) study electronic supply chain partnerships. Specifically, the study focuses on identifying trading partner attributes that are critical to ensure a long-term relationship in an electronic supply chain context. A survey was conducted on 128 organizations constituting 64 electronic relationships. The analysis reveals six factors or attributes that an organization finds critical in a trading partner using a shared electronic system. Among the factors such as top management commitment and other well-known IOS success factors is that of joint partnering. Joint partnering refers to the efforts where information, risks and rewards are shared, where a trading partner is regarded as a collaborator rather than a competitor in the IOS initiatives. The empirical findings suggest

that organizations within an electronic supply chain partnership support a collaborative rather than an adversarial stance towards IOS initiatives. The trading partner should be willing to participate in cross-organizational teams created to plan and manage the IOS. In addition, the trading partner should use participative rather than authoritative management of decision-making practices.

Fawcett et al (2008) put focus on the collaboration aspect in a SCM context. Specifically, the research seeks to answer what the specific practices and requirements for successful supply chain collaboration are. Through an extensive literature review, going back almost 25 years, an interview guide was developed. The in-depth interviews were carried out on 51 organizations on the basis of their reputation for SC excellence. The analysis revealed that true synergistic supply chain collaboration is rare. Effective collaboration requires closing cultural, emotional, physical, and strategic gaps. Moreover, managers often fear the vulnerability inherent in a collaborative relationship, and they get caught between the desire of long-term benefits of collaboration and being vulnerable to counterproductive short-term measures and mindsets.

There are, however, certain efforts that conquer insecurity and risk in this context. Through investments in training and inter-organizational team building an organization's commitment to supply chain collaboration becomes evident and business partner's willingness to explore collaborative opportunities becomes greater. The researchers conclude that this study identified two facts that supply chain managers must grasp. First, there is tough competition and dealing with the competition in effective manners requires higher levels of creativity and collaboration. Second, managers in successful organizations using SCM strategies consistently reported that their high performance hinged on their ability to achieve supply chain collaboration.

6.4 Integration of key business processes

Zailani and Rajagopal (2005) conducted a study which aimed at testing how different forms of supply chain integration are related to organizational performance. The researchers argue that many of the theoretical arguments for integrating operations between supply chain partners stem from the process reengineering literature which goal is to create and coordinate

processes seamlessly across the supply chain. Through a review of operations management related journals, about 30 articles were selected and examined to develop relevant hypothesis. It is proposed that information-sharing within a supply chain increases performance, and that internal and external integration across the supply chain increases the performance. The propositions are found to be supported through a literature review – information-sharing and integration of business processes is positively associated with performance. The conclusion is that the potential benefits of supply chain integration can no longer be ignored. The achievement of such integration, however, requires the recognition and proper handling of interrelationships between the supply chain partners. Through integrating key strategies with suppliers and customers, organizations can learn and continually adapt to changing market structures.

Siau (2003) did a thorough study of a number of well-known and successful IOS, e.g. the Sabre reservations systems from American Airlines, the Apollo reservations system from United Airlines, the ASAP Express from Baxter Healthcare Corporation, and the Wal-Mart Supply Chain system. His goal was to identify what factors that contributes to the success of these systems and how they can give organizations a sustained competitive advantage. The researcher finds that the competitive advantage does not only come from the technology itself, but also from instilling a mindset that focuses on customer values and innovation. The most significant factor in achieving a competitive advantage is the organization's ability to manage changes in structure and work processes to take full advantage of the technology. Specifically, BPR is the effort which should help organizations in achieving the potential benefits from the evolving technology. As Siau (2003, p. 37) states: “(.) *critical factor in determining which companies derive the greatest benefits from IOS is the ability to manage major changes in work design and organizational structure.*”. Organizations must derive cost savings from implementing and using an IOS to cover the investment. However, the cost savings must come through the painful exercise of redesigning and re-implementing core organizational structures and business processes. It is not enough to simply lay an IOS on top of existing work processes – it will probably be ineffective and most certainly it will not breed the maximum potential benefits from such a system. Organizational redesign must become synonymous with IOS development. The most successful organizations is those that manage to integrate the technology effectively into their organization in a way that continually add

valuable new capabilities to the system, while deriving cost savings from increased productivity and decreased costs made possible by IOS.

Auramo, Kauremaa, and Tanskanen (2005) conducted a study that comprised 48 organizations which had implemented IT for supply chain purposes. The goal was to produce empirical evidence of benefits from IT in supply chains. In doing so, the researchers identify some underlying mechanisms that contribute to the benefits that IT can give. One of those is BPR in that to achieve strategic benefits from IT the use and implementation of the technology have to be coupled with process redesign. It is proposed that to achieve strategic benefits from IT, supply chain processes have to be changed. According to the researchers, the link between IT use and simultaneous design of business processes is an essential ingredient to bring benefit from development efforts. The study in sum corroborates that business process reengineering skills are essential to benefit from IT strategically. However, the change does not have to be total, but without any changes in processes IT becomes merely a resource in automation providing only benefits in limited scope. The findings thus suggest that there are still few organizations that are able to implement IOS and use it strategically. Also in the SCM context, most of the organizations view IT primarily from an operational perspective.

