A Collaborative Framework for Collaborative Commerce

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Abstract

This article proposes a collaborative framework for the process of collaborative commerce (c-commerce) through which prospective partners could employ and configure c-commerce technologies according to the needs of different stages to realize potential benefits promised by the next generation of enterprise application software. This framework details pre-conditions that lead prospective partners to establish a collaborative relationship, including structural, social-psychological, and technological factors. This framework also describes how collaboration in c-commerce is unfolded following a teamwork problem-solving model. Furthermore, the framework discusses a variety of possible outcomes resulting from an initiative of collaborative commerce. Those components of collaborative commerce are structured in the format of the input-process-output model.

1. Introduction

In the past few years, the business press has constantly reported successful stories of collaborative commerce (c-commerce) that companies in a variety of industries employed to realize potential benefits from the use of collaborative technologies. For example, Boeing improved its production productivity from 228 airplanes per year in 1992 to 620 expected in 2002 by using collaborative e-marketplace [9]. In order to build a new family of supersonic stealth fighter planes that it was bound to deliver in four years, Lockheed Martin Aeronautics Co. used collaborative technologies to link more than 80 suppliers located at 187 locations to design and build components of the Joint Strike Fighter [15]. A recent report on c-commerce [2] indicated that software for creating c-commerce would be the next stage of growth in the enterprise application software business. The report estimated that the size of the c-commerce market would grow from $5.8 billion in 1999 to $36.5 billion in 2004 (estimated by AMR and IDC). Another report [8] showed that about 60 percent of 356 survey respondents considered c-commerce as critically important to their businesses in the year of 2001 – 2002 and 78 percent of companies planed to implement c-commerce to improve supplier and customer interaction. As many firms start adopting c-commerce, issues surrounding c-commerce have intrigued researchers' interests. For example, Welty and Becerra-Fernandez [31] investigated the issue of managing trust and commitment in collaborative relationships. Kumar [16]

delineated the features of information and communication technologies for supporting c-commerce. Based on the type of inter-organizational relationship and the level of organizational computing, Chuang and Nakatani [5] propose a classification of c-commerce.

The majority of existing c-commerce literature was anecdotal, although sporadic research about c-commerce has been published. The focus of extant literature has been on reporting the benefits realized by those pioneers and on the architecture of information technology for c-commerce. C-commerce applications are generally described with what business processes c-commerce systems may support. For example, Bellini, Gravitt and Diana [2] classify the c-commerce market into three categories: supplier relationship management, knowledge management, and product lifecycle management.

Not much, if any, research has been done to examine the phenomenon from the perspective of collaborative process, let alone the interactivity of the process. Furthermore, even though it is indicated that the value proposition of c-commerce should be derived from the development of collaborative relationship [7], how c-commerce could be used to facilitate the development of such a relationship is not clear. Fou [10] defined c-commerce as "commercial relationships carried out over a collaborative framework to integrate enterprises' business processes, share customer relationships and manage knowledge across enterprise boundaries." [9, p. 1] Although the target of c-commerce might not be limited to the items listed by Fou, his definition indicates an important element in c-commerce: a collaborative framework through which prospective partners obtain mutual benefits and share common risks. Nevertheless, his definition raises a few interesting questions that are unanswered by the extant literature. For example, what is a collaborative framework for c-commerce? How could it facilitate the achievement of goals of c-commerce initiatives? How are c-commerce technologies used in such a framework? We believe answers to those questions are critical to understand the phenomenon of c-commerce. Furthermore, answers to those questions would provide guidance for determining and configuring the features of c-commerce applications and for sustaining collaborative relationships. Consequently, the objective of this article is aimed to answering those questions by proposing a collaborative framework for the process of c-commerce at the project level. By drawing research in organizational collaboration, organizational cooperation, group dynamics, and information systems,

we developed such a framework to address the above issues.

