QUALITY OF INTER-ORGANIZATIONAL SYSTEM (IOS) FRAMEWORK FOR SUPPLY CHAIN MANAGEMENT (SCM): STUDY OF SIX COLLABORATIVE FACTORS FROM SUPPLIER AND CUSTOMER PERSPECTIVES

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Abstract: *This paper has identified a research gap to study how organizations collaborate together to adopt Inter- Organizational System (IOS) for Supply Chain Management (SCM). We propose such a framework and then use four theories, namely resource dependency theory, organizational theory, actor-network theory and negotiated order theory, to understand how the framework supports management collaboration and interaction in the adoption of an IOS. This adoption framework is proposed to better study how senior management staff, from both supplier and customer perspectives, collaborate and interact in the IOS adoption process. The framework has been constructed from the literature identifying six major aspects for consideration namely: inter and intra organizational collaboration; strategic management approaches; supply chain design (SCD); business process redesign/reengineering (BPR); information systems (IS) / information technology (IT) architecture and external environmental factors. From customer and supplier perspectives the adoption of IOS for SCM, makes a significant contribution to knowledge in this field.*

Keywords: *inter-organizational Systems (IOS), supply chain management (SCM), strategic management, business process engineering (BPR), supply chain design (SCD), framework, collaborate, supplier, customer, supply chain operation reference (SCOR), quality*

1. INTRODUCTION

This paper proposes and illustrates the development of an IOS for SCM adoption framework by examining how factors influence the collaborative process between suppliers and customers. Within this paper, an adoption framework has been developed from normative literature drawn from IS, IT and SCM disciplines resulting in six collaborative factors being identified in influencing the collaborative process in IOS for SCM adoption. In order to understand how suppliers and customers collaborate together to adopt IOS for SCM in a supply chain network, this paper examines both perspectives. A greater understanding of the factors influencing the adoption from both supplier and customer perspectives will therefore be a great contribution to the IOS and SCM literature. In this paper we need to ask the main question *"How to successfully adopt an Inter-Organizational System (IOS) for Supply Chain Management (SCM)? "* To answer this question, we look at the literature and develop an IOS for SCM adoption framework (that incorporates the customer and supplier perspectives) as well as analysis of four theories: resource dependency theory; organizational theory; actor-network theory (ANT) and negotiated order theory to better understand the implication of

the adoption framework. For simplicity of argument this paper examines a typical supplier-customer relationship using the IOS for SCM adoption framework, but we acknowledge that more than two organizations are normally in a supply chain network.

Premkumar (2000) [44] discusses issues related to an integrated IOS in SCM, and highlights the potential benefits and management issues, and provides implementation guidelines. A number of studies such as Grover (1993) [17], and Premkumar and Ramamurthy (1995) [42] focus on factors that influenced the adoption of an IOS. Kurnia and Johnston (2000) [27] use both factor and procession approaches to give a better understanding of IOS adoption. Teo et al. (2003) [51] uses institutional theory to explain how mimetic, coercive, and normative pressures could influence the intention to adopt an IOS. A few studies, such as Rahim et al. (2002) and Johnston et al. (2004) [45], have examined the adoption of an IOS from both customer an supplier perspectives. No framework to date has been proposed, however, to examine an IOS for SCM adoption in a supplier-customer relationship.

A theoretical framework is proposed within this paper that outlines six ajor aspects of IOS for SCM adoption namely: inter and intra organizational collaboration; strategic management approaches; supply chain design (SCD); business process

redesign/reengineering (BPR); information systems (IS)/information technology (IT) architecture and external environmental factors. It is argued that an effective IOS for SCM adoption is influenced by a supplier-customer relationship; for instance, Frohlich and Westbrook (2001) [13] find that there is virtually no adoption of an IOS in the service industry. Furthermore, Bunker et al. (2007) [5] recently explored and illustrated the need to recognize and act on the nature and influence of different perspectives in IS adoption. This paper is limited to the management factors involved in the supply chain domain but acknowledges that other employees in the organization also have their contribution to the adoption process. Management has an important role to play because they have the authority to approve the project, provide financial support and power to influence the required change and re-structure of the organization [33]. This paper is arranged in the following order: (a) discussion of the four proposed theories on which the adoption framework is based; (b) introduction and examination of the background of SCM and IOS; (c) construction of an IOS for SCM theoretical adoption framework; (d) discussion of each of the six aspects of the framework; and (e) conclusion and discussion about framework limitations and areas of future study.