Ettlie, Perotti, and Joseph (2005) examine enterprise system implementations as they are one of the most expensive projects any organization can undertake and the need to reduce the risk involved in these projects are indigent. The purpose of the study was thus to both theoretically and empirically find key predictors of successful enterprise system deployment. Data was gathered through a survey which was answered by 60 organizations in the Fortune 1000 that recently had adopted an enterprise system. Three key predictors were identified, namely leadership, acquisition strategy, and BPR. Regarding BPR, the findings suggest that the organizations which are able to change the internal processes to align with the new technology, and not the opposite where the technology is aligned with existing processes, are the organizations that are most likely to be successful in enterprise system deployment.

Lummus, Vokurka, and Krumwiede (2008) study supply chain integration. The purpose of their research is to ascertain whether organizations perform better when they have identified themselves as having a high level of supply chain integration compared to their competitors.

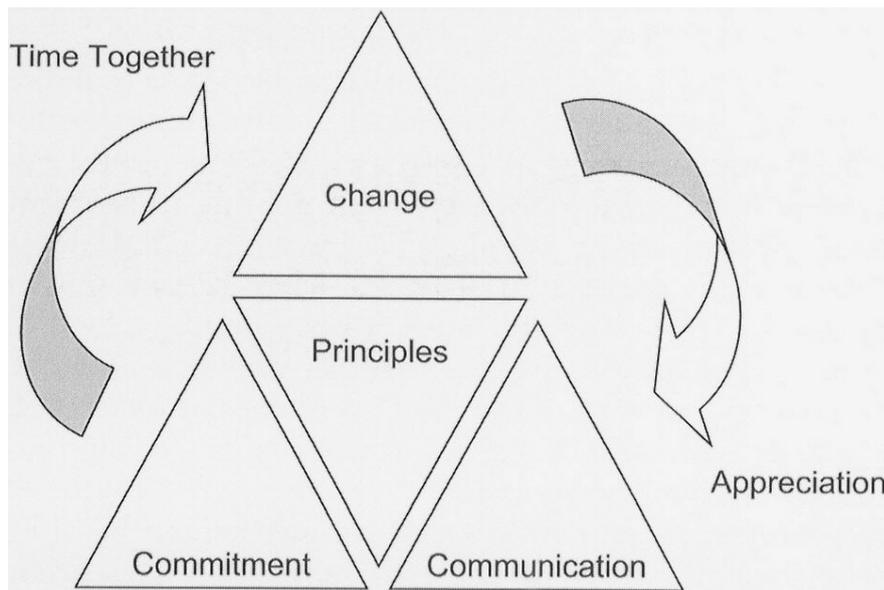
Data was gathered through three rounds of a multi-country survey comprising 325 organizations from six countries considering themselves high performers on supply chain integration. Their hypothesis is that organizations that are integrated with their supply chain partners should perform better than their competitors that are not integrated with their supply chain partners.

The empirical analysis reveals what was expected based on the literature review – organizations conducting integration efforts with their supply chain partners perform higher than those who do not, in terms of cost, speed, flexibility, and reliability. The study concludes that the findings can be used as support for those supply chain managers attempting to justify integration efforts and techniques within their organizations or with other members of the supply chain. In addition, the competitive nature of business today requires organizations to integrate their supply chains as it is a key capability in meeting the demands of today's global customers.

6.5 History of success

Bullington and Bullington (2005) conducted an original study. The purpose of their paper was to apply results of research on successful families to SCM in order to suggest how supply chain relationships can be improved. Combining family strengths research, based on surveys and interviews of more than 6000 successful families over a period of 20 years, with research on supply chain relationships, a model is developed that should guide managers in developing and maintaining strong supply chain relationships. Figure 5 demonstrates their findings.

Figure 5: Supply chain relationships model (Bullington & Bullington, 2005, p. 193)



Commitment is evident from the family strengths research because it is found that successful families are deeply committed to enhancing each other's welfare. The importance of a good, systematic communication to a healthy relationship is obvious. Change refers to the ability of the parties in a relationship to deal with crises, or adapt to new situations, and is highlighted as a critical construct in successful relationships. Having mutual principles is also important to a relationship, and may be shared concepts, morals, or goals. Appreciation may refer to the achievement of a long-term competitive advantage, monetary elements, or communicated credit. Last, spending time together with a partner is the most certain way to build trust in the relationship. The length of the relationship is a key element in the establishment (or breakdown) of trust. Time spent together is a demonstration of commitment. Through committing time or resources to the relationship, the likeliness of its continued success is greater.