2. Literature Review

Even though c-commerce is an emerging business phenomenon, collaboration between trading partners / stakeholders has long been a research topic among researchers in the areas of business and public policy disciplines. In the field of marketing, for example, researchers examine the factors that affect the development of collaborative relationships between buyers and sellers [27], and the means to develop and sustain collaborative supply chain relationships [26]. Also, research in the field of social services has been done to investigate into how business, government, and stakeholders form collaborative alliance to generate constructive solutions to social problems [11]. However, only limited research studies have been conducted in c-commerce. With very few exceptions, such as Welty and Becerra-Fernandez [31], Kuma [16], and Chuang and Nakatani [5], existing studies are focused on two themes: (1) reporting successful anecdotes and potential benefits of adopting c-commerce (2) proposing IT infrastructures for building c-commerce. Examples of successful stories [9] [15] are available in companies in various industries, such as Boeing Co. and Lockheed Martin Aeronautics, Co., General Motors Corp., Juniper Networks Inc., and Toshiba Canada Office Corp. Alexander [1] gave a more general discussion about the benefits of c-commerce and barriers of deploying c-commerce from a practitioner's point of view.

The emphasis of IT infrastructure prevails in the extant literature of c-commerce. For example, Bellini, Gravitt and Diana [2] classify the c-commerce market into three categories of enterprise application software: supplier relationship management, knowledge management, and product lifecycle management. Fou [10] considers c-commerce as a continuum of application of enterprise application software and classifies the evolution of c-commerce into three stages: (1) web-enabled single-dimensional and single-process c-commerce, (2) B2B exchanges-based, single-dimensional and multiple-process c-commerce, and (3) Web service-based, multiple-dimensional and multiple-process c-commerce. Fou asserts that the ultimate aim of c-commerce is to maximize return on intellectual capital investment, improve business agility, and provide better quality of customer experience. In order to achieve the objective, Fou believes that the next stage of c-commerce must be built on Web services, and he proposes a Web service-based collaborative architecture that consists of four tiers: c-commerce vendors, web services, business rule engine, and multi-dimensional c-commerce enterprise web portal.

Derome [7] believes that c-commerce capabilities should be depicted from a functional standpoint and downplays the importance of state-of-the-art technologies in developing collaborative relationship. For example, according to him, e-mail is a c-commerce tool, as are Electronic Data Interchange (EDI) and extensible Markup Language (XML). He segments the c-commerce capabilities into three categories: Free-form collaborative services, process collaboration layer, and the structured data exchange category. The IT environment, duration of collaboration, and goal of collaboration vary from category to category. Although Derome suggests a variety of technologies for each of the three categories, he emphasizes the importance of deriving value propositions from the development of a collaborative relationship.

Li and Williams [19] examined the impact of previously established transaction-focused application one the cooperative relationship and found that companies that had established a successful cooperative relationship at the transactional level by creating interfirm network (via proprietary or open systems) tended to develop new and collaborative partnership at the strategic level. Their studies show that further developed collaborative relationship could occur in the existing transactional application or a new application devoted to the new partnership.

As it is generally accepted that trust and committee are the premises for establishing and developing a collaborative relationship, Welty and Becerra-Fernandez [31] presents a business interaction model in which interaction technology (i.e., collaborative commerce software) is used to develop and enforce the development of trust and commitment between cooperative partners. Welty and Becerra-Fernandez's article highlights an important element of sophisticated c-commerce: interaction between cooperative partners over four different phases of business transaction process. Besides, they assert that the difference between traditional enterprise resource planning systems and collaborative commerce lies in that the latter integrate customer satisfaction into business processes. In other words, it is customer satisfaction rather than the delivery of goods or the submission of payment that closes a business transaction loop. The importance of trust and commitment in c-commerce is also addressed by Chuang and Nakatani [5]. Chuang and Nakatani assert that existing inter-organizational relationship (IOR) and trust level among prospective collaborators might affect the establishment of a c-commerce. Different types of IOR and different levels of trust might dictate the structure and conduct of a c-commerce. Based on the combinations of types of inter-organizational relationships and the stages of organizational computing, Chuang and Nakatani [5] propose a classification of c-commerce applications.