2. FUNDAMENTAL THEORIES FOR UNDERSTANDING OF IOS FOR SCM ADOPTION

Four theories, namely; resource dependency theory; organizational theory; actor-network theory; and negotiated order theory, are used as the fundamental theories by which to understand and apply the IOS for SCM adoption framework. This framework supports management collaboration and interaction during the adoption process and so the four theories form the framework context (explained in detail in Section 0 of this paper) as it applies to different organizational cases. These theories will now be discussed in turn.

2.1. Resource Dependency Theory

Resource dependency theory provides a holistic approach with explicit recognition of economic and socio-political dimensions of trading partner relationships. Resource dependency theory is used to study how inter-organizational relationships help an organization to better manage its resources and uncertainty [27]. However, supply and demand of resources can lead to the dominance of buyer or supplier in a supply chain network [8]. In turn, supply and demand of resources can lead to an imbalance in a power relationship between suppliers and customers. This paper argues that resource dependency and power

relationships influence management's decision in the adoption of an IOS for SCM.

2.2. Organizational Theory

Organizational theory has been used extensively to study organizations but the theory has also been used to study the relationships between two or more organizations. Literature usually focuses on structural characteristics (e.g. centralization, formalization and complexity) and behavioral process characteristics (e.g. power and conflict). We argue that structural and behavioral characteristics of managers influence the adoption of an IOS for SCM [31]. It has been argued that "a major limitation is that researchers have simply extended or adapted constructs from a within-organization setting to an across-organization level without articulating their distinct role or benefits in the new level of analysis " [4]. This paper uses actor-network theory, therefore, to compensate for this limitation.

2.3. Actor-Network Theory (ANT)

ANT is proposed to examine the interaction between "actors ", namely managers, within an organization and in a supplier-customer relationship. One of the strengths of ANT is that people and technologies are considered as actors, and are examined together as a social- technical network: "modern affiliations among individuals, groups, and organizations entail the use of ICTs to varying degrees; therefore, all networks can be viewed as heterogeneous socio-technical actor-networks " [29] ANT "seeks to position itself firmly in the middle of the spectrum between technological and social determinism " [47]. The proposed theoretical framework allows researchers to examine how people influence the adoption of technologies and how technologies influence people.

ANT allows the study of interaction between managers (people) as well as the IOS (technology). Like "actor SAP " described by Hanseth and Braa (2000 cf. Rose et al. 2005) in their study, IOS is a "powerful actor and an ally in getting the change process moving ". While ANT has its strengths, it also has its limitations: "… whilst technology becomes an independent actor in its own right, no distinction is made between the agency of technology and humans " [47].

2.4. Negotiated Order Theory

ccording to negotiated order theory, organizations negotiate the terms under which they will interact with one another in the future " [34]. Negotiated order theory is used extensively in the behavioral science literature to study inter-organizational collaboration: "negotiated order theory thus focuses on the symbolic and perceptual aspects of inter-organizational relationships,

particularly on the evolution of shared understandings among stakeholders of the domain's structures and processes, limits and possibilities " (Gray and Wood 1991, p.10) [17]. We apply this theory to examine the interactions between different stakeholders to address a shared problem or cause; in the case of this study, adopting an IOS for SCM [34].

Collaborative negotiation allows managers to express their interests and needs, and negotiate their differences and changes required to make the collaboration work. Incremental collaborative negotiation helps to build commitment from managers [52]. Furthermore, negotiation happens at both intra and inter-organizational level. The negotiation outcomes (with another organization) have to be sold to managers (in various departments) within an organization.

In order to understand how these four theories form the background to our proposed adoption framework, the next sections (3 and 4) of the paper will firstly define SCM and IOS, before examining the IOS for SCM (5) adoption framework.

