Internet-Enabled Supply Chain Systems: Drivers *or* Inhibitors of Collaboration?

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Abstract

Today many firms are attempting to reconstruct traditional trading relationships in the supply chain by pursuing collaborative partnerships. Some firms have introduced Internet-enabled supply chain systems to integrate strategic suppliers into collaborative networks to promote cooperative activities and relationships. In reality, many of these so-called 'collaborative' supply chain systems have underperformed or been terminated. Although these supply chain systems frequently achieve gains in operational performance, they often fail to enact any substantial relationship change or redesign business activities required for collaboration. Supply chain participants need to be actively engaged, committed and resolve conflicts to obtain any benefits from an Internet-enabled collaborative system. In this paper, the authors propose a framework that identifies the key factors that drive (or inhibit) collaboration when implementing a supply chain system. This research investigates the impact of an Internet-based collaborative supply chain system on both manufacturer and supplier participants. Based upon empirical data from an EC-Funded Fifth Framework Project, the framework is tested on an Internet-enabled system to promote collaboration between manufacturers and their supplier network.

Keywords: *Inter-Organisational Systems, Integration, Supply Chain, Internet-Enabled, Collaboration*

Introduction

In today's global marketplace, many companies are expanding their business strategies and operations by leveraging the competencies and capabilities of other firms in their supply chain. Increasingly, there is a shift in the unit of competition from the individual company to the supply chain, where competitive advantage is derived from the supply chain as a whole (Handfield and Nichols, 2002). One such opportunity is to develop Internet-based technologies that transcend traditional boundaries to automate and integrate supply chain functions between trading partners. Volkswagen Group, for instance, have claimed to recoup their outlay costs for a supplier network portal within a year through "reduction in administrative tasks, acceleration of processes, improved planning accuracy and improved transparency in the collaboration with suppliers" (Neumann *et al.*, 2005). Whilst there is a plethora of literature extolling the benefits of collaboration in supply chain relationships, achieving it in practice is often difficult. The promise of collaborative supply chain technologies as advertised by vendors has fallen short of expectations. Organisations are discovering that real world problems and questions are complex and unique in collaborative environments. For example, the close buyer-supplier relations in Japanese automobile manufacturers are often considered a benchmark in partnering relationships. However in 2001, Toyota, discovered it was paying significantly higher prices for parts inside its network of suppliers than

were available outside this network (Shackleton *et al.*, 2005). Similarly, Chrysler, after attempting to replicate Japanese-style partnerships found that suppler relationships were “so cozy” that competitors were extracting better prices for similar parts (Ball, 2001). In particular, firms implementing Internet-enabled supply chain systems need to consider their resources and ability to handle necessary challenges (Pant et al., 2003).

In this article, we outline and assess the impact of deploying an Internet-enabled system for the purpose of promoting collaboration in three separate manufacturing supply networks. This study proposes a new framework which identifies the key factors influencing the impact of Internet-enabled supply chain systems within diverse supply chain relationships. In particular, this paper highlights the critical enablers which can also act as inhibitors of collaboration in buyer-supplier relationships. This framework was developed and tested in conjunction with an EC-funded Fifth Framework Initiative - *Collaborative Improvement Tool for the Extended Manufacturing Enterprise*.

Internet-Enabled Supply Chain Systems and Collaboration

One method to pursue supply chain connectivity is through inter-organisational systems (IOS) that permeate traditional boundaries to transfer information and knowledge between participants. Using information systems to integrate trading partners has been in existence since the 1960s with the advent of Electronic Data Interchange (EDI). After nearly four decades of prior research, many authors (e.g. Malone *et al.*, 1987; Clemons and Row, 1992) have illustrated the potential to reduce costs and provide operational benefits by introducing IOS systems within supply chains. In the 1990s, the emergence of the Internet has shifted attention to the potential of this ubiquitous platform for trading partners to support collaborative applications to exchange information and knowledge (Harrison and Van Hoek, 2002). These collaborative IOS can be defined as hubs where companies can exchange proprietary data, jointly manage projects and cooperate on the design of new products (Williams, 2000). Often Internet systems are perceived as an 'enabling technology' (Porter, 2001:64) in providing operational and potentially strategic benefits to their supply chain activities (Handfield and Nichols, 2002). Research on Internet-enabled IOS in the context of supply chains has been scant and fragmented (Subramani, 2004). This is evident in the extant literature which has used various terms to describe these systems such as Internet-enabled (e.g. Barua *et al.*, 2004; Subramani, 2004), Internet (or electronically)-mediated (Schultz and Orlikowski, 2004; Myhr and Spekman, 2005), and e-supply chains (Pant *et al.*, 2003). Garcia-Dastugue and Lambert’s (2003) argued that a wide range of Internet-enabled coordination mechanisms have empowered the supply chain by facilitating information flows, and the integration of business processes across the supply chain. One notable study is Subramani’s (2004) study of the benefits of Internet-enabled supply chain systems for suppliers. She found patterns of system use enabled suppliers to both create value and retain a portion of the value created by the deployment of these systems in inter-firm relationships.

