

Facilitating Collaboration in e-Supply Chain Systems: An Action Learning-Based Approach

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Abstract

Increasingly, organisations are emphasising more cooperative trading relationships with the view to constructing long-term collaborative partnerships. Often firms introduce e-enabled systems to integrate strategic suppliers into collaborative networks. But in reality, many of these collaborative supply chain systems have underperformed or been terminated. Often these inter-organisational systems achieve gains in operational performance but fall short of relationship change. However to maximise the potential of an integrated system, participants need to learn 'the art of collaboration' with supply chain partners and manage a difficult change process. Achieving a successful implementation requires a formal intervention programme to improve integration in the group by facilitating behavioural as well as technical change. One intervention technique is "action learning". This approach focuses on learning from experience in a practical organisational context to cultivate behavioural change and collaborative practice. In this paper, the authors identify the key elements of an action learning programme created to promote behavioural change in the implementation of an Internet-based collaborative supply chain system. Based upon empirical data from an EC-Funded Fifth Framework Project, the impact of this formal integration programme is assessed.

Keywords: *Inter-Organisational Systems, Integration, Supply Chain, Change, Internet, Action Learning, Collaboration*

Introduction

Today many firms are increasingly drawn to the competitive opportunities available through a more effective and efficient supply chain network. One such opportunity is to develop collaborative technologies that transcend traditional boundaries to automate and integrate supply chain functions between trading partners. Recently, Internet-based collaborative initiatives have gained momentum for enabling efficient supply chains. 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, 2001).

However, the promise of collaborative 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 (SymbiusCorporation, 2002). Implementing and managing a trading partner alliance is harder than the decision to collaborate. Managers attempting to form collaborative alliances are having difficulty implementing the strategy, in reality they are as likely to fail as to succeed (Boddy *et al.*, 2000). In particular, firms implementing Internet-enabled supply chain systems need to consider their resources and ability to handle necessary challenges (Pant *et al.*, 2003) as well as cultivate a learning environment for organisational change.

In this article, we outline and evaluate a unique implementation approach to address the change issues of implementing an Internet-based system in a supply network. It is important to create a structured, yet flexible intervention programme to cultivate collaboration within an array of diverse supply chain relationships. This intervention programme was developed and tested in conjunction with an EC-funded Fifth Framework Initiative entitled *Collaborative Improvement Tool for the Extended Manufacturing Enterprise*.

Supply Chain Systems and Collaboration

Many organisations are exploring ways of collaborating with supply chain partners through the integration of inter-organisational systems (IOS). The development of truly ‘open’ collaborative systems is only now beginning to evolve with the Internet as an enabler. Historically, the origins of supply chain technological linkages can be traced to EDI as one of the earliest inter-organisational systems to be scrutinized academically (refer to Figure 1). Traditional EDI systems are based around proprietary communication protocols limiting the exchange potential of the system (Lee and Whang, 2000). Internet-based collaborative supply chain systems are a relatively recent phenomenon. These collaborative IOS can be defined as hubs for Internet-based collaborative efforts, where companies can exchange proprietary data, jointly manage projects and cooperate on the design of new products (Williams, 2000). Collaboration is a vital ingredient in supporting Internet-based activities through the inter-company integration of processes and partnership by way of information exchange and joint supply chain management.

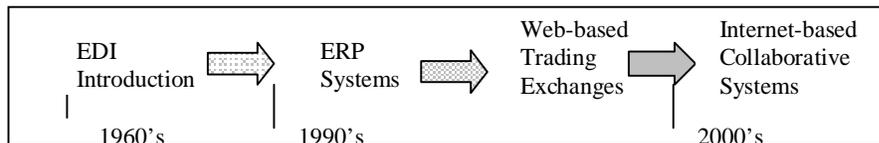


Figure 1: Evolution of Inter-organisational Systems (McNichols and Brennan, 2004)

However, there is a dearth of published studies on supply chain systems pertaining to collaboration, particularly the implementation of these systems. Two notable recent exceptions on e-enabled supply chain include: Subramani (2004) analysis of the benefits to suppliers from participation; and Pant *et al.* (2003) investigation of the implementation approaches to these systems. Subramani concluded that suppliers can both create value and retain a portion of the value created by the use of these systems in

inter-firm relationships. Moreover, she found that IT deployments in supply chains lead to closer buyer-supplier relationships. Pant et al. (2003) concluded firms need to understand different options for creating e-enabled supply chains before implementation, keeping in mind their resources and ability to handle associated challenges. The implementation of collaborative e-commerce systems often transforms supply chain relationships by revealing both opportunities and difficulties (Boddy et al., 2000).

