INVESTIGATING COLLABORATIVE COMMERCE SYSTEM FROM THE PERSPECTIVE OF COLLABORATIVE RELATIONSHIP

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ABSTRACT

Collaborative commerce system (CCS) is an information technology (IT) application built on the foundation of partners' relationship, thus its development decision needs to take the collaborative relationship into consideration. This study aims to understand what factors influence the implementation of collaborative commerce (c-commerce) and to explore how the collaborative relationship affects the engaged parties' CCS decision. Four cases were studied to answer the research questions. The results reveal that the project will be successfully implemented when the degree that internal processes affected by the CCS are acceptable to the engaged parties and their capacities for information technology infrastructure can support the CCS. Moreover, partners with closer relationships tend to use a more complex CCS. This also means more resources, such as time and cost, required to develop the CCS. Finally, the CCS may also facilitate the development of good relationship quality. The research contributes to revealing how the CCS decision is related to collaborative relationship, which provides a new perspective for further research in c-commerce. The findings can also be applied in practice for serving as a reference in making the CCS decision that can promote the quality of collaborative relationship and help the successful implementation of the c-commerce project.

Keywords: collaborative commerce (c-commerce), relationship, resource dependence, coordination, virtual organization

1. Introduction

Collaborative commerce (c-commerce) refers to the use of information technology (IT) to tightly integrate internal and external relationships for an enterprise [Chen et al., 2007; Hartono and Holsapple, 2004; Kim, 2006; Li, Du and Wong, 2007]. Collaborative relationships occur because of enterprises' resource dependence on partners. Resources are a crucial determinant for enterprises to properly address challenges in the increasingly competitive environment [Barney, 1991]. Enterprises cannot acquire all the resources they need and thus, they have to cooperate with others [Pfeffer and Salancik, 1978]. C-commerce allows enterprises to team up with their partners using IT to

complete tasks that they cannot possibly accomplish alone [Centola et al., 2004; Ratnasingam, 2004; Wang and Archer, 2007].

Recent studies about c-commerce can be classified into four categories: the influences that IT has on enterprise partnerships [Saraf et al., 2007; Wiengarten et al., 2013], the factors leading enterprises to adopt inter-organizational information systems [Bajwa et al., 2008; Chan et al., 2012; Chong et al., 2010; Lin, 2006], operational models of c-commerce [Sherer and Adams, 2001], and steps to implement a collaborative commerce system (CCS) [Li et al., 2007; Perrin and Godart, 2004]. C-commerce will positively influence both the bottom line performance for the enterprises and effectiveness for the whole supply chain [Bafoutsou and Mentzas, 2002; Chen et al., 2007; Lee et al., 2003; Saraf et al., 2007; Trkman, 2010]. However, it should be carefully planned before adoption because it generates a significant impact on business operations, which can be an IT-enabled strategic change [Dembla et al., 2007; Hsiao and Omerod, 1998]. The CCS can facilitate complicated collaborative operations among enterprises and realize the expected benefits of c-commerce. However, the CCS is an IT application built on the foundation of partners' relationship to collaborate for accomplishing the partners' agreed objectives, thus its development decision needs to take the collaborative relationship into consideration. This study aims to fill the research gap by focusing on how the collaborative relationship among the engaged parties affects their CCS decision.

To truly reap the benefits of c-commerce as a relationship strategy, there must be significant investment in understanding the full process of how the enterprise relates to other enterprises. While small/medium sized enterprises (SMEs) may be reluctant to implement c-commerce because of assumed cost, all enterprises are affected by this factor [Centola et al., 2004]. C-commerce is a new breed of IT-based interactive model for enterprises. Its adoption decision includes the partnership issue as well as the IT utilization issue. That is, taking on a c-commerce strategy need to consider: "What factors will affect the implementation of c-commerce conducted across organizational boundaries?" and "What factors should be considered while developing the CCS?" These questions deserve special attention as enterprises may waste their resources or jeopardize their partnerships if they rush into the implementation process for c-commerce. The current study will investigate the two questions. That is, the research objectives are two folds: the first is to understand what factors influence the implementation of c-commerce and the second is to explore how the collaborative relationship affects the engaged parties' CCS decision.

The research investigates four cases for answering the above questions so as to help enterprises evaluate their readiness for implementing c-commerce and to prepare them for the new operational model. Specifically, the purposes of the research are to analyze the factors that should be considered in the implementation process of c-commerce and to explain how the CCS decision is affected by the collaborative relationship. In the theoretical background section of the paper, a review of related literature will be presented. Next is the methodology section that describes research framework and research design. We then present the case analysis. Following that will be a discussion on the research implications. Finally, we conclude research findings with suggestions for further research.

2. Theoretical Background

2.1 C-commerce and Virtual Organization

C-commerce is an IT application for enterprises to collaborate with partners for improving operational performance and increasing corporate competitiveness [Whipple and Russell, 2007; Wiengarten et al., 2013]. Its implementation is one of the key technologies to facilitate the success of supply chain management, which allows the integration of business processes among the collaborative members [Chan et al., 2012; Chang and Graham, 2012]. The Internet is the platform that enables c-commerce and information sharing among partners [Chen and Drezner, 2000; Chong et al. 2010; Ratnasingam, 2004].

C-commerce shares many similar characters with virtual corporation [Wang, 2000; Travica, 2005]. A virtual corporation is one form of virtual working [Jackson, 1999]. Davidow and Malone [1992] utilized "virtual corporation" to describe an integrated process comprised of individual processes existing in different corporations to achieve a preset goal. The broader concept "virtual organization" was later derived from virtual corporation. A virtual organization handles integrative tasks among engaged parties who are united by using IT to share resources and form a network relationship [Bleecker, 1994; Kasper-Fuehrer and Ashkanasy, 2001; Mowshowitz, 1997].