As shown by the above review, research studies of c-commerce are rare. Reporting successful cases and IT infrastructure for c-commerce dominate the extant literature. Although the selection of appropriate IT infrastructures is critical to develop successful c-commerce, yet they are not sufficient. The decision over the choice of an IT infrastructure for c-commerce should be made taking into account factors surrounding *collaboration* per se. Those factors should be identified and organized as parameters of a collaborative framework

through which collaboration would grow, develop, and sustain.

3. Collaborative Framework For C-Commerce

To serve the purpose of the study, we believe that a collaborative framework for c-commerce should include the elements that explain why firms enter into IT-enabled inter-organizational relationship, the process that describes how collaboration is unfolded, and what is expected to produce from such a collaborative effort. Hence, the structure of the collaborative framework we proposed will be in the format of precondition, process, and outcomes. By integrating research in inter-organizational cooperation, inter-organizational collaboration, group dynamics, and information systems, we propose a collaborative framework as shown Figure 1. In the following paragraphs, we will discuss how those factors come together and affect each other.

3. 1 Pre-conditions of C-Commerce

Although the practice of collaboration is part of human life and might be as old as the history of human being, due to the concern with anti-trust law, not until early 1980s was the necessity and conduct of inter-organizational collaboration gradually recognized and accepted [17]. Since then, issues in inter-organizational collaboration and relevant areas have caught researchers' attention and research has been reported, though a comprehensive theory is still not available [32]. Based on different theoretical perspectives (e.g., resource dependence or political perspectives), researchers in relevant areas have identified several factors that may facilitate the development of inter-organizational collaboration. Those factors are presumably applicable to c-commerce, which we consider a special case of inter-

organizational collaboration. In addition to those factors identified by research in inter-organizational collaboration, we also consider other factors unique to c-commerce. We classify those antecedents into three broad categories: structural, social-psychological, and technological.

3.1.1 Structural factors

Structural factors refer to those related to the structure of prospective partners in the industry or in the supply chain. It is generally accepted that high interdependence between organizations is an important antecedent to the development of an inter-organizational collaboration [20] [12] [27]. Nowadays, because of the complexity of business activities and high level of division of specialization, no one single company can solely assume all kinds of roles in the industry. As a result, an essential aspect of today's business activities is the coordination of activities performed by different companies. While interdependence is widely acknowledged as an important factor to the formation of a collaborative alliance, the definition of it in most research studies is vague. It is generally referred to task interdependence, which can be defined as the extent that tasks performed by one party are related to those performed by other parties. However, according to Tjosvold [28], task is one of many facets of interdependence and he proposes an integrated model of interdependence in organizations in which he differentiates objective interdependence from subjective interdependence. Objective interdependences include tasks, rewards, and assignments, while subjective interdependence means the link between goals expectation. The importance of interdependence is that the extent and the manner that prospective collaborators are interdependent of may affect how they collaborate and the performance of the alliance.
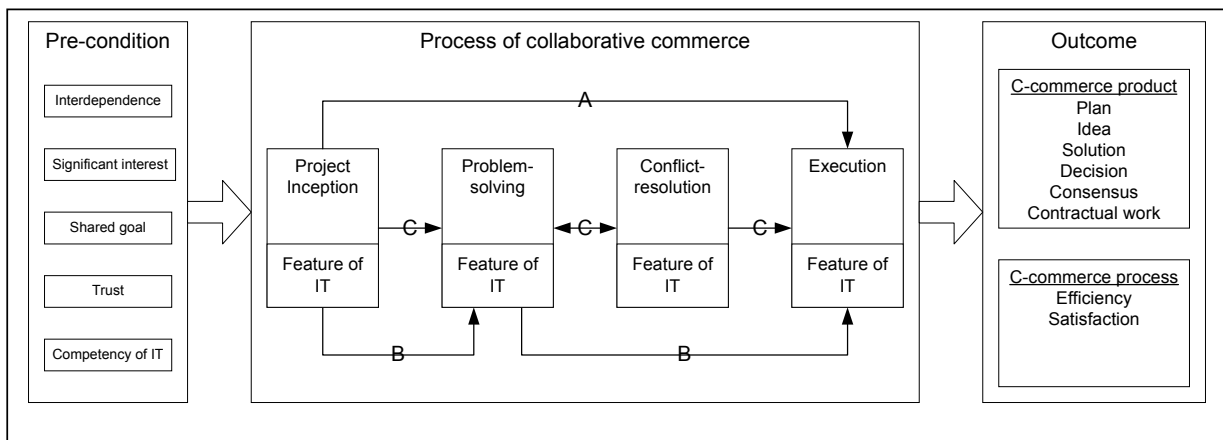