For a collaborative-based system, a vital ingredient for a successful implementation is learning '*the art of collaboration*'. 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). 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). 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).

Implementing Collaboration in Supply Chain Systems

Actually achieving any impact from a collaborative partnership between supply chain members is a difficult task. Collaborative inter-organisational systems implementation is based around two discreet, yet simultaneous change processes - *technological* and *behavioural*. 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 (Chan and Swatman, 2000). 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. To achieve potential from inter-organisational systems requires further scope than mere technical implementation, it requires a process of organisational change (Roberts and Mackay, 1998). Many studies (e.g. Chan and Swatman, 2000) have suggested that re-engineering the business process is the most important part of implementing a technology. To fully achieve more information and knowledge sharing, organizations 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). Support mechanisms can take the form of relatively formal bodies which bring the players into regular face-to-face contact through teams of various kinds (Boddy and MacBeth, 2000). 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. Particularly the improvement of interpersonal relations led to actions to create more formal mechanisms which supported future co-operation. In turn, these actions contributed to the relationship exceeding the initial expectations of the partners (Boddy et al., 2000).

Action Learning Based Approach

Collaborative Improvement is an evolving systematic change process undertaken to instil collaboration and learning (Cagliano *et al.*, 2004; Middel *et al.*, 2004). Working together collaboratively can create learning opportunities enabling a firm to acquire knowledge from partners. Knowledge acquisition refers to skills learned and knowledge acquired by one firm from another firm (Norman, 2004). Crossan and Inkpen (1995) concluded that the success of companies working together was linked to learning and knowledge sharing. The ability of firms to acquire and exploit knowledge has been supported by many authors, such as Cohen and Levinthal (1990) and Huber (1991), and linked to a firm's ability to innovate (Fiol, 1996). This suggests that explicit attention should be paid to the accumulation and development of knowledge which offers competitive advantage and long-term capability for learning between organisations. To create an environment conducive to learning, companies need to incorporate an intervention programme to continually acquire new knowledge. Formal interventions that focus on the group process are a potential way to achieve superior knowledge integration (Okhuysen and Eisenhardt, 2002).

The main focus is on individuals learning to solve problems at work, from experience through reflection and then action. Action learning can be structured to overcome the difficult nature of fostering collaboration when this is contrary to previous supply chain interactions. To cultivate the implementation process, facilitators are used to introduce and guide the establishment of collaborative initiatives and system use, based on improvement projects involving the trading partners. Although the participants are performing task-based projects, it is important that the accomplishment of the task does not obscure the process of learning. Without reflection and feedback, action learning would be no different from a normal problem solving initiative within the company. Facilitators provide a useful source of feedback structured to reinforce reflective learning with participants through deploying evaluation techniques that promote discussion and reflection. An illustration of the inter-relationships among the components of action learning is provided in Figure 1.

One type of formal intervention is an 'action learning' based approach to foster behavioural change and collaborative practice. Recently, 'action learning' has been promoted as a practical strategy in developing organisational learning programmes (Weinstein, 1999). Action learning can be defined as a process in which a group of people come together more or less regularly to help each other to learn from their experience (Revans, 1980). Action learning makes a key distinction from other types of learning through its continuous process of learning and reflection in organisational practice. This involves groups of people, or *learning sets*, working on real workplace problems. In action learning, the starting point is the action and through reflection this becomes reflection this becomes learning-in-action. The main focus is on individuals learning to solve problems at work, from experience through reflection and then action. One advantage of an action learning programme is the removal of participants from their day-to-day work routines and providing an opportunity for reflective learning. Action learning can be structured to overcome the difficult nature of fostering collaboration when this is a novel approach from previous supply chain interactions. To cultivate the implementation process facilitators are used to introduce and guide the establishment of collaborative initiatives and system use, based on improvement projects involving the trading partners. Although the participants are performing task-based projects, it is important that the accomplishment of the task does not obscure the process of learning. Without reflection and feedback, action learning would be no different from a normal problem solving initiative within the company. Facilitators provide a useful source of feedback structured to foster and reinforce reflective learning with participants through deploying evaluation techniques that promote discussion and reflection.