Both c-commerce and virtual organization carry similar definitions, knowing how a virtual organization is formed is helpful to understand the development process of c-commerce. Forming a virtual organization can be divided into four phases: opportunity identification, relationship formation, operation, and relationship termination [Sherer and Adams, 2001; Strader et al., 1998]. The first three phases together create an excellent reference framework to understand how c-commerce is developed between enterprises. The following three subsections are devoted to discuss each of the phases.

2.2 Collaborative Opportunity Identification and Resource Dependence

According to the resource dependence perspective (RDP), enterprises rely on all types of resources to survive in a competitive environment, and some of the resources are proprietary so that other enterprises are incapable of controlling or imitating, or can only obtain from external environments [Pfeffer and Salancik, 1978; Ulrich and Barney, 1984; Wernerfelt, 1984]. Wade and Hulland [2004] defined resources as a type of assets or capacity that enterprises can use to identify or respond to opportunities and threats in a competitive environment. Enterprises will by all means strive to attain pre-set goals and realize desired outcomes and thus, they will devote relevant resources or sustain certain conditions. However, to achieve certain goals, an enterprise needs to acquire outside assistances and to cooperate with other parties, which illustrates the importance of interdependence [Pfeffer and Salancik, 1978]. In the opportunity identification phase, an enterprise needs to first define objectives, then clarify resources needed to carry out required operations to achieve objectives, and finally to confirm which resources can only be obtained from outside environments.

However, the RDP does not completely explain how enterprises may identify opportunities to develop c-commerce since the RDP does not concern the IT. Enterprises then need to further discern whether IT can help them to acquire outside resources or be beneficial in cooperating with outside partners. Kumar and Dissel [1996] argued that enterprises may choose to adopt an inter-organizational system (IOS) to coordinate the collaborative efforts and share resources with their partners. Yet, it is imperative that enterprises select a proper IOS based on the desired type of independence before they can truly reap the benefits of collaboration. Combining the aforementioned two perspectives can determine whether an enterprise should act on the opportunities identified and if it should adopt an IOS. The c-commerce opportunity identification matrix illustrated in Figure 1 provides a guideline to follow. There are four quadrants in the matrix. The first represents that no cooperative opportunity exists and an enterprise may create some opportunity by adopting an IOS. The second shows that a cooperative opportunity exists and an enterprise can benefit from the opportunity with an IOS. Only these two quadrants are considered in the study.

		Does a collaborative opportunity exist?	
		Yes	No
Can IT help the partnership?	Yes	Engage in collaborative commerce	Create collaborative opportunity with collaborative IT
	No	Traditional cooperative model	Operate independently

Figure 1: Collaborative Commerce Opportunity Identification Matrix

2.3 Relationship Formation and Collaborative Interface

A collaborative relationship is not automatically formed after a collaborative opportunity is identified. The involving parties or organizations need to engage in bilateral or even multilateral negotiations with potential partners. Only after all parties reach agreements on the terms and conditions of the partnership can the collaborative relationship be formed. A negotiation, or the bargaining process, is the communication process in which both partners confirm whether forming a partnership is mutually beneficial, and is the process in which they reach a consensus about the products or services of interest [Wall and Blum, 1991]. However, if no common ground can be established, they will end the negotiation and turn to other partnership candidates [Louta et al., 2008; Matook and Vessey, 2008; Yu, 2007].

In the process of negotiation, what IT factors should an enterprise consider when it selects partners? Answers can be found in the EDI (Electronic Data Interchange) partner selection guideline that Angeles and Nath [2000] proposed including six dimensions: strategic commitment, trading partner flexibility, joint partnering for EDI, readiness for high-level EDI, EDI infrastructure, and communication. In the relationship formation phase, each party can select its partners using these dimensions as criteria and clearly set agenda about the IT-based collaborative model in the negotiation process.

Many studies have focused on how to facilitate the integration process for the IT-based collaborative model [e.g. Kasper-Fuehrer and Ashkanasy, 2001; Malone and Crowston, 1990; Mowshowitz, 1997; Travica, 2005; Weigand and Heuvel, 2002]. In the stage of establishing collaborative relationship, Perrin and Godart [2004] suggested that enterprises do not need to reveal details of their internal processes, but they should define the interface for integration with a coordinating mechanism to ensure their internal processes can be aligned up. With

this interface, all parties can closely monitor the execution status and information for the jointed activities or integrated processes. As c-commerce refers to process integrations, using information systems, among enterprises [Bajwa et al., 2008; Li et al., 2007; Lin, 2006; Perrin and Godart, 2004; Saraf et al., 2007; Sherer and Adams, 2001], this research defines the CCS as the collaborative interface that coordinates inter-organizational activities and integrates processes among different organizations.

2.4 Implementing Collaboration and Coordination

Through the relationship formation phase, all engaged parties will jointly decide an IT-based collaborative model. However, there is an issue that requires further examination, and that is: how exactly can this model coordinate all engaged parties to achieve agreed goals? The coordination theory proposed by Malone [1987] provides an approach to dealing with this issue. Coordination includes four elements: goals, activities, actors, and interdependencies. Each of the four elements has its associated coordinating processes. The first process is goal identification, and then is matching the goals to corresponding activities, followed by selecting actors for the activities, and the final process is to manage the interdependence relationships among goals, activities, and actors. Interdependencies describe the relationships among goals, activities, and actors.

In the operation phase, the CCS is responsible for congruently coordinating operational processes for all partners and each partner needs to supply their operation layer information and complete internal information pertaining to the agreed coordination mechanism [Kornelius and Wamelink, 1998]. From the coordination theory viewpoint, there exist interdependencies for goals, activities, and actors among all engaged parties. These interdependencies can be well managed by using the CCS. Thus, different organizations, after their collaborative relationship is established, can congruently carry out the joint activities together to attain their expected goals.