Figure 1. A collaborative framework for c-commerce

Another pre-condition of c-commerce is the significance of interest of the collaborative business in

question. Logsdon [20] argues that high stake and high interdependence are two premises to collaboration. She defines interest broadly, including long-term interest and

legitimacy status of an organization. In other words, she asserts that an institute would not engage in collaborative relationship with others because of short-term efficiency. Instead, just as Kanter indicates, "Successful partnerships manage the relationship, not just the deal." [13, p. 96], prospective collaborators will consider the significance of each transaction in the context of long-term perspective and decide whether to collaborate. In one study, Sriram, Krapfel, and Spekman [27] obtain similar results and their research shows that the importance of transaction (collaborative business) affects the propensity to collaborate through perceived buyer dependence and transaction costs.

3.1.2 Social-Psychological Factors

Structural factors such as task interdependence might warrant the necessity for collaboration, but they are not sufficient for organizations to collaborate. Social-psychological factors, such as mutual trust, might play an even more important role in the decision on collaborative relationship. Trust and commitment are generally considered as premises for establishing a collaborative relationship [25] [26]. Trust could be broadly defined as the belief that others will act or react in a predictable way [21]. Trust is important for the creation of collaborative partnership because it could reduce uncertainty and provide certain extent of assurance for managers' decisions. The level of trust one party has on the other party in a relationship might determine how strong the first party is committed to the relationship. Just like relationship between individuals, relationships between companies begin, grow and develop [14]. The level of trust and commitment grows following the development process of relationship between two parties. The level of trust might have impacts in three aspects of an alliance of c-commerce: First, it might affect the willingness of prospective collaborators to join the alliance. Second, the level of trust might determine the amount of resources (e.g., time and effort) collaborators would invest in the relationship. Third, the level of trust and commitment influence the interaction between collaborators. Impacts in those aspects will not only affect the outcome of c-commerce, but also influence sustainability of the alliance. For example, previous studies [19] indicate that those companies that had already developed routine applications between them are more likely to develop interfirm collaboration than those had not, because trust and commitment had been nurtured.

Another social-psychological pre-condition is shared goal expectation. As indicated previously, Tjosvold [28] classifies interdependence into broad categories: objective and subjective interdependence. By subjective interdependence, he means the link between goals expectation, which means that the goals of collaborative initiative expected to achieve by prospective collaborators must be related or shared. The importance of shared goal expectation in c-commerce initiatives is twofold: One is that shared goal expectation could help direct efforts from different parties toward the same direction and the result would be a truly synergetic outcome. Second, shared goal expectation would confine conflicts, when arise, to the category: choice of means. According to Daft & Lengel [6], conflicts in organizations may occur in two different ways: one is conflict in ends and the other is conflict in means. Conflict in ends means that organizational units have different viewpoints regarding what goals or objective the organization should pursue, while conflict in means implies that organizational units share organizational goals but have different opinions regarding how to achieve the shared goal. In general, conflict in means could be resolved by providing more data to parties in questions. Thus, shared goal expectation is important in that it may affect the way collaborators interact in the process of c-commerce.