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 (see Figure 2). 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 representative from each of the participating organisations involved in the project. This instrument was designed to capture the actual and perceptual changes indicated by the same 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 questionnaires on results of collaborative improvement initiatives.

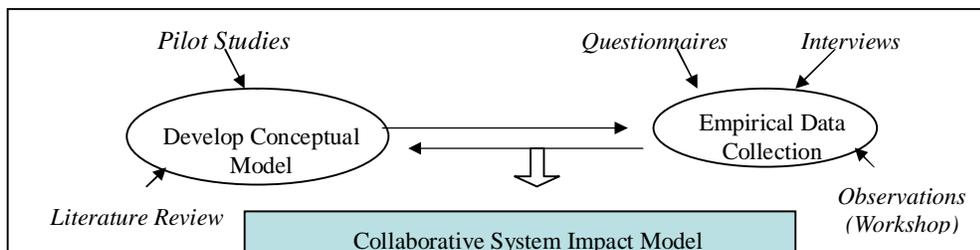


Figure 2: Research Design for the Study

Empirical Data

The empirical data consists of two supply networks, each comprising a systems integrator and three 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 supply networks.

The technical architecture of the *Co-Improve tool* was designed as a bespoke system based on TCP/IP protocols. Co-Improve Software is a Web base product, with Java Server Pages (JSP), and HTML code. Co-Improve software architecture is a three-tier solution: Web-client, software company platform, and Oracle database. To use the 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. After careful consideration an Internet-based platform allowing web connectivity was considered the most appropriate due to many organisational considerations: the location of the participants; diverse size; and limited technical infrastructure of some suppliers.

The Dutch network involving one system integrator and three of its first-tier suppliers. The 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 to satisfy their requirements 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 means that information and communication can 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 today. This publicly listed company is a global manufacturer of hydraulic components and electronics to Original Equipment Manufacturers (OEM) of mobile machines, within agriculture and the construction industry. 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 inter-organisational system integration (see Table 1).

Table 1: Description of the Companies in the Dutch & Danish Networks

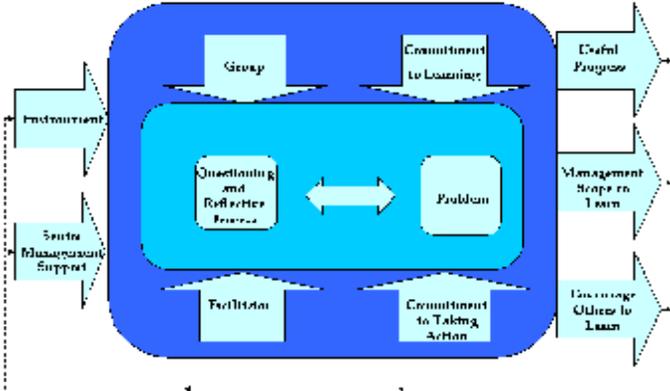
	Dutch System Integrator	Dutch 1	Dutch 2	Dutch 3
Description	First - tier supplier of hydraulic systems	Supplier of plastic precision parts and assembled products	Supplier of precision mechanical parts	New supplier of customised metal cylinder-tubes
Employees	> 500	200	55	160

	Danish System Integrator	Danish 1	Danish 2	Danish 3
Description	First-tier supplier of mobile hydraulics	Supplier of metal parts	Supplier of foundry products	Supplier of metal parts
Employees	> 7500	80	250	65

Action Learning Change Programme

In this empirical project, an action learning intervention programme has been applied to facilitate the process of collaborative improvement and learning between the system integrator and suppliers to enhance the overall performance of the network. This intervention process is used to promote change in the participants during the implementation phase of the Internet-based system. Marquardt’s (1999) six components of action learning have been applied to the Dutch and Danish learning networks (see Figure 3).