Golicic and Mentzer (2006) perform an empirical examination of relationship magnitude as a result of the growing phenomenon of inter-organizational relationships. Hypothesis 1 proposes that trust, commitment, and dependence are dimensions of relationship magnitude (i.e. the degree of closeness and strength of an inter-organizational relationship). Further, hypothesis 2 proposes that the level of relationship magnitude is positively related to the level of relationship type (i.e. the group or class of relationships that share common characteristics, ranging from arms length to integrated relationships). Last, hypothesis 3 proposes that a change in the level of relationship type changes the level of relationship value (i.e. the utility

of the relationship considering the benefits and costs). The empirical data was gathered from a survey completed by 326 organizations.

Hypothesis 1 finds strong support in the empirical analysis – trust, commitment, and dependence are strongly supported as dimensions of relationship magnitude. Hypothesis 2 also finds support – higher levels of relationship magnitude is positively associated with higher levels of relationship types. Last, hypothesis 3 is supported even though described by the researchers as exploratory – a change in the level of relationship type changes the level of relationship value. Discussing the analysis, the researchers claim that their findings are in line with SET as both favor closer relationships. Further, to develop a closer supply chain relationship, the parties must develop high levels of trust, commitment, and dependence. However, developing high levels of these dimensions takes time, and it is suggested that supply chain partners can work on such efforts with the partners which whom they desire a close relationship. In addition, practitioners are often reluctant in investing time and resources into relationship because they seldom see a quick financial return on their investment. The empirical findings in this research suggest that higher value of a relationship is strongly associated with the magnitude of it – organizations must therefore realize and acknowledge that positive outcomes is something that results over time within a relationship.

Kent and Mentzer (2003) in their study empirically test a theory-based supply chain relationship model. The model proposes several connections: i) Trust and commitment are strongly related, ii) investment in IOS is positively associated with relationship commitment, iii) relationship commitment is positively associated with logistics efficiency and effectiveness, and iv) logistics efficiency and effectiveness is positively associated with relationship dependence. A sample of 324 retail organizations through a survey was used as empirical data. The findings posit that if an organization perceives investment in the IOS by its supply chain partner, it develops higher levels of relationship commitment. The connection between relationship commitment and logistics efficiency was the most significant of all the relationships tested in the study. However, the relationship between relationship commitment and logistics effectiveness was not significantly supported. The managerial implications are that investment in IOS can lead to commitment in a supply chain relationship, and that commitment in a supply chain relationship can lead to logistics efficiency.

Kwon and Suh (2004) conducted a study which aimed at empirically identify and test the role of trust and commitment within a supply chain partnership. Through a comprehensive survey of 171 supply chain practitioners a number of implications becomes evident. Among others, it is found that a supply chain partner's reputation in the market has a strong positive effect on the level of trust. Also, information-sharing reduces uncertainty between supply chain partners. It is concluded that effective supply chain management requires relationship-building, and that supply chain integration is a long-term strategic process that requires trust and commitment.

Wu, Chiang, Wu, and Tu (2004) carried out a study on the influencing factors of commitment and business integration on SCM. Among others, the researchers point out continuity as a behavioral factor positively related to commitment and business process integration within a supply chain. Continuity is referred to as the perception of the expectation of future interaction of a business relationship. It is emphasized that the majority of partnerships with high levels of commitment will have correspondingly higher continuity. Further, relationships of longer-term are more likely to foster strategic integration from an inter-organizational relationship for three reasons: First, older relationships have passed through and have succeeded in phases of adjustments and challenges. Second, partner organizations are more familiar with relationships of longer duration and consequently are more comfortable operating within the historical context of an older relationship. Third, as a result of their survival hitherto, longer relationships provide a stable situation for strategic integration. The empirical analysis, based on data from 134 supply chain practitioners through completed questionnaires, reveals that a high degree of continuity is positively associated to commitment of supply chain partners. Also, when supply chain partners regard the relationship with a high continuity expectation, commitment increases. The researchers declare a concluding remark in this manner - to realize the benefits on supply chain integration supply chain partners must build appropriate inter-organizational relationships which should be characterized as enduring.

7 Discussion and propositions

In this chapter the literature review is summarized, analyzed, and discussed in connection to the research model. The sections are divided in the same way as the previous chapter with one section for each proposed factor affecting the success of an IOS for SCM purposes. Pertinent propositions are developed in the end of each section.

7.1 Long-term orientation

The importance of an organization having a long-term orientation of their supply chain partnerships was proposed as critical factor in the success of an IOS for SCM purposes. This was based on SCM literature which clearly emphasizes that supply chain partners should, ideally, consider their supply chain partnership's duration as indefinitely. IOS research supports this view through underpinning the importance of the supply chain partners having a long-term and shared vision of the IOS. Theoretical support is also found from SET as trust, commitment, and relational norms are developed over time within a relationship. And having commitment within a business relationship opens up for relation-specific investments and the willingness to share knowledge, which can be a source of a competitive advantage as outlined by TRV.