3. SUPPLY CHAIN MANAGEMENT (SCM)

(SCM) is the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers. Supply Chain Management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption (supply chain). Another definition is provided by the APICS Dictionary where SCM is defined as the "design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally."

"Supply Chain Management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders " [30]. The benefits of SCM include improved productivity and operational efficiency; reduced inventories, operating costs, processing error and processing time [12]. Information sharing in a supply chain network is recognized as a way to overcome the bullwhip effect, which is defined as, "the phenomenon where orders to the supplier tend to have larger variance than sales to the buyer (i.e. demand distortion), and the distortion propagates upstream in an amplified form … " [31].In a supplier-customer relationship in a supply chain network, it is important to understand who (supplier or customer) drives the flow of goods. Demand Chain Management (DCM) is

defined by Frohlich and Westbrook (2002, p.729) [13] as, "practice that manages and coordinates the supply chain from end-customers backwards to suppliers ". DCM is a pull-process, i.e. the demand to buy goods is driven by customers, whereas SCM is a push-process where suppliers want to sell or push their goods to their customers [13].

4. INTER-ORGANIZATIONAL SYSTEM (IOS)

The benefits of SCM can be realized if organizations integrate their business processes and information systems together [12]. An IOS is a solution for SCM as "an automated information system shared by two or more companies … An IOS differs from an internal distributed information system by allowing information to be sent across organizational boundaries " [26]. In an IOS environment, shared information is expected to be kept in quality, correctness, completeness and reliability otherwise the "garbage in, garbage out " adage applies [52].

5. IOS FOR SCM ADOPTION FRAMEWORK

Authors such as Premkumar et al. (1997) [43] and Iacovou et al. (1995) [23] have published extensively in the area of IOS adoption. We propose that many managerial factors have an influence on the adoption process and this paper proposes a framework to allow researchers to examine and study how managers collaborate with their partners to: propose and execute a strategy; redesign a supply chain; redesign and reengineer business processes; develop Inter – organizational frames for multi – prospective purpose of using.

For IOS to function in SCM, it is "not only important to align the external partners' business strategies but also to look inward and redesign internal control systems and performance measures to ensure the success of these systems " [44].Within an IOS for SCM adoption framework (see Figure 1) common aspects are identified (and numbered) as (5.1) collaboration ((a) intra- and (b) inter-organizational); (5.2) strategic management approaches; (5.3) supply chain design (SCD) and business process redesign/reengineering (BPR); (5.4) IS/IT (in IOS) Factors; and (5.5) external environmental factors.The issues addressed by the various aspects of the framework are assumed to be the same for both supplier and customer's management teams.
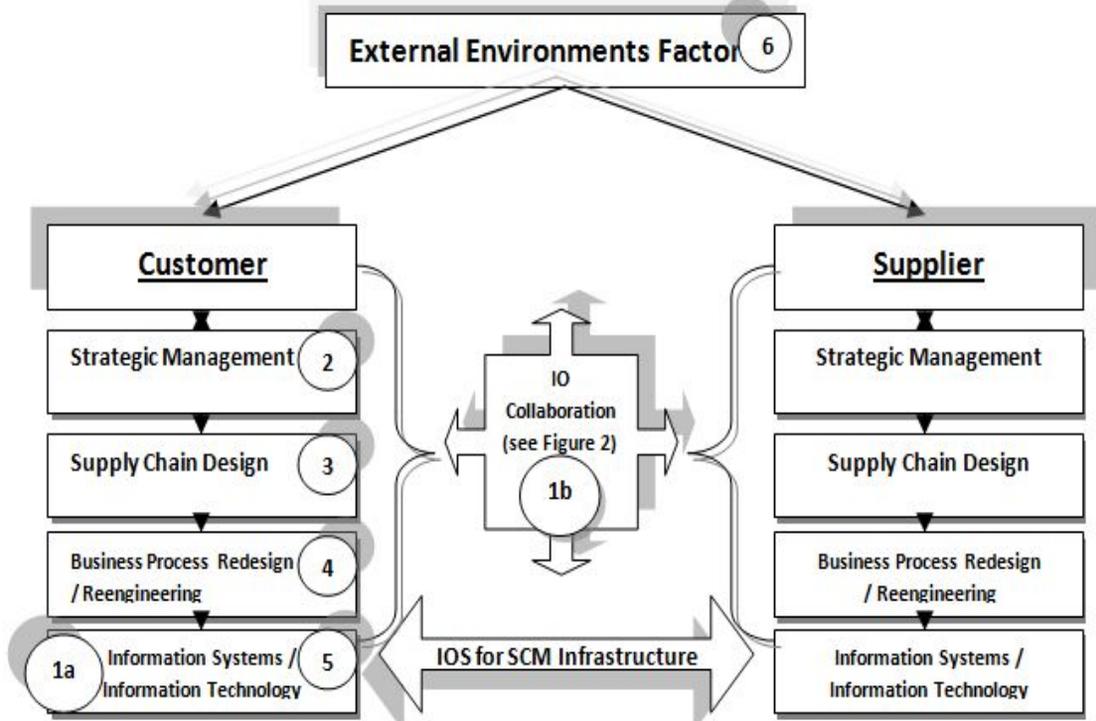
Figure 1: IOS for SCM Adoption Framework