Based on the above literature review, the implementation decision of c-commerce can be explained from the perspective of resource dependence. C-commerce is used as a strategic application for enterprises to acquire and utilize necessary resources from and with the support of external partners. Its operation involves participants from various enterprises working together on the IT platform for achieving the common goal, which exhibits the characteristic of a virtual organization. The collaboration requires effective coordination mechanism, which can be equipped in the collaborative interface, to deal with issues arisen from different interests and viewpoints. However, the research regarding factors of developing the CCS is still limited. Therefore, this current study aims to fill this gap from the perspective of collaborative relationship.

3. Methodology

3.1 Research Framework

The process model of c-commerce suggests three phases of implementation: opportunity identification, relationship formation, and operation [Sherer and Adams, 2001; Strader et al., 1998]. The present research investigates influence factors of implementing c-commerce and developing the CCS from these three phases. Figure 2 illustrates the research framework adapted from the process model. The main difference between a c-commerce and a conventional partnership is that enterprises engaged in the c-commerce use IT as their means of interactions [Hartono and Holsapple, 2004]. IT factors will influence an enterprise's c-commerce implementation decision [Chen et al., 2007; Kim, 2006; Li et al., 2007]. Nevertheless, non-IT factors such as task and members characteristics, and non-IT resources, also cannot be neglected [Centola et al., 2004; Ratnasingam, 2004]. Considering both IT factors and non-IT factors, this research adopts theoretical perspectives of the RDP, the coordination theory, and the IT use, to analyze what factors will influence the implementation of c-commerce and the development of CCS in the three phases respectively:

(1) Opportunity identification: indentify factors that lead the enterprise to trust that they can benefit from c-commerce and analyze how the enterprise evaluate and select the collaborative opportunity. Opportunity identification is mainly based on the RDP. When the enterprise relies on external resources to attain its goal, the opportunity of c-commerce appears [Pfeffer and Salancik, 1978]. The evaluation of the opportunity will be made on the importance and controllability of the dependent resources [Ulrich and Barney, 1984]. The enterprise has to review IT and non-IT factors of implementing the project, assess costs and benefits of potential alternatives, and then choose the best alternative that can bring positive effects.

(2) Relationship formation: discuss factors that the enterprise considers in identifying, evaluating, and selecting partners and analyze how the enterprise forms collaborative relationship with its partners. Relationship formation should consider partners' fitness for the project, on both business process (non-IT) and IT infrastructure [Louta et al., 2008]. With a feasible collaborative opportunity, potential partners are selected according to their fitness and willingness to the project. The expected coordination efforts in implementing can be used as a measure of evaluation. Coordination efforts include those of goals,

activities, actors, and interdependencies of the project [Malone, 1987]. If the estimated costs and risks incurred by the required coordination with potential partners are acceptable, then enter into negotiations with the partners to develop a consensus about the project and form the partnership [Wall and Blum, 1991].

(3) Operation: analyze how the collaborative relationship affects the CCS that coordinates inter-organizational activities between the enterprise and its partners. Coordination tasks are critical in executing the collaborative project and the utilization of IT can integrate the partners' connected activities and reduce the coordination requirements [Kornelius and Wamelink, 1998; Malone and Crowston, 1990]. If the collaborative relationship is bad, conflicts may occur due to poor coordination. A CCS that offers functionalities of coordination and conflict resolution will be helpful to the execution of the project. While developing the CCS, these functionalities should be taken into consideration. However, the collaborative relationship will also influence the effects of these functionalities.

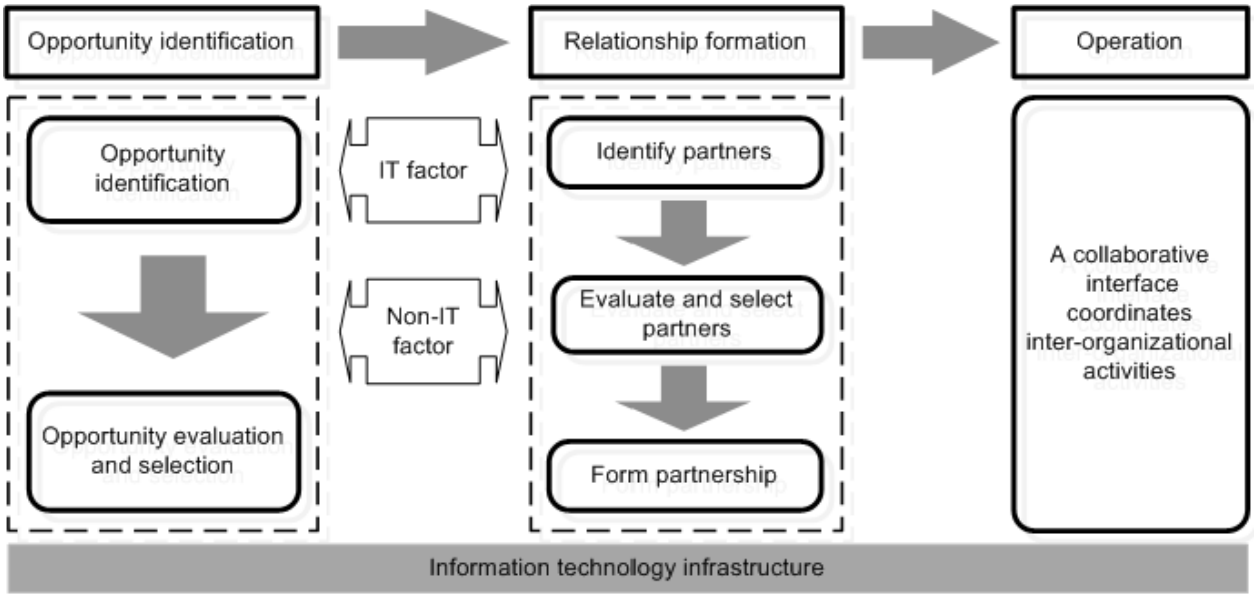

Figure 2: Research Framework

3.2 Research Design

Although there have been some studies in the past few years, there has not been a unified theme about c-commerce [Bajwa et al., 2008; Hartono and Holsapple, 2004; Li et al., 2007; Lin, 2006; Perrin and Godart, 2004; Saraf et al., 2007; Sherer and Adams, 2001]. The research focuses on exploring how the collaborative relationship may affect the CCS decisions. A case study approach is adopted for the research because it is an effective research framework for the exploratory research [Bonoma, 1985; Eisenhardt, 1989] and has a distinct advantage in situations when 'why' or 'how' questions are asked about a contemporary set of events over which the investigator has little or no control [Yin, 2003].