A study that draws on TRV is Paulraj and Chen (2007) who studied strategic business relationships using IT, as opposed to pure transactional or operational relationships. Drawing on TRV, they propose that having a small number of suppliers with whom they regard the relationship as long-term have higher levels of performance and external logistics integration. The findings support their initial model - strategic relationships characterized as long-term foster collaborative behavior, lead to the development of interaction routines and coordination mechanism which reduce communication errors, facilitate information-sharing and foster learning. These findings are consistent with the work of Davis (2008) who finds that value is created within a supply chain through collaborative efforts and long-term commitment. The findings also suggest that relationship-based supply chain activities are closely linked to improved SCM as forming long-term partnerships fosters improved collaboration and commitment. Ryu and Cook (2005) also put focus on the importance of having a high level of long-term orientation. Their findings indicate that throughout a relationship soft contracts are

developed, and with higher levels of long-term orientation the presence of hard contracts is less. This is in line with the fourth source of achieving a competitive advantage as outlined by TRV – achieving effective governance of an exchange relationship, for instance in form of self-enforcing agreements, lowers the costs of governance and provides incentives for value-creation initiatives. The last study is by Shah et al (2002) that attempt to integrate the two research streams of IOS and SCM in that they propose how different types of supply chain partnerships should be aligned with what kind of IOS. The findings suggest that the organizations within a collaborative supply chain partnership with a long-term focus should choose an advanced IOS that support a high level of integration through strategic and collaborative elements.

Both from a theoretical viewpoint and based on relevant empirical studies the importance of supply chain partners having a long-term orientation is emphasized. To achieve effective SCM the partners must consider their relationship as long-term where they work towards a common goal. And incorporating the work on IOS relation-specific success factors, a strategic close partnership characterized as long-term stands out as a key determinant in how effective SCM can be achieved through an IOS. Throughout the literature review, having a long-term orientation stands out as evident in respect to successful business partnerships in that it fosters collaborative behavior and lead to the development of interaction routines and coordination mechanisms. When supply chain partners engage in close partnership of long-term nature, self-enforcing agreements and soft contracts are developed, and effective governance of the relationship can become a source of a competitive advantage. Incorporating SET, the supply chain partners will over time develop trust and commitment as long as there are positive outcomes from the relationship. Based on theory, existing literature on IOS and SCM, as well as empirical findings from the literature review, it is suggested that the organizations engaging in an IOS project for SCM purposes are more likely to succeed if every party is considering their relationship with their supply chain partners as long-term. Through building and maintaining long-term relationships, the achievement of effective SCM is possible.

With a basis on the above reasoning it is proposed:

P1: If the organizations deploying an IOS for SCM purposes regard their relationships as long-term, the likeliness of the IOS's success is greater

7.2 Information-sharing

Based on the theory and literature, information-sharing was proposed as a critical factor that affects the success of an IOS for SCM purposes. There are two aspects of information-sharing in relation to IOSs. First, sharing information to achieve an IOS that satisfy every party in terms of technology-specific aspects like functionality and design, and second, to achieve effective SCM enabled by the IOS.

To achieve a satisfactory IOS for SCM purposes it was suggested that the involved parties should share information on their business (e.g. production facilities, business processes, capacity, strategies, et cetera) such that the supply chain partners are able to reach a consensus, meaning an IOS that supports the necessary and desired requirements of each organization. Research on IOS success factors highlights the use of cross-organizational teams in the planning and implementation phases as a valuable tool in this manner. From the literature review, Klein et al (2007) support this view where they start by stating that cooperative logistics relationships require information-sharing. The findings indicate that performance increases when parties share strategic information and customize IT to make it fit the requirements of the logistics relationship. However, information should not be shared uncritically in every stance within an IOS project – rather, a focus where the involved parties compete on resources on the IOS and cooperate in sharing information would breed mutual success within the supply chain partnership.

As identified in the review of relevant SCM literature, information-sharing is required to achieve effective SCM. One of the purposes of implementing an IOS for SCM purposes should be to enable and facilitate effective information-sharing between the users. The information can be both pure transactional and operational, but also strategic. Klein et al (2007) conclude that Internet-based technology solutions ease the sharing of strategic information which results in increased logistics performance. This is in line with Grean and Shaw (2005) who find that the sharing of retailer and manufacturer data in combination can give tremendous gains in terms of reduced costs, increased sales, as well as creating a common language for business. What is evident from the literature is that if supply chain partners share information as point of sales data, marked data, consumer data, as well as

strategic information, it is possible to achieve a successfully integrated supply chain that works efficiently and effectively.

