

# A Contingency Model for Business-to-Business Electronic Commerce Usage: Antecedents and Outcomes

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## Abstract

*In this paper, we attempt to set the foundations for answering following question: How can a company successfully integrate B2B e-commerce (B2B EC) with its trading partners, and what benefits are obtained from this integration?*

*Through an analysis of relevant theories from the information systems, and organizational relationships research streams, a contingency model is developed. This model identifies antecedents and consequences of B2B e-commerce usage in an organization. This paper also outlines the nature of these relationships and develops a series of research propositions to be explored in future research.*

## 1. Introduction

The “dot com” explosion in the early 1990’s created an impact worldwide considered to be one of the most hyped business phenomenon of our time [1]. Electronic commerce, and in particular Business-to-Business e-commerce (B2B EC), was supposed to create a whole new world of business opportunities, until it imploded in what turned out to be the century’s biggest bubble [1]. As a result, companies are more wary when it comes to committing resources to B2B EC projects, because there are many uncertainties and challenges [2]. Despite these challenges, the outlook remains promising and companies are hopeful that B2B EC will bring dynamic and exciting business opportunities [e.g., 3, 4].

To assess the value of technology, such as B2B EC, scholars from different research streams have studied the impact of Information Technology in organizations for over three decades, and the results have shown both positive [5], and negative impacts [6, 7]. This paradox is also important as new e-commerce technologies emerge because these technologies have

far-reaching ramifications on the way business is conducted [8]. It is believed that these technologies will serve as a powerful tool for supporting supply chain strategies [9, 10], and will seamlessly link and create flexible supply chains [11, 12]. However, it is also recognized the new technologies also demand an increased interdependence and expanded coordination among companies [9].

One of the major challenges faced by companies is how to leverage the inherent benefits of B2B EC to establish relationships with their suppliers and customers in hope of improved benefits along the supply chain.

Through an analysis of relevant theories from the business, information systems, and organizational relationships research streams, this study attempts to answer the question previously posited. We identify the antecedents and consequences of B2B EC usage in an organization using a contingency model and outline a series of theory-driven propositions regarding the relationships between six antecedents of B2B EC usage and the expected outcomes. It is expected this foundation will serve as the basis for future empirical research.

In the succeeding sections of the paper, we develop the constructs and propositions of this research in hope of setting the grounds for future empirical examination.

## 2. Literature Review and Propositions Development

In the 1950s, the U.S. government and some banks began to use networked computers to conduct financial transactions [13]. This was shortly followed by other organizations, which saw the potential and began exploring ways to facilitate work via networking, supported mainly through proprietary networks. Unfortunately, the communication between proprietary

networks was very difficult, if not impossible [13]. This problem continued until the 1970s, when newer technologies, coined with the term electronic commerce, or e-commerce, began to emerge [14, 15], in the form of Electronic Data Interchange (EDI), Electronic Transfer Funds (EFT). Despite the efforts, true seamless communication between networks was a tedious and difficult process. It was not until the dissemination of the Internet in the early 1990's that e-commerce became a viable and widely available practice for both business-to-business (B2B) and business-to-consumer (B2C) segments.

Research wise, the field of e-commerce has evolved at a much slower pace, emerging from different disciplines. Early academic research proposed plans for interorganizational systems (IOS) and the creation of electronic markets [16-19]. As recently outlined by Kauffman and Walden [20] developments in this research area need to occur across multiple disciplines, because the inherent nature of e-commerce.

The research model presented in Figure 1 takes into account the previous recommendations in that its foundation spans several disciplines including management, marketing, operations management, supply chain management, and information technology. In this section, we organize and synthesize the existing body of knowledge on the constructs investigated in this study in an attempt to highlight the gaps in the research. In light of these gaps and with the purpose of advance our understanding of the research areas, several propositions are presented.

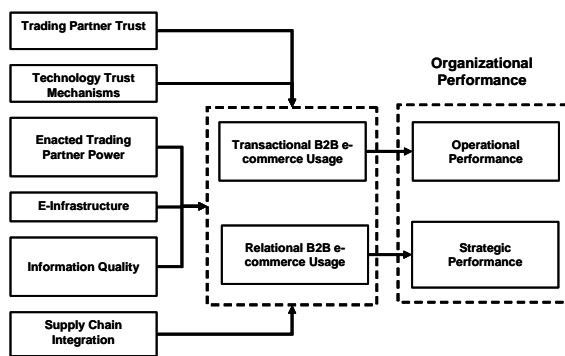


Figure 1. Proposed Research Model

## 2.1. Business to Business e-commerce Usage

There are a diverse number of definitions of B2B EC in the literature [21-26]. Rather than listing those definitions, we highlight several issues that serve as a reference for the following discussions. First, it is the

notion that B2B EC involves different players in the Supply Chain, including internal participants to the focal firm, as well as external participants such as customers and suppliers. Second, there is a perception that a wide range of activities can be executed through the use of electronic means. To that extent, previous research has measured those tasks at an activity level [e.g., 27, 28-30], process level [e.g., 23, 31, 32, 33], and at an exchange level [e.g., 34, 35-37]. Third is the notion of the use of electronic means, being public or private different but supplemental ways of communication.