The research studied four cases and examined if the result of one case can be replicated with other cases. The cases were of four large companies (ATL, BIN, CDB and DFT) from three major industries (TFT-LCD panel, insurance, and 3C distribution) in Taiwan. This study selected the four companies because they engaged in different collaborative activities with partners using information systems integrated with the company's internal processes and were good representatives of study subjects for the research. There existed none business relationships between the researchers and the four companies. To encourage the companies' participating in the case study, the researchers agreed to offer them a copy of the study report for their reference after completing the research. The target collaborative activities to be researched in the four cases respectively were: logistic process, customer payment process, employee recruiting process, and demand forecasting process.

Semi-structured interviews were used to collect data, supplemented with field observations, internal documents, and publications. There are 14 interviews in the study. The primary interviewees were managers responsible for the projects under study. The CCS project manager and the IS director in each company were all interviewed because of

the research topic in common. In addition to them, the global logistics director and the shipment manager of ATL, the annuity service manager of BIN, the recruitment manager of CDB, and the purchase manager and the material manager of DFT were also interviewed because of the company's specific process under study. Each interviewee was interviewed separately. Interview protocol was developed according to the proposed three-phase framework. Questions were asked to collect data regarding major issues including the degree of dependence on external resources in the c-commerce project, supporting capabilities of IT infrastructure of the company and partners, the influence of CCS on internal processes of the company and partners, the benefits of the project, the partners' willingness to collaborate, the required coordination in the execution of the project, the CCS development decision, and the CCS functionalities. Each interviews lasted about two hours for each session.

Data regarding how the CCS can integrate internal processes of collaborative companies were also collected through field observation of the collaborative activities with the introduction of all involved internal processes and information systems demonstrated by the project manager and related department or process managers. A trip lasted about four hours, and each field observation was conducted by two to four researchers. During the field trip, one researcher was responsible for asking questions and recording the conversation, and other members then observed the processes and systems and made notes about the observations. Data were collected from December 2008 to November 2009. Secondary data were also collected from sources including the Internet, company websites, mass media, and market research firms. Only the relevant and complete secondary data were used. To prevent influences of personal subjective perceptions on the research results, the results were analyzed with researchers that did not participate in the interview and data collection processes. This also enhanced the reliability for the results. Additionally, the triangulation method was adopted to perform cross-examinations on the primary and secondary data. If data inconsistency was spotted, then the inconsistency was verified with interviewees again to increase the validity for the research. Validated data were coded against the constructs of the three-phase framework so that the qualitative data along with the quantitative measures such as development time, cost, employees, can be used for analysis. Considering the proper inter-rater reliability, data of some constructs were further rated high, median, and low by the researchers in order to compare the cases with each other.

3.3 Case Description

ATL is currently one of the global leading manufacturers of thin film transistor liquid crystal display (TFT-LCD) panels. The competitive advantages for ATL include its customer oriented organizational structure and business model, and closely cooperated supply chain partners, which allow the company to provide real-time services. One of the highly valued quality policies for ATL is to maintain the shortest response time to provide customers with products or services of the highest quality in the industry. To maintain its competitive advantage, ATL pays close attention to how it can deliver large-quantity products to its customers whose distribution facilities are scattered out in the world. Therefore, ATL implements c-commerce with forwarders in order to provide reliable global logistic service.

BIN is a prime provider of insurance policies of all types. In 2008, it was chosen by the Taiwanese government to sell annuity services to all citizens between the ages of 25 to 65 who are not covered by labor insurance, farmer insurance, or military insurance policies. The toughest challenge with the annuity services is the scale of customers the company needs to serve and the first customer-related process impacted is the payment process, which collects insurance fee monthly. Since most of the target customers are underprivileged and the locations to make payment should be near where they live, the collaboration with convenience store chains provides BIN a good solution. To enhance the quality of the customers' payment process, ATL uses the c-commerce technology with the convenience store chains.

CDB is the leading distributor for computer, communication and consumer (3C) products in Taiwan. The company has more than 250 stores nationwide. It implements a tight cost control mechanism for managing store operations. Due to the corporate strategies of market expansion and cost leadership, the company has to recruit a large number of sales clerks to fill the position vacancies partly caused by the high turnover rate. In responding to the challenging staffing need, CDB has tried all kinds of recruitment channels and currently depends primarily on an online job bank for quickly finding enough qualified candidates. It has implemented a c-commerce application with the online job bank to shorten the time of staff replenishment.

DFT is also a world-class TFT-LCD manufacturer. Key components used in TFT-LCD products are controlled by only few suppliers. DFT is highly dependent on the few suppliers to reliably provide key components. Since the TFT-LCD market is extremely competitive, how efficiently DFT can cooperate with its suppliers will directly determine not just the company's competitive position but also the profitability for its suppliers. If a supplier cannot promptly supply raw materials, then the production scheduling for DFT will definitely be affected. To achieve the objective of reliable supply, DFT installs a collaborative forecasting system that can generate future demand forecasting and purchasing information for the company's suppliers to prepare in advance.

4. Case analysis

4.1 Opportunity Identification

The shipment manager commented on ATL's resource dependence on forwarders: "*We have to collaborate with forwarders because of their logistic resources are very important for us to provide our global customers with reliable delivery service.*" ATL has a well-established IT infrastructure including a complete ERP system. The well-established IT infrastructure enables the company to develop the CCS with its partner forwarders although it develops individual collaborative interface for each forwarder which is more complicated. Nevertheless, the operational process is not much affected.