However, the notion that information-sharing is valuable within a supply chain has been questioned. The study by Li et al (2005) was conducted as a result, and through critically reviewing the mathematical models used to measure the value of information-sharing, they concluded that information-sharing is indeed valuable within a supply chain. Fawcett et al (2007) may provide an explanation for why the value of information-sharing is questioned. They find that the connectivity dimension usually is counted for within supply chains, that the ability to share information is in place. The willingness dimension, however, needs to be emphasized. There is little use in investing in large-scale technology solutions that should help in sharing information with business partners if there are low levels of willingness in every party to in fact share information. Kulp et al (2004) also elaborate on some of the issues of information-sharing – solely sharing information on for instance inventory levels will not give a competitive advantage. However, if information-sharing efforts are coupled with collaboration practices, higher profits can be earned. Thus it is proposed that information-sharing is indeed valuable, however, it should be combined with collaboration practices to enhance the willingness to share.

Incorporating TRV, information should be shared as it can give organizations access to valuable information residing within their partner's organization. If information is systematically shared with supply chain partners, it can become a source of a competitive advantage as TRV states that an organization's critical resources cross organizations boundaries and can be embedded in inter-organizational resources and routines. SET is also in line with favoring systematic sharing of information with supply chain partners, as information-sharing reduces partner's uncertainty and increasing their trust. As such, based on theory and relevant literature, organizations should share information on their business in inter-organizational teams to achieve a satisfactory IOS. Also, information should be shared mutually, enabled by the IOS, to achieve effective SCM.

Following the above reasoning, two propositions are put forward:

P2a: If the organizations deploying an IOS for SCM purposes mutually share information on their business in terms of resources, strategies, and requirements within the implementation phase, the likeliness of the IOS's success is greater

P2b: If the organizations deploying an IOS for SCM purposes mutually share operational and strategic information through the IOS, the likeliness of the IOS's success is greater

7.3 Collaboration

The activities of tight cooperation to reach a common goal with mutual sharing of risks and rewards were proposed as a critical factor in the success of an IOS for SCM purposes. Based on SCM and IOS literature, the ability to work across organizational boundaries in close partnerships of strategic nature is posited as an important ability to achieve effective SCM supported by an IOS. The supply chain parties should regard each other as partners rather than competitors. Theoretical support was found from SET which emphasized collaboration as the parties would develop trust and commitment alongside the business relationship as it goes. TRV also provides support as joined forces and shared complementary resources inter-organizationally can be a source of a competitive advantage.

The literature review seems to support this view. Lefebvre et al (2003) establish that electronic collaboration within a supply chain can lead to inter-organizational innovativeness and increased inter-organizational performance. Their findings suggest that electronic collaboration among supply chain partners plays a major role in achieving a sustainable competitive edge. This is in line with TRV which posits that relation-specific investments and complementary resource endowments can be sources of competitive advantages. Johnston and Vitale (1988) also highlight the importance of collaboration as they state that the search for a competitive advantage through IOS must not only consider the payoffs for one organization, but everyone. Makido et al (2003) also examine the relation between IT and competitive advantage and find an indirect positive correlation. Specifically, they find that IT can give a competitive advantage as it contributes to empowerment and strategic alliances between business partners. They also highlight the importance of collaboration in the development of such systems – the IT systems that require a high degree of internal and external cooperation

are the ones that have the highest probability of providing a sustained competitive advantage to its users.

The ability to work as a collaborator with an organization's supply chain partners in electronic relationships is highlighted as an important attribute that is critical to ensure long-term partnerships. Angeles and Nath (2003) found that through joint partnering efforts where information, risks and rewards are shared, and where a trading partner is willing to participate in cross-organizational teams to plan and manage the IOS, trust and commitment is developed and the trading partner is viewed more as a collaborator rather than as a competitor. Moreover, businesses want their trading partners to show willingness to participate in collaboration efforts where participative rather than authoritative management of decision-making practices is carried out. Chang and Shaw (2004) also support this view as they find that having a good relationship with your supply chain partners is the most beneficial impact on the value of IT within a supply chain. However, true synergistic supply chain collaboration is rare, for some obvious reasons. To achieve true collaboration, cultural, emotional, physical, and strategic gaps must be closed, as noted by Fawcett et al (2008). Nonetheless, there are efforts which help in closing these gaps, realizing the possibility of true supply chain collaboration. These are for instance investments in inter-organizational efforts as training and team building, which Fawcett et al (2008) find as signs of a business partner's commitment to the relationship. Incorporating SET, through investments and other valuable contributions to the business relationship, commitment and trust is created and the relationship becomes strengthened, consequently fostering and rendering true supply chain collaboration.

With a basis on the above, the following propositions are developed:

P3a: If the organizations deploying an IOS for SCM purposes mutually share risks and rewards, the likeliness of the IOS's success is greater

P3b: If the organizations deploying an IOS for SCM purposes view their partner as a collaborator rather than a competitor, the likeliness of the IOS's success is greater

P3c: If the organizations deploying an IOS for SCM purposes make relation-specific investments in connection with the IOS (e.g. in inter-organizational implementation teams, team building, or training), the likeliness of the IOS's success is greater

7.4 Integration of key business processes

Integration of key business processes is evident in SCM literature as one of the main premises. The idea is that through efficient linking of key business processes within a supply chain, operations can be coordinated and run seamless. It was proposed that an IOS should enable and facilitate these integration efforts, and that inter-organizational BPR should establish procedures and adjustments so to align internal business processes with the IOS.