However, one key area of contention in the literature is the effect (or non-effect) of IOS on interpersonal relationships in the supply chain. Some research (Grover *et al.*, 2002; Zhu and Kraemer, 2002; Myhr and Spekman, 2005) argues that routine communication tasks and data exchanges are automated and monitored in an IOS, which releases trading partners to engage in more cooperative activities. This argument is based on the idea that automation allows individuals to spend more time on intense, problem solving interactions which require more interpersonal and face-to-face contact. However, this assertion is challenged by Schultze and Orlikowski’s (2004) finding that a decline in customer-supplier interaction quickly led to a weakening of inter-firm relationships. They concluded that the use of Internet-based technology reduces the opportunity for joint problem solving and there is less collaboration among the participants which challenges the value of interpersonal, inter-firm relations (Schultz and Orlikowski, 2004).

Delving further into this issue, Myhr and Spekman (2005) argued that electronically mediated exchange is a more important determinant of collaboration in supply-chain relationships involving standardised products, while trust is more of a factor in achieving collaboration involving customised products. This study inferred that by constant interaction and information sharing via electronically mediated exchange, partners experiences a closer bond and this serves to re-enforce trust that contributes to collaboration. However, in the complete absence of trust, these non-personal electronic exchanges will not be powerful enough to achieve the requisite base-line level of collaboration (Myhr and Spekman, 2005). Similarly, da Silveira and Caglaino (2006) claim that dyadic IOS provide companies with the ability to strengthen relationships within 'stable' supply networks but not within dynamic (or market-based) networks.

Collaboration in Supply Chain Systems

For a successful implementation of an integrated supply chain system, a vital ingredient is generating collaboration amongst the trading partners. Collaboration is defined as a process of decision making among independent organisations involving joint ownership of decisions and collective responsibility for outcomes (Gray, 1991:227). The benefits of collaboration derive from the opportunity to access new markets, new technologies and new skills, to reduce operational costs and product time to market, and to optimise overall supply chain performance (Hagedoorn, 1993; Eisenhardt and Schoonhoven, 1996). Important components of successful collaborative relationships include: a commitment to working together; goal congruency and benefit sharing. Hence, the success of collaboration depends upon the ability and willingness of managers to build meaningful relationships and create trust (Schrage, 1990). A central premise of collaboration is the extent to which companies are willing to share information and give up their individualism in favour of more collaborative partnerships (Reekers and Smithson, 1994). Hence, this study investigates the importance of information sharing in the relationship to achieve impact from collaboration. Thus the following proposition is tested.

Actually achieving any collaborative impact from a system between supply chain members is a difficult task. Pant et al. (2003) concluded firms need to understand different options for implementing e-enabled supply chains keeping in mind their resources and ability to handle associated challenges. Cultivating collaboration among disparate participants requires a level of change in behavioural aspects as well as technical processes. In reality, the implementation factors (technological) and process (behavioural) are inseparable since they are interrelated (Mendoza et al., 2005). Numerous studies have assessed the technical implementation dimensions of inter-organisational systems. Therefore, this paper focuses on the often neglected but essential ingredient of behavioural change. Behavioural change concentrates on the process change involved in the implementation of the system. Many studies (e.g. Mendoza et al., 2005) have suggested that re-engineering the business process is the most important part of implementing an inter-organisational technology. To fully achieve more information and knowledge sharing, organisations need to enact behavioural changes to foster collaboration. One way to promote behavioural change is to support individual action with structures and mechanisms. The underlying structure facilitates mutual understanding and sharing of resources and processes, consensus building, and the formalisation of roles and responsibilities (Schrage, 1990). For example, a well-developed leadership role, high levels of trust, communication and interaction contribute to the concept of collaboration as synergistic, unique and often "unusually creative" (Huxham, 1993). In a study of two cases of collaboration among supply partners, Boddy et al. (2000) found that actions taken to change aspects of the contextual relationship facilitated more co-operative behaviour. In particular, the improvement of interpersonal relations led to actions to create more formal mechanisms which supported future co-operation and collaboration.