Convenience store chains operate more than 9,000 stores in Taiwan whose area is 36 thousand square kilometers only, which means people can easily find a convenience store in their neighborhood. Even compared to the banks that BIN had collaborated with and also can support BIN to provide collection services at almost any location, convenience stores are still a better choice because they offer 24 hours service every day. In addition to this, BIN's existing IT infrastructure can support the CCS as the IS director analyzed: "*The convenience store chains have complete information systems that can be integrated with the information systems of BIN, which already had EDI-capable IT infrastructure in place and had experience of implementing c-commerce with banks.*"

The online job bank has built up a database containing millions of job-seeker information and can offer appropriate information upon receiving specific qualifications from clients. They also have developed an easy to use online platform for their clients. CDB's IS director described that the CCS will not influence the company's current operation: "*With the existing IT infrastructure, CDB can easily collaborate with the online job bank and has no influence on the company's internal process.*"

DFT has functional IT infrastructure in place. It has used an ERP system for years and has available IT personnel for system development. So it has the ability to develop a web-based CCS. "*After the ERP system generates demand forecasting data of the next four months, the forecast data will be put in the CCS, which the suppliers can then notify DFT about material supplying status and DFT can monitor the supplying progress for production plans.*" ATL's material manager commented on the CCS's benefit to the company.

4.2 Relationship Formation

Having collaborative relationship with the large TFT-LCD manufacturer gives the forwarders a better chance to receive large shipping orders stably. Moreover, with a close relationship, the forwarders even can have shipping plan in advance from the company and manage their transportation capacity better. With these benefits from the collaboration relationship, the willingness of forwarders to partner with ATL was obvious. Considering the forwarders' capacities of IT infrastructure to support the CCS, the company only collaborated with partners whose IT infrastructure supported the XML and EDI specifications for the requirement of interoperability. Forwarders' internal processes were affected by the collaborative interface (Figure 3). Some process adjustments were required for forwarders such as the need to submit the number of bill of lading to DFT upon receipt of its shipment, which caused some difficulties in the phase as the project manager said: "*Some forwarders found it difficult to comply with this requirement, so the full launch date of the CCS had been postponed for these partners.*"

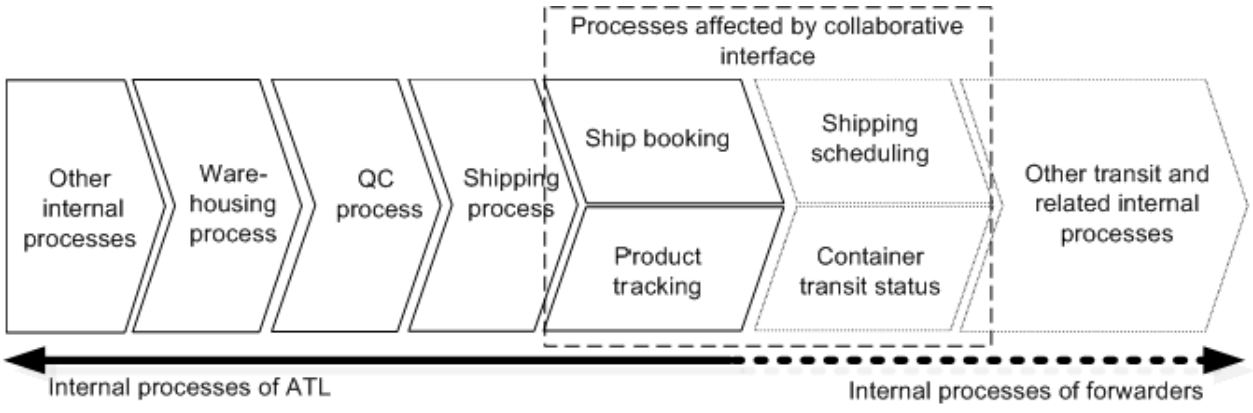

Figure 3: The Conceptual Diagram for the Collaborative Interface between ALT and Forwarders

BIN found that outsourcing insurance fee collection to convenience stores is the best payment solution to its customers of annuity services. As the project manager said: "*All current franchise chains of convenience stores in*

Taiwan have the required resource to provide the in-store payment service and have sufficient capacities of IT infrastructure to support the CCS of the project." There is little influence that the collaborative interface has on the convenience stores' internal processes (Figure 4). The willingness of the convenience stores to collaborate with BIN was the major concern in selecting partners. After several rounds of negotiations, partner chain stores were selected and they were willing to provide the payment service with a very reasonable price. The collaborative companies also have developed a good relationship through negotiations before implementing the collaboration and communications.

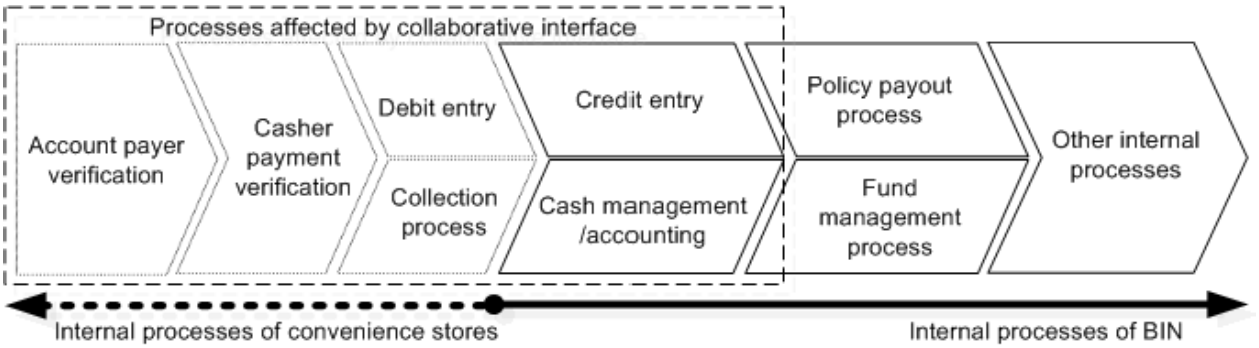

Figure 4: The Conceptual Diagram for the Collaborative Interface between BIN and Convenience Stores