Figure 3: Inter-Relationships among the Components of Action Learning Adapted from Marquardt (1999)



This intervention programme was established in the Dutch network over a period of *eighteen* months through a cycle of *fifteen* 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. Moreover, the process of action learning emphasised the importance of a structured questioning and reflective process within both learning networks (see Table 2).

In the Danish network, the action learning approach covered a period of over *twenty* months through a cycle of *thirteen* workshops. Initially, this programme focussed on monthly workshops complemented with facilitation support by researchers in the intervening period to support the learning process. The workshop program was structured to generate ideas, discuss activities on improvement initiatives, training on software system functionality and evaluation of projects. Overall, the Danish network approach can be characterised as a *bottom-up* approach that involved *learning-by doing*. The detailed implementation programme was similar to the Dutch network approach.

Table 2: Action Learning in the Co-Improve Project

Action Learning	Dutch Learning Network	Danish Learning Network
A problem	Immediate practical concerns involving operational issues and relationship between system integrator and suppliers.	
The group	An inter-organisational network, comprising of a system integrator and three of its first-tier suppliers.	
The questioning and reflective process	Monthly workshops in which an opportunity for reflective learning is provided (Presentation and discussion on improvement initiatives, reflecting on process and progress and specifying and diffusing learning)	
The commitment to taking action	The network is committed to work on practical concerns in inter-organisational processes & system use	
The commitment to learning	The network is committed to reflect and learn from immediate moments and events as part of the collaborative improvement initiatives	
The facilitators	Members of the University of Twente and Trinity College Dublin acted as learning coaches.	Members of Aalborg University and Trinity College Dublin acted as learning coaches.

The implementation programme for both learning networks can be summarised in four phases, each differing in length:

Phase 1: Setting up the Learning Network

The kick-off meeting of the project involved an introductory presentation on the Action Learning approach. This introduction was designed to encourage participants to think differently, be exposed to new ideas and new knowledge on collaboration and tackling initiatives (Garvin, 1994).

Phase 2: Identifying Learning needs

The selection of projects in collaborative operations was an important step in identifying the improvement areas. The researchers interviewed the representatives of the companies and carried out further assessments with regard to the level of operational integration and collaborative improvement maturity. This resulted in a list of possible improvement projects between the SI and the suppliers from which the companies selected specific improvement projects in alignment with their identified goals. This phase is repeated, as required, throughout the programme in order to identify further learning needs.

Phase 3: Facilitation of Action Plans

After the companies selected a project, they start working on the collaborative improvement activity, whereby the researcher participated as a facilitator for all the companies in the project. A series of workshops were organised to plan the actual learning cycle:

- Identify a collaborative improvement project between the companies and devise an action plan which scheduled tasks between the workshops;

- Present and discuss the improvement activities and results in plenum at the workshop;
- Reflect on the process and progress of the project in order for all the network participants to learn and support the process.

Phase 4: Evaluation and Reflection of Learning

In order to learn from the issues, experience and practice emanating out of the improvement initiatives, the facilitator initiated an evaluation and reflective practice. This practice emphasised the learning aspects from the projects:

- Complete a reflective questionnaire instrument to identify and discuss the emergent issues at group level
- Disseminate the learning moments, experience and knowledge throughout the entire network.

After completion of phase four, the learning cycle loops back into phase two. This feedback loop continues for the duration of the programme. During the lifecycle of this intervention programme, a total of seventeen collaborative improvement initiatives were identified, evaluated and reflected on. Details of the initiatives undertaken during the project cycle were compiled and the impact of each initiative was assessed.

Findings

Change Process Theory is often used to highlight the stages of changes involved in the implementation process (Ginzberg, 1979; Cooper and Zmud, 1990). Cooper & Zmud (1990) found the better handling of the implementation process, the better chances of implementation success. One method to evaluate the level of change in the participating organisations is a simple framework 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 implementation programme in each participating firm, a combination of different measures were accumulated. The impact on the dyadic relationship was assessed in two main categories:

- (1.) *Strategic & Performance measures* – contract; sales volume change; cost; quality; delivery; and lead-time
- (2.) *Perceptual indicators* - information sharing; knowledge sharing; achievement of expected system benefits; quality of communication (change); process (change); relationship (change), IT use (change); shared goals (change); trust (change); behaviour (change) and dependency (change).