Inter-organizational collaborative activities (1b) are expanded further to study how parties collaborate at strategic, process and technical levels as illustrated in Figure 2. The numbering in Figure 2 reflects the numbering of aspects of managerial collaboration identified in Figure 1.
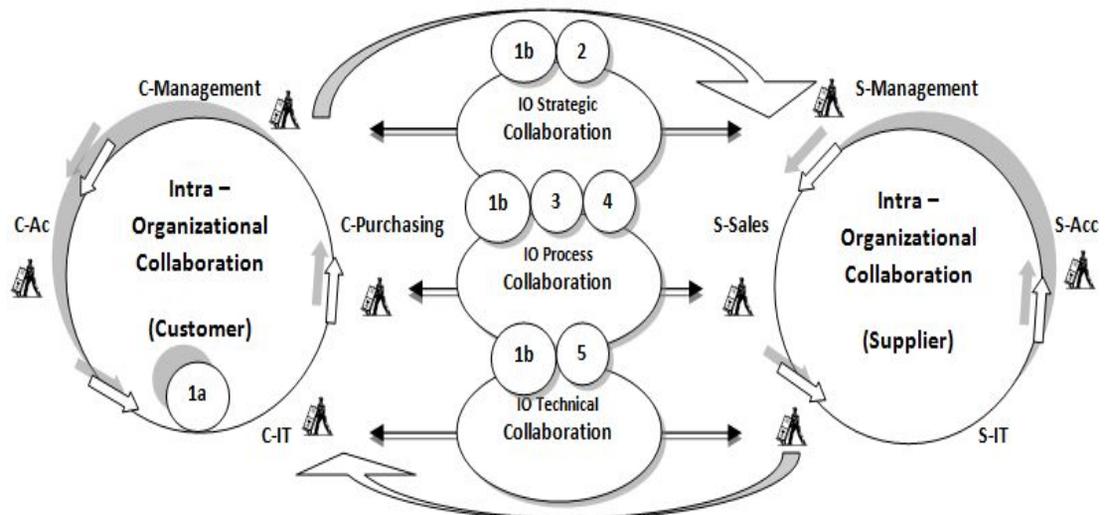

Figure 2: Intra- and Inter-Organizational Collaboration

Table 1. presents a summary of what are considered to be the most important IOS adoption aspects that need to be addressed when organizations collaborate. These aspects and the associated adoption factors in Table 1. are now addressed, discussed and justified for their presence in the framework.