In identifying and evaluating partners to collaborate with CDB for quick recruitment of a lot of employees, the company put the partner candidates' available quantity of qualified resumes, especially for the sales clerk position, at the top of criteria list. The online job bank realized that the partnership with CDB would be helpful to enhance its market position as the number of CDB's valid vacancy increases substantially, and it could easily develop the CCS to work with the recruitment department of CDB. The collaborative interface had very little influence on both parties' internal processes (Figure 5). After the thorough evaluation process, the online job bank was selected to collaborate with the company. As quoted from the project manager: "*The collaborative relationship was very satisfactory and the easy to use CCS was a critical factor in the project.*"

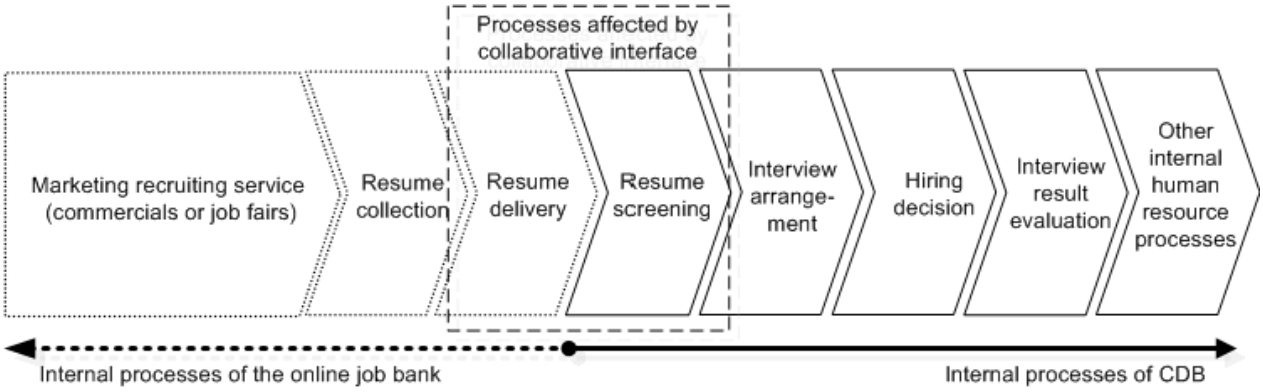

Figure 5: The Conceptual Diagram for the Collaborative Commerce between CDB and the Online Job Bank

DFT noticed its key component suppliers of the company's decision of installing a collaborative forecasting system and they need to use the system after completion of the CCS. The project manager stated: "*The suppliers are happy with the project because the CCS can help them make production and delivery plan better by providing them future demand forecasting and advance purchasing information.*" The company had developed the CCS using a web-based approach that was integrated with the ERP system of suppliers, and the suppliers need to adjust their internal processes of demand forecasting, capacity planning, and production planning according to the specifications proposed by DFT (Figure 6). The collaborative project had been implemented successfully for all suppliers of key components with assistance from the project team members of the company. While implementing the collaborative project, the selected team members from DFT had played multiple roles including process expert, problem solver,

and training specialist, and this consultative approach had proven to be very helpful in developing a healthy collaborative relationship among the team members.

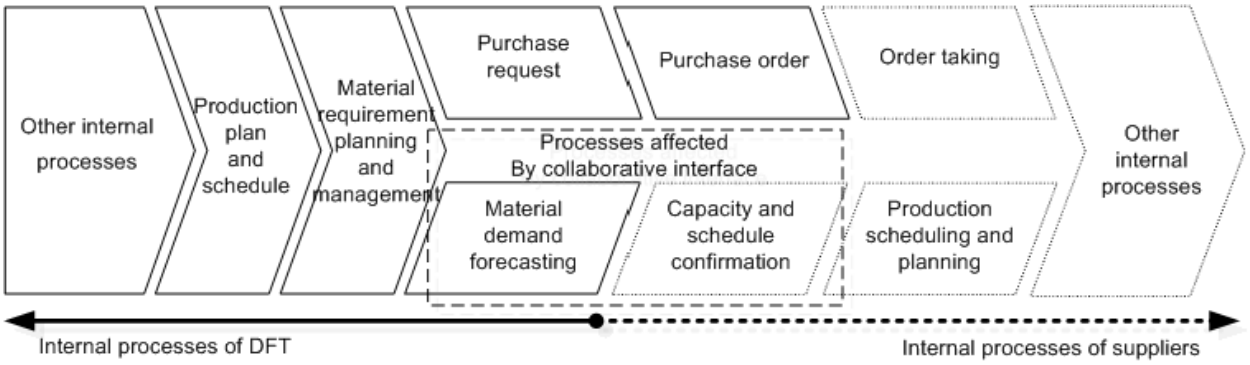

Figure 6: The Conceptual Diagram for the Collaborative Interface between DFT and Suppliers

4.3 Operation

This section analyzes how the CCS was affected by the collaborative relationship in the four cases. Table 1 summarizes the CCS, duration, cost, and number of involved employees of developing each collaborative project. It can be found from a quick look at the table that in the cases of the ATL and DFT, which had closer collaborative relationship than that of BIN and CDB, the development of the CCS was more complicated.