3.1.3 Technology Competency of Prospective Collaborators

Technologies underpinning c-commerce vary considerately. As Derome [7] indicates, c-commerce technologies may range from free-form interaction tools, such as email and secure chat, to structured data exchange, such as electronic data interchange (EDI) and XML. Although proprietary c-commerce package is available, it is generally accepted by practitioners that c-commerce technologies should be integrated with existing commerce systems, such as ERP and CRM. As a result, at least, there are two reasons that organizational competency of information technology is an important factor affecting the establishment of a c-commerce: First, as other studies [7] [24] show, a c-commerce system usually consists of many different technologies, each of which could be chosen from a wide range of technologies. Without a decent level of IT competency, a prospective collaborator might not be able to make informed decisions over the choice of proper technologies. Second, organizational IT competency, to certain extent, reflects the sophistication level of the company using commerce systems. Previous studies [19] show that developing routing applications between partners is an important step of developing interfirm collaboration.

3.2 Process of C-Commerce

At the project level of a collaborative alliance, the practice of a c-commerce is teamwork in nature. Although a c-commerce initiative is initiated, sponsored, sustained, and supported by participating organizations, implementation and on-going activities are carried out by a group of people representing their own organizations who electronically work together in order to achieve a specific objective, such as developing a new product, forecasting product demand, or improving customer services. From this point of view, the on-going process of c-commerce is a teamwork process. Depending on the nature and purpose of the collaborative alliance, the duration and the structuredness of collaboration may significantly vary. For example, Procter & Gamble, Co.

developed a Collaborative Planning, Forecasting, and Replenishment (CPFR) system with which it could receive input from its partnerships with retail customers to determine when, what, and how much to produce so it would be able to meet demands from its retailers [30]. Although the implementation of a system like this may take time, once it is in place, the planning and forecasting process is relatively structured and each session could be relatively short. In contrast, a c-commerce for developing new products might not be so structured as CPFR systems. For example, Lockheed Martin Aeronautics Co. used collaborative technologies to link more than 80 suppliers located at 187 locations to design and build components in order to build a new family of supersonic stealth fighter planes that it was expected to deliver in four years [15]. The c-commerce case in Lockheed Martin Aeronautics Co. is much more unstructured than the CPFR system in Procter & Gamble. As a result, the prescribed process of a collaborative commerce should take into account the possibility that different c-commerce scenarios could have different routes.

3.2.1 Paths of C-Commerce Process

Based on the above discussion, we borrowed McGrath's model of stages of group project activity [22] to describe the on-going process of c-commerce. According to McGrath, groups perform three different functions: production function, member-support function, and well-being function. Production function means that groups perform a variety of activities to generate results, which make contributions to their embedding systems (e.g., participating companies in a c-commerce). Groups also make contributions to their components (member-support function) and to themselves (well-being function). For a long-term c-commerce relationship, sustainability of the collaborative alliance obviously is an important objective (i.e., well-being function of the alliance). However, for the purpose of this study, the production function is the major process that we should focus on. Here, we detail the stages of production function and, when appropriate, illustrate those stages with real cases.

McGrath [22] proposes that the stages of group activities are the inception and acceptance of a project (goal choice), the resolution of technical issues (means choice), resolution of conflict (police choice), and the execution of the performance requirements of the project (goal attainment). In the first stage, the inception and acceptance of a project, members of the collaborative alliance recognize the opportunity or the need for collaboration. The purpose or goal of the particular project for the group is articulated in this stage. McGrath indicate that there are three routes through which groups acquire projects: a project proposed by one of members of the group, a project assigned by an outside agent, or a recurrent project of long standing for the group. It is the third route that most of c-commerce sessions acquire their projects. For example, a manufacturer may regularly use a Collaborative Planning, Forecasting, and Replenishment (CPFR) system [30] with its retailers to forecast the demand for products. The second stage is the choice or design of a logically correct or best means for solution to achieve the articulated goal, when such a means is not readily available. In the context of c-commerce, the second stage could be extended to include general problem-solving issues, not just the choice of means. The third stage, the resolution of conflict of interests or of viewpoints, might be needed when members of the group possess different, or even conflicting, interests or viewpoints. Finally, the last stage is the execution of the project, carrying out the procedure for achieving the articulated goal.