The main research question to be investigated is:

> *To what extent does the implementation of an Internet-enabled supply chain system influence buyer-supplier relationships attempting to promote collaboration?*

Research Design

Many previous studies evaluating inter-organisational systems deploy large-scale surveys using a static cross-sectional approach. This method often excludes the process involved in implementation, which is of paramount importance in technologies nurturing collaboration. Furthermore, many political and environmental aspects are not captured by these static rational models (Grover, 1993). By taking a process-based approach, the researcher can obtain more insight into the dynamics of the operationalisation, which distinguishes "collaborative technologies" from those based around coercion. A process-based approach can examine the affects in various stages of adoption, implementation and impact of all the participating organisations. In order to investigate the dual perspectives of the dyadic relationship, this study examines the supply network participants from both buyers and suppliers.

To investigate the impact of implementing a collaborative supply chain system, an appropriate technique must be incorporated into the research design. The design of this study combined multiple forms of investigations including literature analysis; empirical studies and observations as a basis for the framework. By incorporating multiple sources of evidence, this study allows the data to converge in a triangulating fashion (Stoecker, 1991). This field study approach involved the development of pre- and post- implementation questionnaires to investigate the contextual factors and changes in IOS implementation. It is based around variables shown to be significant by previous studies and validated through pilot investigations. This questionnaire was completed by a participant from each of the organisations involved in the project. This instrument was designed to capture the actual and perceived changes indicated by the actual participants. To complement the questionnaire data, the researchers acted as participant-observers, were actively involved in several one-day workshops over a period of 18 months. In addition to the participant observations, multiple sources of evidence were gathered to provide further support for the outcomes of the operational and learning process. Data analysis was based on reflective notes of each workshop, interviews with each participant and questionnaire results based on the collaborative improvement initiatives.

Empirical Data

The empirical data consists of three supply networks, each comprising a systems integrator and three or four existing suppliers. A system integrator (SI) is defined as a company that integrates components provided by suppliers. The suppliers ranged from small enterprises (50) to medium enterprises (up to 250) and were pre-selected due to their strategic significance. All these firms were participants in an EC-funded project called *Collaborative Improvement Tool for the Extended Manufacturing Enterprise* (Co-Improve). This academic-industry research project spanned the period from 2001 to 2004 and consisted of Dutch, Danish and Italian manufacturing-supply networks.

The Dutch System Integrator (SI) specialises in 'Motion Control'-systems for different markets, such as the automotive, truck, marine, medical and agriculture market. The company has mounted a strategic objective to produce zero-defect products together with the lowest total cost from world-class suppliers based on quality, cost and delivery. The suppliers selected by the system integrator to participate in the project all represent different types of relationships and deliver different categories of products (see Table 1). This selection allows information and communication to pass freely throughout the whole group without running the risk of giving away (or transferring) sensitive information to competitors.

With more than 7.000 employees and 21 factories in North America, Europe and East Asia, the Danish System Integrator is among the largest manufacturers and suppliers of mobile hydraulics in the world. This global manufacturer produces hydraulic components and electronics to Original Equipment

Manufacturers (OEM) of mobile machines within the agriculture and construction industries. The underlying reason for the selection of these suppliers is that they are perceived as strategically significant however there is no history of collaboration or IOS integration.

Similarly, the Italian System Integrator is a large manufacturer of aircraft and sub-systems for the aeronautical industry in both the military and civilian markets. This firm's products are designed and assembled by the large aircraft consortia players. The suppliers for this project were chosen for the purpose of developing more integrated, collaborative relationships.