Table 1: Summary of the CCS Development

Company	CCS	Development Duration	Development Cost	Number of people involved
ATL	Links information systems at the company and forwarders using a communication protocol	2 years	USD 100,000	100
BIN	Links information systems at the company and convenient stores using a communication protocol	2 weeks	0 (charge a transaction fee of each 0.1USD)	20
CDB	Web-based system from the web-site of online job bank	1 day	0 (charge an annual fee of USD 2,000)	5
DFT	Integrated web-based information system	1 year	USD 160,000	80

Among the four c-commerce cases, two of them used a proprietary network approach to develop the CCS and the other two cases used the internet-based approach. Considering that the partner forwarders, due to security concern, operated their information systems in a rather close environment and, that their processes of operation were very different, ATL decided to adopt the proprietary network approach and developed individual collaborative interface for different partners to match up their IT infrastructure and processes of operation. So it spent two years developing the system, which was the longest among the four cases and also involved the most people. Based on the security concern about the personal data and financial information, BIN also used the proprietary network approach to develop the CCS. But contrary to the heterogeneous IT infrastructures in the case of ATL, BIN and its partner convenience stores were linked by the secured network of financial institutions in Taiwan. Moreover, the convenience stores used similar processes to collect insurance fees. Therefore, BIN could develop the CCS in two weeks by linking the company's current information system to that of the partners' which incurred no extra development cost aside from the 20 people involved.

CDB's partner provided job-seeker information and employment service for its customers through an internet-based information system. The CCS was developed in one day with no cost to the company and five people were involved. DFT also adopted the internet-based approach to develop the collaborative material demand forecasting and planning system mainly because their partners' cost concern, even though, the cost of developing its

CCS was still the highest (1.6 times ATL's cost) among the four cases since the material demand forecasting and planning system was more complicated. The company spent one year on the system development, however it was still twice as fast as the ATL adopted proprietary network approach. The number of people involved was 80, which was less than that of ATL as well.

In the project of ATL, the coordination of shipping arrangements and inquiry about transit status of the shipments were done via the CCS and thus reduced the number of negotiations that took place in regular shipping operations. The CCS had alert functions for the delayed response of shipping arrangement requests and for the abnormal transit status of shipments so that the partners could resolve the problems in advance. To encourage the partners to collaborate well, the CCS also generated a report of partners performance review. These functionalities were helpful to prevent the possible conflicts in advance. For the other three cases, their CCS also provided coordination mechanism and conflict resolution mechanism (Table 2). The above mechanisms of preventing and resolving conflicts in each project were agreed on by all engaged parties during their collaborative relationship.

Table 2: Coordination and Conflict Resolution Mechanisms in the CCS

Mechanism	Company	Description
Coordination	ATL	Shipping request of the company and the arranged schedule of forwarders are coordinated via the CCS. The company's shipping clerk can track cargo transit status at any time.
	BIN	The CCS sends policyholder information to convenient stores for them to collect insurance fees and sends collection information back to the company for performing debit entries.
	CDB	The CCS sends qualified resumes to the company and the company's recruitment staff can also search qualified candidates from the job bank site directly.
	DFT	Material demand and supply planning for the next four months are coordinated between the company's purchase department and the suppliers' sales department via the CCS.
Conflict resolution	ATL	The CCS will keep alerting the forwarders if they fail to respond within one day they receive shipping arrangement requests and use alerts of different colors to signal that a cargo has abnormal transit status, it also provides performance review for the company to manage its partners.
	BIN	The company provides a list of questionable payments to convenient stores for them to verify or correct their errors. The CCS will issue questionable notices to the law enforcement agencies and convenient stores to settle the matter with legal means.
	CDB	The company and online job bank sign a contract to ensure that the job bank will continue to provide the company with qualified resumes and the company will only supply accurate and current job vacancy information. If there are disagreements, then legal actions will be pursued to settle the matters.
	DFT	The CCS will issue alerts if suppliers fail to respond material supply information on a timely manner. An inaccuracy instance note will be presented if suppliers provide inaccurate material supplying information. Both the number of alerts and instance notes will be used to evaluate the performance for suppliers. The company and suppliers decide on the range or tolerance for inaccurate forecast to prevent problems caused by forecast errors.

5. Discussion

5.1 Collaborative Relationship Development

From a non-technical standpoint, all four companies in the study chose to enter into c-commerce because they needed certain types of resources from their partners, which can be explained by the resource dependence theory of Pfeffer and Salancik [1978]. The higher the resource dependence level is for a company, the more enthusiastic that company becomes to develop c-commerce. For example, ATL greatly relied on forwarders to provide global logistic service. The forwarders owned specialized logistic resources such as containers, traffic rights, and professional

transit knowledge and all their resources were not easily substitutable. DFT was also highly dependent on the limited supplier of the key components. However, the level of resource dependence on convenience stores for BIN was medium and the level of resource dependence on the online job bank for CDB was low.

In addition to the relatedness of developing collaborative relationship to resource dependence revealed from the above analysis, it can be seen from Table 1 that the two high resource-dependent cases (ATL and DFT) used more time, cost, and people in developing the CCS than other two cases, and the median resource-dependent case (BIN) used more time, cost, and people than the low resource-dependent case (CDB). These evidence the relatedness of investment in the CCS to resource dependence level and also indicate that higher level of resource dependence makes the company more aggressive in developing collaborative relationship. Accordingly, this study proposes the following proposition:

Proposition 1: *The heavier an enterprise relies on external resources, the stronger the incentive is for the enterprise to implement c-commerce; the intention to develop collaborative relationship may be reflected on the time and resource the enterprise devoted to developing the CCS.*

From a technical viewpoint, all case companies and their partners first considered whether their existing IT infrastructure capacities could support a CCS, and what impacts a CCS would have on their internal processes before they decided to enter an IT-based partnership. The IT infrastructure capacity refers to technical and managerial expertise that a reliable physical service requires to extend the electronic connection that is both internal and external to the company [Broadbent et al. 1999]. Among the four cases, the supporting capacities of IT infrastructure for c-commerce for BIN, CDB, and DFT and their partners were high. But ATL developed multiple collaborative interfaces with major forwarders, which was a more complicated interdependence model that was more difficult to implement [Kumar and Dissel, 1996]. The level of its IT infrastructure capacity for supporting the development of the CCS was medium.