Table 1. Important Aspects of IOS Adoption and Associated Factor

Aspects of Adoption	Adoption Factors (and References)
Strategic Management (for IOS adoption	Financial benefits (cost savings) [18] [37]
	Needs and Motivation [37]
	Resource Dependency [27]
	Power [22] [31] [43]
	Inter-organizational relationship [26]
	Trust [23] [30] [2]
	Selecting a Partner
	Organizational Characteristics [42] [23]
	Top Management Support [43] [17]
	Organizational Culture [32] [37]
	Value Added [48] [39]
IS/IT Issues	IS/IT readiness [23] [43]
	Selection of technologies and infrastructure [18]
	Development choice, e.g. in-house or third party [44]
	Lack of IT Personnel [18]
External Environmental Factors	Competitor [42]
	Professional and Business body [51]
	Government [9]

5.1 Collaboration

For supplier and customer to adopt an IOS for their supply chain network, they must collaborate to (re)design their supply chain, change their business processes and (re)designed their systems. Collaboration is an important step for organizations when they want to revamp their supply chain network to adopt an IOS [2]. Among researchers, there are various perspectives on the meaning of "collaboration"; collaboration is defined in this paper as, "the action of working with someone to produce something " [36] Collaboration is the process that links people within an organization and across organizations to "produce something " which, in this case, is the implementation and adoption of an IOS for its SCM. The success of Dell's "Direct model " is linked directly to collaborative activities in communicating and forming relationships with its 1,400 suppliers but Dell admits that the establishment of collaboration with its suppliers is an uphill battle: "it takes a lot of hand-holding just to get the ball rolling " [15].

The characteristics of collaboration in SCM are closer relationships, integrating processes, and the sharing of information, knowledge, risk, benefits and profits between organizations. It has been demonstrated, however, that to collaborate between organizations in a supply chain network is not an easy task [2]. We classify collaboration as shown in Figure 1 (1a) intra- and (1b) inter-organizational collaboration.

(1a) Intra - Organizational Collaboration

Intra-organizational collaboration is described as the communication and interaction activities between actors in an organization. Actors within an organization (say, in this case the customer) include the top management team, departmental management and employees working in departments presented as C-Management, C-Purchasing, C-SC and C-IT as shown in Figure 2. Some departments such as the Accounts department (C-Acc or S-Acc) might not be involved in the collaboration process directly but their input (e.g. cost-benefit analysis) or action might indirectly influence the action taken by managers from other departments within an organization. A fully functional IOS requires different managers from various departments within an organization to work together: Direct personal contacts across functions, liaison roles at each unit, cross-functional task forces, [and] cross-functional project teams. Research suggests that intra-organizational relationships can be problematic and a lack of communication, understanding or a reluctance to share information between departments may become a barrier to the adoption of an IOS.

(1b) Inter-Organizational Collaboration

On the other hand, an inter-organizational collaboration is an external communication and interaction between managers from different organizations (e.g. Dept C-Purchasing and Dept S-Sales shown in Figure 2). Inter- and intra-organizational collaborations are not isolated processes but one continuous communication and interaction process within an organization (1(a)) and between organizations (1(b)) as shown in Figure 2. A prior strong inter-organizational relationship between organizations will have a strong influence on inter-organizational collaboration. Having an inter-organizational collaboration with a partner can influence the decisions taken within an organization.

In Figure 2, inter-organizational collaboration is

classified as strategic and technical process based on all facets named above. For instance, in the case of inter-organizational strategic collaboration (1a-2), we argue that an inter-organizational collaborative strategy is developed through collaboration between the management (C-Management and S-Management) from both parties. The three levels of collaboration are described as:

(a) *Strategic Collaboration* (1b-2): This is the collaboration between top and senior management from both parties. They discuss and develop a collaborative inter-organizational strategy that satisfies both parties.

(b) *Process Collaboration* (1b-3-4): This is the level where both parties have to collaborate to redesign the supply chain network and reengineer the business processes so they will fit both parties. Managers within an organization, such as C-SC and C-IT, facilitate SCD and BPR through intra-organizational collaboration. At the same time, these managers collaborate across organizations with their partner such as C-SC and S-SC to design an inter-organizational supply chain solution and business processes. Hence, both intra- and inter-organizational collaboration, such as in the case of C-SC, are happening simultaneously and continuously for SCD and BPR.

(c) *Technical Collaboration* (1b-5): This is the technical collaboration to develop an IOS and supply chain infrastructure network between the IT departments (C-IT and S-IT) from both parties. Intra-organizational collaboration is expected between the IT and other departments, such as between C-IT and C-SC, to develop the systems. Organizational theory and ANT can be used to enlighten us as on the behavior, structure, interaction and influence between the managers within

an organization and with their partners. The outcome of the collaboration is for the managers to agree on an inter-organizational collaborative strategy that can be executed by both parties. Negotiation ordered theory is used to study the interaction between the managers as part of the negotiation process.