McGrath claims that those stages should be "regarded as a logical template for potential project activities, rather than an endogenous set of inevitable developmental phases." [21, p. 29]. This statement suggests that the process of c-commerce is not a linear or rigid process. Instead, members of the collaborative alliance may "shift gear" from one stage to another, whenever the need arises or the situation warrants. As a result, there are several different paths through which one session of c-commerce may pass.

Execution path: When the activities required to achieve the articulated goal are available, the first stage of inception might directly lead to the last stage of execution (Path A in Figure 1). For a well-defined and recurrent c-commerce system, path A might be the most frequently visited path. Under such a circumstance, the execution stage would be the heart of the c-commerce because for a c-commerce system characterized by recurrent activities (e.g., forecasting demand for products), the inception and acceptance of the goal would gradually become a routine.

For example, IBM developed a c-commerce prototype system for a fictitious company selling power tools [22]. This system would allow the user (i.e., buyers or purchasing agents) to perform transactional activities, such as create requisition lists and issue an order (or reorder) using a requisition list, and non-transactional activities, such as contract negotiation and collaborative product design. Once the user logs into the system, the system will greet him/her with a welcome menu in which the projects that the user is participating are displayed (i.e., configuration of membership in different projects) and the user could choose the project that he/she intends to create a session and carry out the necessary activities to achieve his/her objective for that particular session. In most of the time, the user might be able to carry out his/her business by following the straightforward procedure and finish the session without a glitch.

Problem-solving path: In a c-commerce system designed to support a less structured business process, the procedure or activities for achieving the goal might not be readily available. In such a case, users of the c-commerce system will enter into the second stage, the problem-solving stage, in order to identify or agree upon a feasible procedure to achieve the goal. When the choice of the procedure or the means is made, the group could move

ahead to the last stage of execution. This is path B in Figure 1. McGrath [22] indicates, "[For] path B, sometimes the problem-solving activities of Stage II are the heart of the matter, and Stage IV is pro forma once the correct procedure or appropriate algorithms has been determined." [21, p. 32]. In the context of c-commerce, although for path B, Stage IV is not completely a formality, Stage II could be the major part of the whole process. For example, in a project of joint product development, the problem-solving activities are essential for product conception and development, not just only for the choice of means to conduct the product development.

An example of the problem-solving path is that of the prototype system developed by IBM [22]. In addition to functions introduced above, the system features an awareness function. This function allows the customer service agents of the prototype to offer assistance and proactive help to customers by giving an immediate context of what page they are on, and how long they have been there. Whenever the customer requests for assistance, this system would open a window for communication and allow customer service agents to provide live help. In terms of the process of c-commerce, the customer and the customer service agent enter into the problem-solving stage.

Conflict-resolution path: On some occasions, members of the group may attempt to enter the execution or problem-solving stages and found that they might need to address the issue of difference in viewpoints or interests among them before they can identify or carry out the procedure. As a result, instead of entering into the execution stage, members of the group need to enter the conflict-resolution stage. When this occurs, the path the group travels is path C in Figure 1. Because the impact of unresolved conflicts of viewpoints or interest in the process and the result of group activities could be detrimental, the management of conflicts is very critical to the success of teamwork. Consequently, McGrath [22] claims that on certain occasions, the conflict-resolution stage might be the heart of the matter and Stage II or Stage IV could be a matter of formality or even trivial.