After implementing the e-Supply Chain system, an examination of the level of change occurring in the six dyads was undertaken after eighteen months. The perceptual indicators were compiled from a post-implementation questionnaire grouped according to the change factors. These indicators have been supported by subsequent observations by other academic researchers involved in the Co-Improve project and interviews with each of the participants.

Table 3: Impact of Collaborative Initiatives in Dutch & Danish Dyads

	Dutch 1	Dutch 2	Dutch 3	Danish 1	Danish 2	Danish 3	
Strategic							
Contract	-	-	-	-	-	New Purchase Agreement	
Performance							
Sales Volume	-	5% Increase	No change	-	-	-	
Cost	5% Reduction for Part	-		-	-	-	
Quality	33% Reduction of Internal Scrap Rate	Reduction of Reject Rate		Reduction in DPM on two parts	Reduction on DRPM on several key parts	Implemented internal quality procedure	
Delivery Time	-	-		Reduced delivery time by 50%	Two products achieved 86% & 80%		
Transference							
Information Sharing	Moderate	Slight	Slight	Moderate to High	Slight	Moderate	
Knowledge Sharing	Slight	Slight	Slight	Moderate	Slight to Moderate	Moderate	
Satisfaction							
Achieved Expected System Benefits	Little	Little	Little	None	None to Little	None to Little	
Uncertainty Reduction							
Perceptual	Process Change	Slight – Incremental	Slight - Discontinuous	Slight– Incremental	Moderate to High	Slight to Moderate	Moderate to High
	Relationship Change	Slight	None	None	Moderate	Slight to Moderate	Moderate to High
	Change in Shared Goals	None	None	None	Slight	Slight to Moderate	Moderate to High
	Dependency Change	None	None	None	Slight	None	None
	Trust Change	None	None	Slight	Moderate	None	Moderate to High
	Behaviour Change	Slightly More Positive	None	Slightly More Positive	Moderate	None	Moderate to High
	Partner's Behaviour Change	None	None	Slight	Moderate	None	Moderate to High

Note: *Slight, Moderate* and *High* are all improvement indicators unless otherwise noted.

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 attributable to this part. Both parties indicated a slight incremental improvement in process change. Supplier 1 responded that the relationship had improved and indicated a slightly more positive behaviour 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. The supplier indicated an improvement in trust coupled with more positive partner behaviour and their own behaviour. However, 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 (see Table 3). Specifically, 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 and partner's behaviour. Indicating a substantial level of relationship impact was achieved from the project. Most surprising was that a majority of the respondents indicated that they achieved 'none at all' of their expected benefits from the collaborative system.

Discussion

There were many similarities uncovered in the learning networks. In both networks, there were substantial obstacles to collaboration at the beginning of the project due to previous relationship history. In the Danish network, the first action learning meeting revealed a picture of a satisfactory relationship with Supplier 1, Supplier 3 is not willing to invest time in the project unless resulting in a sales opportunity and a fearful Supplier 2. Similarly, there lacked a mutual understanding between the Dutch SI and its participating suppliers on the concept of collaboration, which had a negative effect on the level of openness between the companies. This often resulted in political behaviour from a majority of the suppliers towards the SI. 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 learning programme. Hence, the first phase of the intervention was organised to address this concern by focusing on creating a mutual understanding of collaboration and developing a sense of mutual direction.

The second phase in both action learning networks instigated improvement activities engaged at the level of customer-supplier relationships. The progress and the results were constantly shared with the entire network in monthly workshops. By emphasising the importance of a structured questioning and reflective process, the programme allowed the participants to share learning experiences and ideas across the network. Prior to this action learning programme, reflection on learning was neglected due to operational priorities within the supply network. Hence, facilitation by the SI and the participant-observers was perceived as essential by the participants in the action learning programme. This facilitation process enabled a distinction to be drawn between the learning outcomes and the operational outcomes.