Integrated behavior, integration of processes, and redesigning business processes is frequently mentioned as important efforts in achieving the potential benefits from new technological solutions. From the literature review Zailani and Rajagopal (2005) start by clarifying that the theoretical basis and arguments for integrated behavior within a supply chain stem from the process reengineering literature. They closely examine literature from relevant journals and conclude that the benefits of supply chain integration can no longer be ignored. They posit, however, that such integration requires proper handling of inter-organizational relations. Their conclusion is that through integrating key business processes with supply chain partners, organizations can adapt to constantly changing market structures. The value of supply chain integration is empirically supported by Lummus et al (2008) who find that organizations that are conducting integration efforts with their supply chain partners perform higher in terms of cost, speed, flexibility, and reliability. Their ending remarks are very similar to Zailani and Rajagopal's (2005), as they posit that the competitive nature of business today requires organizations to integrate their supply chain as it is a key capability in meeting the demands of today's global customers.

IOS literature seems to support the notion that these integration efforts should be carried out through inter-organizational BPR. Siau (2003), who studied a number of successful IOSs, clearly states that it is those organizations that are able to manage major changes in work design and organizational structure who achieve the greatest benefits from IOS. It is not enough to simply lay an IOS on existing business processes – organizational redesign must go hand in hand with IOS development, and success will be obtained if the new technology is integrated effectively into the organization. Support is found from Auramo et al (2005) in that they claim that the use and implementation of IOS has to be coupled with process redesign to

achieve the potential strategic benefits from the technology. Supply chain processes have to be changed through inter-organizational BPR. This is in line with Ettlie et al (2005) who in their study of enterprise system implementation find that BPR is a key predictor in successful enterprise system deployment. The researchers conclude that business processes must be changed and aligned to the system, not the other way around where the technology is customized to fit existing processes. The notion of inter-organizational BPR is in line with TRV. Through redesigning, changing, and aligning key business processes with the IOS and thus up against the supply chain partners, resources can be coupled and combined in ways that competitors cannot easily match. As the resources become inter-organizationally complementary, they can function as a source of a competitive advantage.

From the above reasoning it is proposed:

P4a: If the organizations deploying an IOS for SCM purposes integrate key business processes, the likeliness of the IOS's success is greater

P4b: If the organizations deploying an IOS for SCM purposes manage to carry out inter-organizational BPR, the likeliness of the IOS's success is greater

7.5 History of success

In going through the initial relevant literature on IOS and SCM when developing the research model, it was clear that effective SCM requires a focus on building and maintain long-term relationship. The reason is obvious – sharing sensitive information, integrating processes, and cooperating on common goals are activities that require a lot of trust and commitment, and such psychological factors require time and a certain relationship duration to develop. History of success is in this thesis proposed as a factor that is critical in determining the success of an IOS for SCM purposes. The factor should comprise, from a theoretical viewpoint, the concepts of trust and commitment, as SET suggest that both is developed over time in a relationship if the outcomes resulting from it is beneficial to every party. Hence, developing feelings of trust and commitment between business partners requires interaction with positive outcomes over a certain period of time that is not regarded as short-term. In sum, the factor was developed and proposed as critical in affecting an IOS's success with a basis in four aspects:

- SCM literature which emphasizes the building and maintenance of long-term relationships
- IOS literature on success factors which highlights strong external commitment
- SET which implies that trust and commitment requires a certain relationship duration
- TRV that suggests that if there is trust and commitment between business partners then self-enforcing agreements may arise and can function as a source of a competitive advantage

Through the literature review it is revealed that the duration, or amount of interactions over time, is strongly positively associated to development of trust and commitment. Bullington and Bullington (2005) clearly state that the most certain way to build trust within a relationship is spending time together. Also, spending time together is a demonstration of commitment, supporting the view that organizations should invest in team building and training across organizational boundaries. Through committing time and resources to a relationship, the likeliness of the continued success of it is greater. This is also in line with Golicic and Mentzer (2006) who find that to develop closer supply chain relationships there is a need to develop high levels of trust, commitment, and dependence. What is evident, however, is that this is something that is developed over time within a relationship, and that supply chain partners should have a long-term orientation on their partnerships.

The findings of Kent and Mentzer (2003) suggest that if there is commitment between the supply chain partners there are higher levels of logistics efficiency. Further, if the organizations deploying an IOS perceive investment in the IOS from their supply chain partners, they can develop higher levels of relationship commitment. This supports the findings of Bullington and Bullington (2005) where they stated the enduring success of a relationship is strengthened if the parties commit time and resources to it. Kwon and Suh (2004) establish support to the importance of a successful partnership over time to achieve supply chain integration as they conclude that this is a long-term strategic process that requires trust and commitment. Last, Wu et al (2004) who emphasized the aspect of continuity, provide support in that they argue that if supply chain partners expect their business relationships to be long lasting, they are more likely to develop strategic integration. When business relationships have lasted for a significant period of time, they have conquered

challenges, adapted to changes, made adjustments, and become more comfortable in operating within long-term relationships.