5.2 Strategic Management

To effectively adopt an IOS for SCM an organization must have a strategy. By way of a detailed example of how the IOS for SCM adoption framework can be applied, this paper will now examine the strategic management aspect of the framework in detail. Factors that can influence strategic management, as well as an application of the four theories in the IOS for SCM adoption process will be highlighted. Porter (1996, p.68) [40] defines strategy as "the creation of a unique and valuable position, involving a different set of activities ", and argues the essence of strategy is differentiation and choosing different sets of activities to achieve different values. Table 2 gives a summary of the background of strategic management for an IOS adoption, key people in the development of a strategy and the overall strategic approach. The adoption factors are summarized in this section because we argue that the management has to support the adoption process before it can be executed. The application of the theories for the framework is addressed in Section 0.

Factors that Influence Adoption of an IOS for SCM
The strategic management adoption factors for an IOS (presented in Table 1.) are now summarized in Table 3. It is necessary to examine these adoption factors from both supplier and customer perspectives in order to understand how each of these factors lead to a successful adoption of an IOS for SCM.

Table 2. Summary (2) Strategic Management for IOS Adoption

Issues/Factors	Description
Background	Authors such as Porter (2001) [40] argue that the use of technologies such as EDI-based or Internet-based anable the strategy to provide competitive advantage; examples nclude Baxter Healthcare, American Airlines and Wal-Mart [38].
Key People	Top Management, Senior Management, Project Leader (and Project Champion)
Purpose of an IOS strategy	An inter-organizational collaborative strategy is developed to fit the goals, needs and objectives from both parties. The strategy includes changes to business processes and the adoption of appropriate infrastructure and technologies.
Strategy Approach	No specific IOS adoption strategy is suggested in the literature and studying strategy in an IOS environment is complicated because it involves at least two organizations. We believe, however, that the systemic approach as described by Whittington (2008) [54] is the most appropriate approach because on one hand, it focuses on profit and on the other hand, we can examine the social elements such as power which managers within and external to the organization have to address.

Table 3. Factors that Influence the Adoption of an IOS for SCM

Strategic Management	
Issues/Factors	**Description**
Financial Benefits	Organizations with the most to gain from "SCM vs. DCM " (as discussed) are more likely to be the ones motivated to develop a collaborative strategy. Reduced inventories, operating costs and processing errors are examples behind the drivers of adopting an IOS [12].
Needs and Motivation	An organization must have interests, needs and motivation to collaborate with their partners to adopt an IOS for SCM [37]
Resource Dependency	Supply and demand of resources can lead to a dependency between supplier and customer. However, customers might not want to "lock-in " and depend on one supplier using its IOS because this hampers competition among its suppliers even when there is a clear financial benefit [7]. Resource dependency theory can be used to explain the rivers behind the adoption of an IOS and hence organizations with the most to gain are more likely to have these drivers in place.
Power Relationships	Resource dependency as discussed in (c) can lead to the dominance of buyer or supplier in a supply chain network; this can lead to an imbalance of power relationships between supplier and customer [8]. For example, Ford's strategy was to use its coercive power to lock in its suppliers to its proprietary network and inhibit them from trading with their competitors; thus, sharing information with its suppliers is not a reason behind the adoption [53]. The role of power can lead to different IT outcomes [24].
Inter-organization relationships	Koch (2002) [27] discusses inter-organizational relationship as a network, an alliance and resource dependency between organizations (c). Bensaou and Venkatraman (1996) [4] develop a conceptual framework to understand inter-organizational relationships from information processing needs and capabilities. Oliver (1990) [35] comes up with six contingencies for organizations to establish an inter-organizational relationship and they are : • Necessity: firms enter relationships to meet necessary legal or regulatory requirements. • Asymmetry: firms enter relationships to exercise power or control over another organizations or its' resources. • Reciprocity: firms enter relationships to pursue common goals. • Efficiency: firms enter relationships to improve their internal input/output ratio. • Stability: firms enter relationships to respond to environmental uncertainty. • Legitimacy: firms enter relationships to appear in agreement with the prevailing norms.
Trust	Trust is developed between the organizations and trust can help to reduce uncertainty during IOS development; trust can include competence, openness, reliability and caring relationships (e.g. providing help and training), [22] [30].
Selecting a Partner	Selecting a right partner to collaborate within a supply chain is mandatory and the selection criteria; reliance of resources (c); power relationship (d); previous IO relationship (e); and trust developed between the organizations are included (f).