The prototype system developed by IBM [23] offers several functions, such as contract negotiation, with features of real-time and asynchronous collaboration. Those features could partially facilitate the resolution of conflict of viewpoints. For example, the feature of real-time collaboration introduced above for problem solving could be used to present and discuss issues in the process of negotiation. If and when issues cannot be resolved in real time, the feature of asynchronous communication could be used to create a "forum" equipped with necessary contents and functions to facilitate group processes. Several functions of group decision support systems (GDSS), such as brainstorming, voting, and ranking, could be added on the c-commerce systems and used to resolve conflicts of viewpoints.

The significance of specifying different paths in the process of c-commerce is twofold: One is recognizing the need for coordinating activities performed by different organizations or their representatives in different stages. Second, features of technology required for supporting different coordination mechanisms or activities in different stages would be accordingly different.

3.2.2 Features of Collaborative Technologies

Different technologies that offer different capabilities could be adopted to implement c-commerce. For example, in a highly structured partnership, EDI might be sufficient. However, more sophisticated technology will be needed for a less structured project, like joint product conception, in which partners usually need technology that supports real-time interaction. In these two cases, one type of technology might be sufficient for supporting the whole process. However, as we discussed above, when a group of people work together, the path they may take could be quite different from another group of people or perhaps, even different from the path they take in another session. Consequently, we assert that passing along with different paths and different stages will need support with different technologies. Here, we borrow Derome's classification of technologies (which he called Collaboration over Internet Protocol, CoIP) to discuss how collaborative technologies could be used to support different stages.

Derome [7] classifies c-commerce technologies capabilities into three categories: Free-form collaborative services, process collaboration layer, and the structured data exchange category. Those categories differ in delivery model, suitable environment, duration of c-commerce, expected goal, and applicable business functions.

Structured data exchange is most suitable for a stable environment in which the goal of c-commerce is to precisely and accurately transport data from one location to another. As a result, the less human intervention, the better. Furthermore, the data format, data sources, corporate relationships, and quality of data are all well defined. Explicit rules and standards are necessary for the definition, movement, and representation of data. Technologies for this category are fairly mature and are available from major software vendors. Furthermore, technologies for this category pave foundations for paths A, B, and C. However, they are particularly important for path A. For example, in a c-commerce system based on Collaborative Planning, Forecasting, and Replenishment (CPFR) standard, most of communication could be accomplished with structured data, even though technologies for free-form interaction might be needed occasionally for resolving the difference in forecasting between buyers and sellers.

Process collaboration provides less structured, yet more flexible solution to the alignment of processes between companies. Process collaboration enable partners to share information, synchronize activities and execute shared processes. Because this category requires the synchrony between partners' business activities, it is

usually integrated with existing back-office systems. The integration to back-office systems and the process-oriented focus dictate the requirement of technologies for this category. The capabilities of technology for process collaboration include process modeling, workflow management, document management, graphical analytics, and content aggregation technology. Additionally, process-specific capabilities, such as planning and scheduling optimization technologies, CAD/CAM design capabilities, project management, might be needed. Since the focus of CoIP networks is not on data transportation, but on the support of business functions, systems in this category are usually more flexible and less structured. Also, systems in this category are not so isolated from human intervention as those in structured data exchange. Technologies in this category could be delivered either as a stand-alone network or an add-on to e-marketplace system. Early systems are mainly focused on joint product development or joint-production planning and scheduling. Combined with structured data exchange, technologies for process-oriented collaboration could be used to support path A and partially support path B.

The third segment of c-commerce technology capabilities is free-form CoIP services, which is the most flexible in that participation is not pre-defined in this type of environment. Instead, goals of collaboration, governance rules for interaction, and information access are all defined by participants. The primary function of this category is to augment structured data exchange or process collaboration by offering ask-and-responses conversation, initiating and managing discovery processes, and interactively creating plans, strategies, and partnerships. CoIP technologies widely range from online whiteboard technology, secure chat, file sharing, and analytical tools. Those free-form CoIP services could be available on subscription basis, ("snapped on") part of enterprise applications, or via a web browser free of charge. As the prototype developed by IBM [23] shows, technologies for free-form interaction could be used to in

Stage II and Stage III. In other words, those technologies could be employed to support paths A and B.