With a basis on the above the following is proposed:

P5: If the organizations deploying an IOS for SCM purposes have a history of successful interactions, the likeliness of the IOS's success is greater

8. Conclusion

This final chapter is constituted by a conclusion including a summary of the findings and a short discussion on managerial implications, and finally a section concerning limitations and suggestions for future research.

8.1 Conclusion

The objective of this thesis was to identify factors critical to the success of an IOS when it is deployed for SCM purposes. Specifically, it was aimed at identifying the factors related to the interplay between organizations (i.e. the *inter-organizational* aspect). A model was developed through merging relevant research on SCM and IOS revealing five critical success factors of inter-organizational nature: *Long-term orientation, information-sharing, collaboration, integration of key business processes, and history of success.*

Findings from the literature review and the subsequent analysis suggest the following: (i) If the parties have a long-term orientation of their relationship; (ii) mutually share information on their business as well as operational and strategic information through the IOS; (iii) collaborate though mutually sharing risks and rewards, viewing each other as collaborators rather than competitors, and make relation-specific investments in connection to the IOS; (iv) integrate key business processes and carries out inter-organizational BPR; and (v) have a history of successful interaction, the likeliness of success is greater.

SET posits that relationships are strengthened over time when it offers positive outcomes. This is in line with the findings which clearly emphasize the collaborative aspect where supply chain partners should work in close relationships to enhance each others' value creation. The findings also support TRV's notion suggesting that supply chains partners should share information and complement resources in order to achieve a competitive advantage. The managerial implications from these findings are that organizations should not oppose or counteract business relationships of collaborative rather than pure transactional or operational character. Through emphasizing and strengthening their business relationships, however, organizations can develop a foundation highly appropriate for SCM practices. The deployment of an IOS can vastly support and facilitate these practices – nevertheless,

organizations considering such a large mutual investment should have a relationship mutually considered as long-term and valuable.

8.2 Limitations and future research

This thesis seeks to identify the *inter*-organizational critical success factors of an IOS deployment for SCM purposes. As such, technical and *intra*-organizational factors are not taken into consideration and this thesis does not attempt to provide a complete list of success factors to an IOS deployment or to explain their relationship in-between. Further, this thesis considers only those organizations which in mutual agreement decide to implement and deploy an advanced IOS for collaborative purposes. Hence, IOS of pure transactional or operational nature is not examined. Another issue that should be explicitly mentioned is that this thesis does by no means try to come up with a general or overall merger of the research streams of SCM and IOS. When the research on SCM and IOS in this thesis is merged it is limited to and with the goal of identifying the common denominators within the literature in respect to the deployment of an IOS for SCM purposes.

A last concern is that the research combining SCM and IOS is scarce, thus making it a research domain still in its infancy. Research within this “new” domain will most certainly develop, and the initial contributions will probably have several potential aspects of amendment. Consequently, the literature review is restricted to the, pro tempore, fairly small body of research within the interception between SCM and IOS. Future research should seek to further develop this highly current, yet relatively undiscovered, research stream. Last, the propositions developed in this thesis should be tested empirically. Organizations which have deployed IOS for achieving SCM in a successful way could be appropriate to analyze to assess the propositions.

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Appendix A – Articles in the literature review

Table 6: Article review matrix

Citation	Title	Journal	Type of paper	Focus
<i>Long-term orientation</i>				
Paulraj & Chen (2007)	Strategic Buyer-Supplier Relationships, Information Tecnology and External Logistics Integration	Journal of Supply Chain Management	Empirical	How strategic business relationships using IT affect external logistics integration and agility performance
Davis (2008)	A relationship approach to construction supply chains	Industrial Management & Data Systems	Empirical	How relationship variables influence supply chains within the construction industry
Shah, Goldstein, & Ward (2002)	Aligning Supply Chain Management Characteristics and Interorganizational Information System Types: An Exploratory Study	IEEE Transactions on Engineering Management	Empirical	To develop and test a theoretical framework merging SCM and IOS research in order to understand alignment of IOS capabilities with the needs of supply chain members
Ryu & Cook (2005)	The Effect of LTO Culture On International Supply Chain Contracts	The Journal of Applied Business Research	Empirical	How a business culture characterized as long-term oriented influence the formation of soft and hard contracts
<i>Information-sharing</i>				
Klein, Rai, & Straub (2007)	Competitive and Cooperative Positioning in Supply Chain Logistics Relationships	Decision Sciences	Empirical	How logistics relationships should be managed in terms of cooperative and competitive postures