Comparing the level of IT infrastructure capacities of engaged partners for supporting c-commerce of the four cases, as analyzed above, with the time and people involved in developing the CCS, as shown in Table 1, we find a negative rank correlation between them. In other words, engaged partners with higher levels of IT infrastructure capacities for supporting the CCS used less time and fewer people in developing it. As time and people used in a project also reflects the difficulty in implementing the project, this leads to the next proposition:

Proposition 2: *The stronger the supporting capacities of IT infrastructure for the CCS of engaged partners, the lower the difficulty to implement the project.*

5.2 Collaborative Relationship and the CCS

Enterprises need to adjust their internal processes to the CCS. For ATL, the CCS revolutionized the operational process for the shipping clerks. Some forwarders find it difficult to submit the number of bill of lading upon receiving shipments from ATL. The impact level that the CCS generates on internal processes of the company and its partners is high. With the collaborative demand forecasting system, the impact on internal processes of DFT and its partners is medium. But the impact of the CCS on internal processes is low in BIN and CDB respectively.

Based on the above analysis, likewise, we can find a positive rank correlation between the impact level that the CCS generates on internal processes of engaged partners with the time and people involved in developing the c-commerce. In other words, the CCS has higher impact on operational process needs more time and people for deployment. This leads to the third proposition:

Proposition 3: *The higher impact a CCS has on operational process, the higher difficulty to implement the collaborative project.*

A CCS integrates internal processes for the collaborating partners. Process integration in a collaborative project reflects the closeness of the collaborative relationship. A closer relationship involves more time and people in the collaborative project, which then requires more coordination efforts. Coordination activities can be reduced or replaced by the CCS that integrates operational processes. The complication of CCS indicates more coordination needs in the collaborative project and also means its development involves more people and takes longer time. From the four cases, one can see that the more people are involved in the development and the longer the process takes, the higher the CCS development costs. Collaboration can be regarded as a transaction. According to the transaction cost theory, its expenditures include cost incurred before the deal, such as information search cost, contract negotiation cost and contract closing cost, and after the deal, also known as contract fulfillment cost [Williamson, 1992]. The development and implementation processes of a CCS fall in the pre-deal cost category. When more people and processes are involved, then the coordination becomes more complicated and the cost higher. As a result, the cost for developing a CCS is higher and the development process takes longer time to complete. Based on the above, this study proposes the fourth proposition:

Proposition 4: *To implement a c-commerce with closer relationship that may require more coordination, a more complicated CCS may be needed with higher development cost.*

It can be summarized from the above discussion that the collaboration with closer relationship may consider to utilize a CCS to simplify the cumbersome coordination tasks. Whipple and Russell [2007] categorized collaboration relationship into three types: transaction, event, and process. In the four cases studied, the collaborations of ATL and DFT belonged to process collaborations. They had closer relationship compared with those of BIN and CDB which belonged to transaction collaborations. It seems reasonable to argue from this finding that the closeness of collaborative relationships may be correlated to the type of collaboration. Specially, the process collaborations that involve more process integrations among partners may develop closer relationships to deal with more coordination requirements. However, from the analysis of relationship formation phase, it can be found that BIN and CDB had more satisfactory relationships than those of ATL and DFT. In other words, closer relationships did not bring the partners better relationship quality. This offers evidence for us to further argue that collaborative relationship can be regarded as a two-dimensional construct, of which one new dimension of closeness is added to the commonly used dimension of quality. Relationship closeness may also be measured by adaptation and atmosphere that Woo and Ennew [2004] applied in measuring business-to-business relationship while relationship quality is often measured by trust and satisfaction as Crosby et al. [1990] proposed. The two-dimensional construct can also explicate more clearly how collaborative relationship affects the engaged parties' CCS decision. As we already mentioned that relationship closeness may influence the CCS to be equipped with functionalities for facilitating the coordination among partners; the CCS may also bring partners good relationship quality by providing them with functionalities of communication support and conflict resolution. That is, the CCS not only may be affected by relationship closeness but also may affect relationship quality.

6. Conclusion

This research integrates theories of resource dependence and coordination to investigate what factors influence the implementation of c-commerce and explore how the collaborative relationship affects the CCS. A three phase framework of opportunity identification, relationship formation, and operation is used for case studies. The results indicate that enterprises engage in c-commerce because of their resource dependence on partners, which will lead to their jointly developing a collaborative relationship. The heavier an enterprise relies on external resources, the stronger the incentive is for that enterprise to develop collaborative relationship. IT infrastructure of all partners needs to support the CCS. The cost for implementing c-commerce is related to the impact of the CCS on operational process and the supporting capacity of IT infrastructure to the CCS. A more complicated CCS may be needed for the c-commerce with closer relationship. Moreover, the CCS not only may be affected by relationship closeness but also may affect the quality of collaborative relationship.

The research has its limitations. The cases studied are selected from manufacturing, retailing, and financial sectors for their representativeness. They are leading firms in their industries and have plenty of experiences in implementing c-commerce. However, the industry characteristic and experience factor may be sources of variation in interpreting the research results. Moreover, the studied processes are logistics, customer payment, recruitment, and demand forecast. Compared with the processes of marketing or research and development, which require more innovations and idea exchanges, the collaboration would be different. So the research propositions needs to be further studied in different industries and different processes in the future to enhance its validity. Keep this in mind, nevertheless, the research has its contributions. It reveals how the CCS decision is related to the collaborative relationship, which provides researchers a new perspective for further studying c-commerce. Moreover, practitioners can apply the three phase framework to assess the development of collaborative relationship and the CCS. In fact, enterprises can first evaluate their level of dependence for external resources and then analyze if existing IT infrastructure in place is suitable for such an implementation. In the implementation, they can also assess the influence that a CCS has on their internal processes and if their IT infrastructures have the capacity to support it.

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