Application of Theories to the IOS for SCM Framework

The four theories and their application to the framework are summarized in Table 4. Researchers use these theories as the basis to study how managers interact and collaborate at a strategic level to adopt an IOS for SCM

Table 4. Application of Theories

Issues/Factors	Description
Resources Dependency	Resource dependency theory is used to examine the influence of resources in the development of an IOS based on the relationship of an inter-organizational dependency between suppliers and customers. Resource dependency helps us to understand the "formation of inter-organizational linkage [which] helps an organization acquire resources and manage uncertainty " [27].
Organizational and ANT	Two organizations are likely to have two different strategies and directions; thus, these strategies might not always be compatible with each other. This may result in an organization having to start from one strategic approach and then change to a different one in order to achieve its objectives or to compromise its position with partners. The changes might be linked to physical constraints, incompatible systems or resisting change from partners. ANT helps to understand the interaction and influence from different managers within an organization and between different organizations. ANT is also advantageous in the study of the formation of inter-organizational relationship and how inter-organizational relationship influences organizations to collaborate to adopt an IOS.
Negotiation Order	The power dominance resulting from resource dependency will influence the negotiation process between supplier and customer. The negotiation between managers will result in an outcome in inter-organizational collaboration. On the other hand, an intra-organizational collaboration influences the decision making within an organization which in turn influences the decisions taken with its partners. Two organizations are expected to negotiate IOS issues, resolve their differences and comprise to find a common ground that leads to a proposed IOS collaborative strategy. It has been suggested to set up ground rules, e.g. trading terms, between organizations to avoid future conflict [20].

Having looked in detail at the strategic management aspects of the adoption framework as an example to explain its application, we will now briefly look at the other aspects of the framework in turn. Each of these aspects can be expanded (similarly to strategic management) for illustrative purposes when the framework is described in full.

5.3 Supply Chain Design (SCD) and Business Process Reengineering/Redesign (BPR)

Organization and its partners have to collaborate and work together to redesign, reengineer and streamline common business processes to build a "superefficient " supply chain network [20]. This is important because, "competition no longer means one company competing with another company – it means an entire supply chain competing with another supply chain " [10]. These aspects (SCD and BPR) are tightly linked. SCD is the (re)design of a supply chain by integrating the flow of information, movement of goods and business processes such as production planning, inventory control, distribution and logistics [3]. SCD is influenced by other framework aspects such as selection of a strategy, the maturity of the technology infrastructure, level of collaboration, and the level of information sharing agreed between organizations. In turn, BPR is influenced by level of business processes which organizations are willing to reengineer. In a real world situation, the original design of a supply chain might require further modification due to unforeseen technological problems or business issues.

First of all, SCD depends on the selection of an IOS strategy, i.e. it is influenced by this aspect of strategic management. Different SCM strategies, such as Just-In-Time (JIT), Zero Inventory (ZI), Efficient Consumer Response (ECR), Vendor Managed Inventory (VMI) or Continuous Replenishment Process (CRP), influence the design of an IOS for SCM.

Once SCD is aligned with a strategy, the business process modeling must fit the SCD in an IOS environment. To fit the SCD in an IOS environment, existing business processes have to be remodeled or reengineered. Hammer (1990) [19] introduces the idea of "reengineering "; and together with Cox (2001) [8], they enhance the concept of BPR as, "fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed. "

5.4 Business Process Reengineering/Redesign (BPR)

An organization has to reengineer its business processes with their partners which are based on SCD to achieve the IOS functions - this is sometimes also known as "process X-engineering. " Similarly, an organization has to change and streamline its internal business processes to maximize the benefits of IOS [20]. An important point here is that organizations should understand their own processes first before attempting to understand their partners [11]. Without achieving BPR at the intra-organizational level, the benefits for an IOS might not be achieved at the maximum level. Intra- and inter-organizational

collaboration between management will help drive BPR at the organizational level as well as at the inter-organizational level.