3.3 Outcomes of C-Commerce

Although a c-commerce could be a short-term establishment, most of them would be long-term agreement among collaborators and collaboration will be recurrent processes. For a long-term collaborative relationship, the outcome of the c-commerce is more than that resulting from one session of c-commerce. The sustainability of the collaborative alliance might be a desired result. While what factors affect the sustainability of a c-commerce needs further investigation, we postulate that the more satisfied with the process and the result of c-commerce the collaborators are, the more likely the alliance would sustain. Consequently, we consider two broad categories of the outcomes that should be measured for evaluating the performance of c-commerce: the product and the process of c-commerce.

Information sharing is one of major targets of c-commerce; however, many reports show that sharing information is one small portion of and limited value-added activity in c-commerce. In order to direct the target of c-commerce to high value activities, we make an attempt to conceptualize the product of c-commerce by employing task classification of McGrath's Task Circumplex, in which McGrath classifies the types of tasks into four broad categories: generating alternatives, choosing alternatives, negotiating issues, and executing works. Because the execution type is mostly about physical activities, such as performing psycho-motor tasks, we don't consider it here. Under each of the other three categories, McGrath further classifies into two subcategories, as shown in the second column in Table 1. In Table 1, we add a few c-commerce examples from Phillips and Meeker [24] to demonstrate the applicability of the classification.

Table 1. Products and examples of c-commerce (Source: Adapted from [22] and [24])

Category	Type	Definition	Examples in c-commerce
Generate	Planning tasks	Generating plans	Planning, scheduling and forecasting
	Creative tasks	Generating ideas	Product conception and development
Choose	Intellective tasks	Solving problem with a correct answer	Payment reconciliation, or complex pricing, route optimization
	Decision-making tasks	Dealing with tasks for which the preferred or agreed upon answer is the correct	Collaborative promotion planning, campaign management
Negotiate	Cognitive conflict tasks	Resolving conflicts of viewpoint (not of interests)	Resolving difference in forecasts of demand for products
	Mixed-motive tasks	Resolving conflicts of motive-interest	Contract negotiation and management

Each type of the products of c-commerce could be measured and evaluated in terms of objective dimensions that are appropriate for that type. However, because c-commerce generally involve more inter-personal and inter-organizational interaction than transactional commerce, stakeholders' satisfaction with the product might be, if not more important, as important as objective measurements. Those measurements are directly related to the product of one session of c-commerce. It is obvious that those dimensions of the result of c-commmerce will have impact on stakeholders' assessment over whether the establishment of the c-commerce achieves its objectives and expected benefits.

Many c-commerce initiatives are intended to improve the efficiency of business processes. For example, shortening the lead-time of product delivery or product development cycle time. As a result, the efficiency of c-commerce process is an important factor for the survival of the c-commerce. With the same token as satisfaction with the product of c-commerce, the level of stakeholders' satisfaction with the c-commerce process is important for the retention of stakeholders in the c-commerce.

4. Conclusion

C-commerce creates a new form of commerce. Extant literature has focused on the development of IT infrastructure for c-commerce and reporting realized benefits in those companies adopting c-commerce. In this article, we proposed a collaborative framework that depicts the pre-condition, interactive process, and possible outcomes of collaborative commerce. Interdependence, significant interests, mutual trust, shared goal expectation, and sufficient IT competency are factors that lead companies to initiate and join the establishment of collaborative commerce. The proposed framework indicates that the collaborative process is an interactive process in which participants may "shift the gear" and take different paths when the situation warrants the necessity. It is our position that different technologies should be employed to support different stages and paths of c-commerce. Furthermore, we take the first step toward conceptualizing the product of c-commerce and briefly discussed the issue of sustainability of a c-commerce initiative.

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