Li, Yan, Wang, & Xia (2005)	Comparative analysis on value of information sharing in supply chains	Supply Chain Management	Literature review	Investigate 12 mathematical models on the value of information-sharing to determine whether information-sharing within supply chains is valuable or not
Fawcett, Osterhaus, Magnan, Brau, & McCarter (2007)	Information sharing and supply chain performance: the role of connectivity and willingness	Supply Chain Management: An International Journal	Empirical	How two distinct dimensions to information sharing – connectivity and willingness – impact supply chain performance
Grean & Shaw (2005)	Supply-Chain Integration through Information Sharing: Channel Partnership between Wal-Mart and Procter & Gamble	Published in book ¹ : E-Business Management	Case analysis	Understanding the role of IT in a business relationship through studying a ten-year long relationship between Wal-Mart and Procter & Gamble and how IT is leveraged by sharing data mutually
Kulp, Lee, & Ofek (2004)	Manufacturer Benefits from Information Integration with Retail Customers	Management Science	Empirical	Examine the impact of information integration on profitability within a supply chain
<i>Collaboration</i>				

¹ This is the only deviation from the restriction of utilizing solely articles which have been published in a journal. This paper takes the form of an article and constitutes a chapter in the book *E-Business Management*, and is included in the literature review because it provides valuable insight into a 10-year long successful relationship between two major organizations, Procter and Gamble and Wal-Mart, and how this relationship has developed through the deployment of an IOS.

Lefebvre, Cassivi, Lefebvre, & Léger (2003)	E-collaboration within one supply chain and its impact on firms' innovativeness and performance	Information Systems and e-Business Management	Empirical	To assess the relative efficiency of electronic collaboration tools and their impacts on innovativeness and performance in a supply chain
Johnston & Vitale (1988)	Creating Competitive Advantage With Interorganizational Information Systems	MIS Quarterly	Conceptual	Develop a framework to guide the search for opportunities through IOS
Makido, Kimura, Mourdoukoutas (2003)	IT and competitive advantage: the case of Japanese manufacturing companies	European Business Review	Empirical	How IT improves competitiveness
Chang & Shaw (2004)	Evaluating the Economic Impacts of IT-Enabled Supply Chain Collaboration	PACIS 2004 Proceedings	Empirical	Identify the value impacts of supply chain collaboration
Angeles & Nath (2003)	Electronic Supply Chain Partnerships: Reconsidering Relationship Attributes in Customer-Supplier Dyads	Information Resources Management Journal	Empirical	Discover important trading partner selection criteria that are relevant in electronic supply chain partnerships
Fawcett, Magnan, & McCarter (2008)	A Three-Stage Implementation Model for Supply Chain Collaboration	Journal of Business Logistics	Conceptual	How managers effectively can overcome cultural and structural hinders to SC collaboration
<i>Integration of key business processes</i>				
Zailani & Rajagopal (2005)	Supply chain integration and performance: US versus East Asian companies	Supply Chain Management	Literature review	To investigate supplier and customer integration and how different integration strategies differ and affect performance
Siau (2003)	Interorganizational Systems and competitive advantages – lessons from history	The Journal of Computer Information Systems	Multiple-case analysis	Successful IOS histories and their contributing factors

Auramo, Kauremaa, & Tanskanen (2005)	Benefits of IT in supply chain management: an explorative study of progressive companies	International Journal of Physical Distribution & Logistics Management	Multiple-case analysis	To provide empirical evidence of benefits from IT in supply chain management
Ettlie, Perotti, & Joseph (2005)	Strategic predictors of successful enterprise system deployment	International Journal of Operations & Production Management	Empirical	To theoretically and empirically find key predictors of success enterprise system deployment
Lummus, Vokurka, & Krumwiede (2008)	Supply chain integration and organizational success	SAM Advanced Management Journal	Empirical	To ascertain whether companies perform better when identifying themselves as high performers on supply chain integration
<i>History of success</i>				
Bullington & Bullington (2005)	Stronger supply chain relationships: learning from research on strong families	Supply Chain Management	Conceptual	To apply results of research on successful families to supply chain management in order to improve these critical business relationships
Golicic & Mentzer (2006)	An empirical examination of relationship magnitude	Journal of Business Logistics	Empirical	To examine the different dimensions of relationship magnitude
Kent and Mentzer (2003)	The effect of investment in interorganizational information technology in retail supply chain	Journal of Business Logistics	Empirical	To empirically test a theory-based supply chain relationship model
Kwon & Suh (2004)	Factors Affecting the Level of Trust and Commitment in Supply Chain Relationships	The Journal of Supply Chain Management	Empirical	To assess the role of trust and commitment within supply chain partnerships

Wu, Chiang, Wu, & Tu (2004)	The influencing factors of commitment and business integration on supply chain management	Industrial Management + Data Systems	Empirical	Commitment and business integration and their affection on SCM practices
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