SCD and business modeling will lead to requiring system and infrastructure development for an IOS. A process-oriented model such as the SCOR (Supply Chain Operations Reference) model could be used for both supply chain and process design; SCOR has been used as a designing tool as well as to identify, define and link business processes within an organization. Furthermore, the SCOR model is used by large global manufacturers such as Coca-Cola and Unilever.

The inter- and intra-organizational collaboration is a continuous communication and interaction within an organization and between customer and supplier which leads to the enhancement of business processes. BPR has to fit both perspectives. The departments have to firstly agree to reengineer their intra-organizational processes within an organization; and secondly, the inter-organizational processes have to fit their partners' business processes. The enhanced business processes have to fit the new IOS for SCM, and vice versa.

BPR also has to consider employees within an organization because changes are implemented for the employees but also by the employees. One of the negative aspects of BPR and systems implementations is that employees may be afraid of losing their jobs which leads to resistance to change [33]. Therefore, the most successful reengineering projects direct attention to social design and process transformation. Examples of identified social design include defining jobs and incentives, developing and fostering shared values, and designing change management programs.

5.5. IS/IT (in IOS) Factors

This paper does not focus on physical infrastructure or networking design of an IOS but the basic issues of constructing an IOS are addressed. Examples of an IOS include e-procurement and EDI-built systems. IS/IT readiness is a major factor that influences IOS adoption [22] [43] . Technical compatibility could be a challenge for the organizations but with the advancement of technologies such as the Internet, portal and web services technologies, building an IOS for SCM is less troublesome than in the past [1]. The physical architecture design of an IOS includes primary technology choice, client/server architecture and the nature of linkages [18]. Furthermore, depending on the strategy (e.g. with a single partner or with multiple partners) and the development costs, means that an organization has a choice of developing and implementing an IOS by way of: (a) an in-house team; (b) a third-party; (c) a purchased or packaged solution; (d) a combination of the options (a), (b) and (c) [44]. Finding personnel with essential skills to develop an IOS could also be a barrier for management, whilst another obstacle may be financial, where organizations have to invest capital to redesign their own internal systems as well as the IOS with their partners [18].

5.6 External Environment Effects

The external environment also influences the IOS adoption process. An organization might be pressured by its competitors within its industry to adopt an IOS [6]. Alternatively, an industry professional and business body might influence all of its members to adopt IOSs in a supply chain network or marketplace in order to improve the overall efficiency and effectiveness of that industry [31]. Furthermore, a government might influence the level of awareness and adoption of IOS for a particular industry by providing funding and support for the development of an infrastructure. [9]

6. CONCLUSIONS

This paper develops and proposes an IOS for SCM adoption framework in which six collaborative factors are identified to influence the collaborative process as well as highlighting the relationships between some of these factors. A research approach based on a pluralist methodology is proposed to test and enhance the framework.

This paper also recognizes that the non-management members of an IOS project team have an important part to play in the adoption and implementation process overall, but that the model needs significant further development to include these roles. The IOS for SCM adoption framework in this paper illustrates a one-to-one supplier-customer relationship. In the real world, supply chain networks are different for different industries; hence, different sets of adoption factors are expected to influence different industries [37]. We propose that a researcher must have an open-mind and "expect the unexpected " when using this theoretical framework. For example, if an organization decides not to change its business process, then its partner might have to find an alternative way to work around the problem to find a different solution that might not be documented. The perspective of customer benefits might be different from those of a supplier. The way to execute a strategy within an organization might be different from the approach to execute a strategy with its partners. An organization might have the controlling power over its employees, but the power over its partners might be different and delicate.

The result of this research aims to show how to increase the quality of IOS for SCM and to clarify the interaction between managers and process of deciding which framework to adopt for better SCM functioning from suppliers and customers perspectives

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