Table 1: Description of the Companies in the Co-Improve Project

	Dutch System Integrator	**Dutch 1**	**Dutch 2**	**Dutch 3**	
Description	Manufacturer of automotive hydraulics	Supplier of plastic parts	Supplier of precision parts	New supplier of cylinder-tubes	
Employees	> 700	200	55	160	
	Danish System Integrator	**Danish 1**	**Danish 2**	**Danish 3**	
Description	Manufacturer of mobile hydraulics	Supplier of metal parts	Supplier of foundries	Supplier of metal parts	
Employees	> 7500	80	250	65	
	Italian System Integrator	**Italian 1**	**Italian 2**	**Italian 3**	**Italian 4**
Description	Manufacturer of Aeronautical components	Supplier of surface metal parts	Supplier of structural components	Designer of manufacture prototypes	Supplier of metalworking & treatments
Employees	>1800	200	800	14	30

The technical architecture of the *Co-Improve Software is* a bespoke system based on TCP/IP protocols. The Co-Improve Software is a Web based product, with Java Server Pages (JSP), and HTML code. The software architecture is a three-tier solution: Web-client, software company platform, and Oracle database. This web-based *portal* only requires a web browser with 128-bit encryption capability to gain access to the secure server hosted by the software company. The aim for the Co-Improve software is to require zero installation and integration. To support the implementation of the software system and collaboration between the participants, a formal intervention programme was established in all three networks over a period of eighteen months through a cycle of fifteen to eighteen workshops. These workshops were organised through mutual consent with the participants on a monthly basis, schedules permitting. The workshops were aimed at engaging companies in collaborative improvement activities, involving processes of diagnosing, fact-finding, implementation and evaluation of improvement actions. This series of workshops were designed to involve all the participants and immerse the firms in a learning environment to promote collaborative improvement projects and software system use.

Findings

To evaluate the level of change in the participating organisations a simple framework was deployed based around a road-map approach developed during the initial consultation stages and evaluated at set stages during the project (Corbett et al., 1999). To ascertain the impact of the implementation of the system, a combination of different measures were gathered from each participant. An examination of the level of change occurring in the ten dyads was undertaken after eighteen months.

The impact on each dyadic relationship was assessed in two main categories:

(1.) *Strategic & Performance measures* – contract; sales volume change; cost; quality; and delivery.

(2.) *Perceptual indicators* - information sharing; knowledge sharing; system benefits; communication change; process change; relationship change, shared goals change; trust change; behaviour change.

Overall, there has been evidence of some operational performance improvement, transference and uncertainty reduction between the firms. Specifically, in the Dutch network, all the suppliers reported an increase in the frequency of meetings, quality of communication, increase information and knowledge sharing. In Dutch 1 dyad, the internal scrap rate was reduced on one product by 33%, achieving some cost reduction and reduction in defect rate PPM. Both parties indicated a slight incremental improvement in process change. In Dutch 2 dyad, there was 5 % increase in sales volume and a reduction in the reject rate due to improved cleanliness of their delivered products which amounted to a slight discontinuous process improvement. An anecdotal indicator of success of this one initiative was that the SI has decided to adopt this approach in order to cultivate a strategic improvement initiative through a 'roll out' to other suppliers. In Dutch 3 dyad, both firms reported no improvement in their relationship although there was a slight incremental improvement in the joint processes. Interestingly, all the Dutch dyads reported little or no relationship improvement.

In the Danish Network, there is evidence of some operational performance improvement, transference and relationship improvement between the firms. In particular, all the dyads reported some performance gains. In Danish 3 dyad, the supplier achieved a strategic benefit through the procurement of a new purchase agreement. All three dyads indicated an increase in frequency of meetings, quality of communication, information and knowledge sharing. Interestingly, nearly all the respondents reported a moderate or significant (highest level) improvement in process change. In particular, two dyads indicated a moderate to significant level of change in relationship; trust and behaviour. Indicating a substantial level of relationship impact was achieved from the project. Most surprising was that a majority of the respondents indicated that 'none at all' of their expected benefits were achieved from the system.

Combining all the individual responses, Spearman R test was used to evaluate the strength of the relationship between each variable. These results show correlation is significant at the 0.01 level between behaviour change and four variables: *trust change*, *relationship change*, *knowledge sharing* and *process change*. In addition, correlation is significant at the 0.05 level between behaviour change and *goal sharing change*. In other words, the higher the behaviour change, then the higher the change in each of the five impact variables. Moreover, the results show a strong correlation (significant at the 0.01 level) between quality of communication change and *relationship change* as well as *goal sharing change*. Further results reveal correlation at the 0.05 significance level between quality of communication change and *trust change* as well as *process change*. However, the correlation between quality of communication change and *knowledge sharing* was not significant.