However, there were substantial differences between the two networks in terms of their conflict resolution approaches during the facilitation 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-of 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. Therefore, the impact from these collaborative initiatives only produced a narrow-band of information and knowledge exchange. This finding concurs with other studies (e.g. Mohr and Spekman, 1994; Monczka *et al.*, 1998) 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 concurs with Beccerra and Gupta (1999) who indicated that supply chain performance would be enhanced if the problems of distrust were reduced.

In retrospect, many operational outcomes were not as definitive as envisioned at the outset of the project. Some of the initiatives were stalled for long periods of time or failed to achieve their initial goals. Furthermore, in dynamic environments, a multitude of obstacles appear during the project implementation programme. Specific obstacles that delayed the implementation process included:

- (1.) A fire destroyed most of the Dutch SI manufacturing plant, delaying any project work for 3 months.
- (2.) The Danish SI was visiting potential alternative suppliers in China during the first workshop.
- (3.) In Dutch 3 dyad, the supplier was a new trading partner and had not been awarded a contract for serial production. Consequently, there were limited opportunities for operational performance, an increase in partnership uncertainty and inhibited commitment to collaborative working practices.
- (4.) The Danish SI sent a letter to one supplier requesting access for an external consultant to review the supplier's internal processes with no discussion between the parties beforehand. As a result, the supplier appeared suspicious of the SI behaviour.
- (5.) A laissez-faire attitude initially displayed by the Dutch SI, consequently no champion emerged to encourage the system implementation. Furthermore, no SI push to adhere to or complete mutual action plans.
- (6.) Overall, the software system was never fully utilised due to limited expectations and low functional usage. Two 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.) inadequate software training sessions in the beginning of the project; and (3.) the system was never truly championed or received top management support from the Dutch or Danish system integrators.

Hence, all these obstacles had to be addressed or circumvented during the intervention programme. The key to a successful intervention programme is promoting change to overcome these hurdles and maintain project momentum. In particular, the regular meetings of the workshops were necessary to sustain the initiatives and speed within the improvement projects. The findings revealed that attention was increased in the time before, during and after the workshops. These face-to-face meetings were perceived by the participants as a necessary “fuel” for the efficiency and effectiveness of collaborative improvement activities. Companies were able to align the process of improvement with regard to the progress and expected outcomes. Moreover, these regular meetings provided the participants with the opportunity to reflect and learn from each other during the programme.

Ultimately, the outcomes of the project are influenced by the intervention programme and the conflict resolution approach used to facilitate change during the implementation process. To achieve collaborative improvement, requires an adaptive intervention programme based around minimising conflict and cultivating dedicated partners committed to actively engaging in a reflective learning process.

Conclusion

This paper outlined a formal intervention programme designed around improvement initiatives in collaboration with strategic trading partners in the context of Internet-based supply chain systems. This action learning approach is designed to overcome the shortcomings in traditional implementation programmes when dealing with the more multifaceted potential of collaborative systems. There are very few academic studies (i.e. Henriott, 1999; Pant *et al.*, 2003) which examine implementation in the context of e-supply chain systems. Consequently, there are limited published articles examining the relationship between information systems implementation and collaboration utilising an action learning approach. Such an intervention programme requires the flexibility to cultivate collaboration in diverse types of buyer-supplier relationships.

In this study, the design of the action learning programme has been built around a structure of regular workshops divided in *four* key phases. After 18 months, the participants indicated that they recognised the importance of creating a learning environment, in which they can and do share information and communicate openly. Not only did they display the willingness to collaborate, communicate and share information, they also tried to understand and learn from each other’s position and develop a sense of direction with regard to collaboration and their relationship. According to one participant, the action learning process enabled them to “work together more closely in an open and trustworthy way”.

Action learning is not a panacea for the problems that have beset IS implementation and change for years. However, its reflection and learning process can form a basis for changing work practices. In reality, many obstacles surface during the course of an implementation programme. The key is to exploit the unique learning opportunities from these diverse issues, which is catered for in the adaptability of action learning. With the right mix of commitment and active engagement coupled with a suitable conflict resolution approach, this approach can provide an effective intervention programme for learning and reflection from practice.

Given the paucity of empirical research, there is need for further validation of action learning based approaches to implementing integrated systems in the context of collaborative supply networks.

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