The results also revealed a strong correlation between *trust change* and all the other impact variables. A strong relationship correlation (significant at the 0.01 level) was found with *relationship change* (r_s=0.86). In addition, there was also a correlation (significant at the 0.05 level) with *goal sharing change* (r_s=0.47), *knowledge sharing* (r_s=0.49), and *process change* (r_s=0.53). In other words, the higher the trust changes

then the higher the changes in relationship, goal sharing, knowledge sharing, and process change. Finally, the results indicated that information sharing change had a statistical correlation and strong relationship with certain impact variables. The strongest relationship correlation (significant at the 0.01 level) was found with *trust change*, *knowledge sharing*, and *process change*. There was also a correlation (significant at the 0.05 level) with *relationship change*, and *goal sharing change*. These findings suggest a higher change in the four variables (behaviour change; communication change; trust change; & information sharing) during implementation is linked to greater impact on collaboration within buyer-supplier relationships.

Another issue is to what extent (if any) the system had an effect on collaborative practice in this project. Hence, this study investigated the influence of the Internet-enabled system by analysing the usage figures of the software. The total usage of the software system, as measured by the number of hours logged on, indicated a low uptake overall (illustrated in Figure 1). Furthermore, this analysis compared the implementation timeframe, which coincided with the workshop sessions of the project, with the usage patterns of the software. This comparison showed a substantial initial use during the early software training sessions particularly in the Danish and Italian networks. However, after this initial training period, the usage pattern reveals a sharp fall off for the reminder of the project across all three networks.

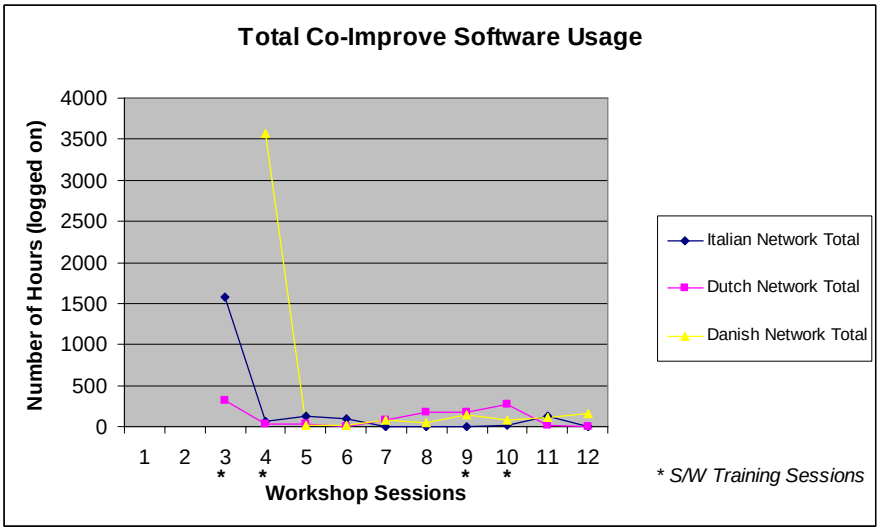

Figure 1: Total Software Usage by Network

To delve further into the usage patterns of each network, the author calculated each participant's software usage by dividing their individual hours logged on into the total amount of hours. Accordingly, Table 3 shows that the percentage of uptake throughout the Dutch network is low with one participant never logging on and two others with very few attempts. The Italian network portrays a similar pattern with low usage from all the participants. In contrast, the Danish network experienced mixed levels of usage with three individuals registering medium levels and three low levels of use. However, when these individual patterns are compared to the overall Danish network figures, it clearly indicates that the vast majority of use occurred around the initial workshop session on software training. To illustrate this trend, the shaded columns in Table 2 reveal the very limited use covering all the periods outside of the training session. Hence, this analysis reveals the limited functional use of the system for the project-based collaborative initiatives after the early training session.

Table 2: Total Software Usage by Participant

	System Integrator	SI (excluding training session)	Supplier	Supplier (excluding training session)
Dutch 1 Dyad	Low (2%)	0.8%	Low (3%)	3%
Dutch 2 Dyad	Low (2%)	None	None	None
Dutch 3 Dyad	Very Low (0.4%)	0.4%	Very Low (0.6%)	0.6%
Italian 1 Dyad	Low (3%)	None	Low (1%)	None
Italian 2 Dyad	Low (3%)	None	Low (2%)	0.8%
Italian 3 Dyad	Low (2.5%)	1.6%	Very Low (0.3%)	0.3%
Italian 4 Dyad	Low (4%)	1.6%	Low (3%)	None
Danish 1 Dyad	Very Low (0.7%)	0.6%	Medium (9%)	0.8%
Danish 2 Dyad	Medium (10%)	1.5%	Low (2%)	2%
Danish 3 Dyad	Medium (12%)	0.6%	Low (6%)	1.5%

In summary, these implementation findings suggest that behavioural change, quality of communication change information sharing, and trust change are all correlated with the impact variables of collaboration within buyer-supplier relationships. Therefore, the evidence supports that a higher level of change in the communication behaviour during implementation will lead to greater impact on collaboration within buyer-supplier relationships.

Discussion

There were many similarities uncovered in all three supply networks. Overall, there were substantial obstacles to collaboration during the software system implementation. Most of the suppliers had the impression that this was another way of implementing cost reduction and quality programs. Furthermore, participants were constantly struggling with balancing operational priorities and devoting energy to this software system and collaborative project.

Accordingly, the strongest indicator of the impact of collaboration was found in three enablers (or disablers): *commitment*; *involvement* and *conflict resolution approach.* This study discovered a strengthening degree of commitment during the project was a strong indicator of the impact of collaboration achieved. This concurs with Kwon and Suh's (2004) notion that accomplishing commitment is a key success factor in achieving supply chain integration. The findings revealed an active participation in improvement projects and workshops facilitated an increase in quality of communication and information exchange. All the relationships reporting high total change were identified as highly active participants during the final two phases of the project. Additionally, this high level of involvement coincided with a substantial behaviour and trust change occurring during the implementation phase. A strengthening of commitment and high level of involvement is associated with a moderate (or high) relationship change, trust change and process change. This implies that the cooperation element (as expressed through commitment and involvement) leads to trust change, relationship change and process improvement.

There were substantial differences between the three networks in terms of their conflict resolution approaches during the implementation process. Even though all the relationships (except Dutch 3) attained an impact in performance and process change, distinct differences emerged in the levels of

information sharing, relationship change, behaviour change and trust change. The poor relationship change results in the Dutch network indicate that the non-directive conflict resolution style, or 'laissez-faire' approach, was an unsuitable method. The hands-off approach of the SI did not cultivate a suitable project management atmosphere to facilitate action plans for improvement completion. In order for collaboration to flourish these relationships required an approach that facilitated more complex coordination and a higher level of information and knowledge exchange. This finding concurs with other studies (e.g. Mohr and Spekman, 1994) that the use of avoidance as a conflict resolution technique, including 'avoiding' issues, does not lead to successful partnerships.

In contrast, the Danish network results imply that the persuasive conflict resolution style through an immersive, problem solving approach was an appropriate method for the project. Due to initial relationship factors, the Danish 2 & Danish 3 situations required more explicit intervention in the form of political behaviour. The need for a more assertive and persuasive method became apparent during the initial discussions in which the two supply participants' motivation was low. Consequently, this more persuasive approach led to the Danish 3 relationship achieving a significant improvement in relationship building and trust enhancement compared to the other dyads. This suggests that the approach was suitable to this relationship by addressing the areas of instability and building personal bonds thus reducing distrust. This indicates supply chain performance would be enhanced if problems of distrust were reduced.

The Italian system integrator adopted a top-down, directive style of conflict resolution in the project. This directive approach was manifest in the highly structured methodology involving a sequence of steps to drive the implementation process. This approach was suitable for the companies that could be persuaded and directed towards improvement namely Italian 1, 3 & 4. The Italian 1 & 4 relationships only required a medium level of coordination and corresponding levels of information and knowledge sharing. It was particularly successful with the lowest positioned supplier, Italian 3, who over-performed in many impact categories.

Finally, a conceptual framework was constructed from the empirical findings to synthesize the key enablers and change variables that drive (or inhibit) the impact of the Internet-enabled system on collaborative practice among the participants. Ultimately, the outcomes of the project are influenced by the level of involvement, commitment by the individuals and the conflict resolution approach used to facilitate change during the implementation process. To achieve collaborative improvement, requires a continuous engagement process based around minimising conflict and cultivating dedicated partners committed to actively engaging in a reflective learning process. The cyclical nature of this building process on collaborative impact is illustrated in Figure 2.

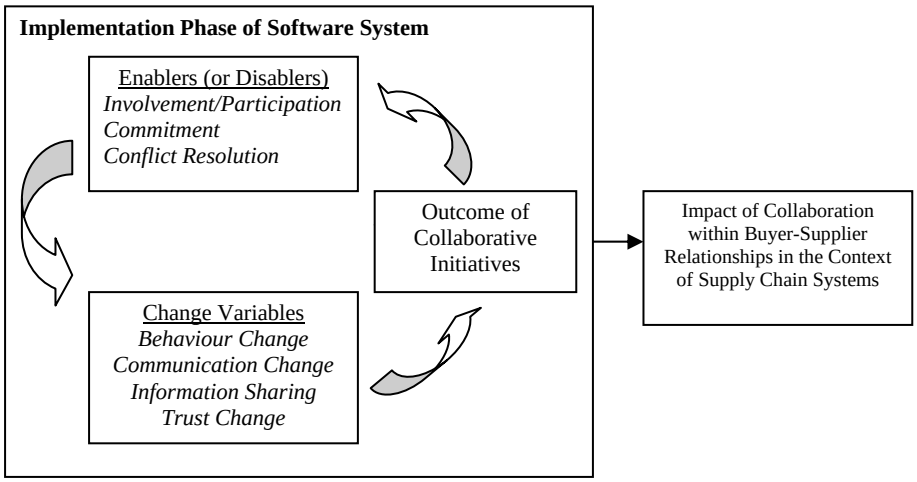

Figure 2: Conceptual Framework Illustrating the Drivers of Collaboration

What transpires is a cyclical process in which the positive or negative outcome of each initiative in turn affects the enablers and implementation change variables. At the culmination of the project, the outcome of this iterative phase determines the impact of collaboration on the buyer-supplier relationships. Similar to Vangen and Huxham (2003) who argue that trust (and commitment) can be "built incrementally via successful implementation of modest collaborative initiatives." (p. 25) Ultimately constructing a 'small-wins' approach (Bryson, 1988), in which collaborative advantage can be built through mutual experience of improvements gained via successful implementation of initiatives.

In practice, the software system was never fully utilised due to limited expectations and low functional usage. Three main impediments affecting the use of the system were: (1.) the Danish system integrator was also implementing a revival ERP system which demanded resources; (2.) all networks experienced inadequate software training sessions and support during the rollout of the system; and (3.) the system was never truly championed or received top management support from either the Dutch or Danish system integrators.

Conclusion

Some previous studies have argued that inter-organisational system can enable (e.g. Subramani, 2004) and/or mediate (e.g. Myhr and Spekman, 2005) cooperation in buyer-supplier relationships. However, very few academic studies (Pant *et al.*, 2003) empirically examine implementation in the context of Internet-enabled supply chain systems and its relationship with collaboration.

This paper discusses the question are *Internet-enabled supply chain systems drivers or inhibitors of collaboration amongst trading partners*? Upon reflection, this question is difficult to answer due to the criticality of the system uptake and implementation (or lack of). In this empirical project, the usage levels and functionality were generally very low apart from the initial software training sessions. Due to this limitation, the long-term impact of the system on collaboration among the participants could not be empirically verified. However, this limited investigation did identify that an Internet-enabled system can act as *both* a driver and inhibitor of collaboration. In practice, the launch of an Internet-enabled system provided an enticement for the suppliers and buyers to work together towards certain project goals. The uptake of the system, although limited to sporadic periods, was one of many driving forces promoting a change in communication behaviours which are requisite to collaboration. In particular, the findings during the implementation phase provide evidence that increased buyer-supplier interaction (involvement), joint problem solving and higher trust led to collaboration among the participants. This corresponds to Schultze and Orlikowski's (2004) assertion that a decline in these elements would weaken the interpersonal relationships and potentially offer less collaboration among the participants.

On the other hand, the lack of system continuance hindered the project goals which inturn inhibits the gradual process of building collaboration. Subsequently, the main focus of the project shifted to emphasise operational improvement and strategic alignment to promote collaboration in selected buyer-supplier relationships. The results indicated with the right mix of commitment and active engagement coupled with a suitable conflict resolution approach, an Internet-enabled system can provide an effective driver of behavioural change which can lead to collaboration between supply chain partners. However, any imbalance of these three key enablers can counteract any salubrious attempts at collaboration through an Internet-enabled system just as readily. In summary, there was no evidence to suggest that the Internet-enabled system on its own accord had any impact on collaboration amongst the trading partners.

Given the paucity of empirical research, there is need for further validation of drivers and inhibitors to implementing Internet-enabled systems in the context of collaborative supply networks.

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