Following this discussion, B2B EC usage can be viewed as the level of electronic means used in the activities/processes that can occur between organizations. Theoretical support for this construct can be found in the IS use literature at an individual level, and in the EDI use at an organizational level. Since the focus of this research is on the organizational impact of B2B EC, we focus on the latter. Theories such as the Technology Acceptance Model (TAM) [38] and the Diffusion theory [39] have been used to study adoption of technology at the organizational level [e.g., 40, 41]. The EDI research has captured the diffusion and use of the technology in several ways. For example, Ramamurthy et al. [42] conceptualize EDI diffusion from both external and internal perspectives. The external perspective involves transaction sets implemented via EDI while the internal perspective is viewed as the extend that EDI information is integrated with other key in-house IS applications. Massetti and Zmud [43] provide an excellent review of the different conceptualizations of EDI use by describing four facets of use: volume, diversity, breadth, and depth. These facets have been used extensively in the empirical research [e.g., 7, 44, 45].

With regards to B2B EC, the usage research is still in its infancy. Only a handful of theoretical pieces can be found that attempt to follow the steps of the EDI use construct. A major limitation is that EDI involves specific set of predefined transactions whereas because of nature of B2B EC, that might not be the case. To that extent, researchers have proposed the use of exchanges and processes instead of activities to capture B2B EC use [e.g., 23, 25, 32, 33, 46]. Others have proposed the identification of transactional and relational usage as means to capture the relationships between a focal firm and its trading partners. In transactional exchanges, firms do not work in tandem to obtain mutual benefits, but rather each player tries to maximize their own benefits [36, 37]. On the contrary, in relational exchanges, firms try to work together to maximize mutual benefits [36, 37]. We utilize this

conceptualization to capture B2B EC usage as shown in Figure 1.

## 2.2. Trading Partner Trust

The concept of trust in an e-commerce context has received a lot of attention from researchers and practitioners alike in recent years [47], particularly because: 1) the impersonal nature of the digital environment, 2) the extensive use of technology has steadily replaced the face-to-face interactions, 3) the uncertainty of using technology for transactions, and 4) the relatively newness of the medium [47]. Trust is a major concern in e-commerce as information exchange between two parties is critical in business processes and will not happen without trust [48]. Further, in the strategy and marketing research, trust has been associated with successful buyer-seller relationships [49-52].

Despite the interest, researchers have acknowledged the confusion that exists with the concept of trust [53-55]. This is due in part to the fact it has been studied by different disciplines, including psychology, marketing, and others. Another problem is that trust is a vague term and has been used in previous research to measure different constructs.

To overcome these problems, some typologies have been proposed. Noteworthy is the work of McKnight and Chervany [56] who propose the following conceptual-level constructs: disposition to trust, institution-based trust, and trusting beliefs and trusting intentions, which can further be divided into measurable components. Gefen et al. [57] summarize the conceptualizations of trust into four groups: trusting beliefs, trusting intentions, feelings of confidence and security in the caring response of the other party, and a combination of these elements.

McKnight and Chervany [56] hypothesized that trust can be captured using four measurable subconstructs: competence, benevolence, integrity, and predictability. Chircu et al. [58], studying the role of trust in the adoption of electronic intermediaries, measured trust through benevolence, integrity, ability, and predictability. Jarvenpaa, Knoll et al. [59] and Jarvenpaa and Leidner [60] conceptualize trust in virtual teams through: ability, benevolence, and integrity. More recently, Pavlou [47] studies trust in B2B marketplaces by conceptualizing trust with credibility and benevolence. Further, Ratnasingam and Pavlou [61] propose three subconstructs of trust – competence, goodwill, and predictability.

Following previous research, we define Trading Partner Trust as the extent with which organizations assess that another organization will perform potential

dyadic transactions according to their confident expectations. We believe this is a critical prerequisite for B2B EC usage to succeed since if trading partners do not trust one another, business relationships will not flourish. This leads us to propose,

**Proposition 1.** Trading Partner Trust is associated with B2B EC usage.

## 2.3. Technology Trust Mechanisms

Recent hacker attacks worldwide have affected companies and individuals alike, posing a real disruptive threat to companies that might hinder e-commerce use at all levels [62, 63]. By placing strategic data in digital format, companies open themselves to security breaches [64]. To mitigate these uncertainties, firms rely on formal structures, such as hierarchies, regulations, and contracts [65, 66]. In a technical context, these structures and regulations can be translated into integrated solutions based on firewall systems, intrusion detection systems, etc. Despite technology per se is not a substitute for trust [67-69], it can be an enabler of B2B e-commerce [47]. Though this may appear to be a key component for effective B2B EC, it has received little attention from researchers [63, 70].

The conceptualization of trust discussed in the previous section can be also useful to pinpoint the theoretical underpinnings for the technology trust construct. In particular, institution-based trust that indicates the security one feels about a situation because of guarantees, safety nets, or other structures [54, 71, 72]. McKnight and Chervany [56] describe institution-based trust as a critical part of Internet transactions. Considering this, other research has proposed the concept technology trust to capture institution-based trust that must exist among trading partners [47, 61, 73, 74]. This is due to the adherence to technical standards, security procedures, and protection mechanisms.

From the previous discussion, and following recent research [61], we define technology trust as the extent of security infrastructure and control mechanisms embedded in B2B e-commerce linkages capable of facilitating reliable transactions. Technology trust encompasses security services such as; digital signatures, encryption mechanisms (public key infrastructure), authorization mechanisms (User IDs and passwords) [61]. Further, it includes control mechanisms, that are the procedures and protocols that monitor and control the successful performance of a transaction [75-77]. We argue that the existence of these mechanisms will build and enhance the usage of B2B

EC and this leads us to propose. The previous arguments suggest the following proposition

**Proposition 2.** There is a relationship between Technology Trust Mechanisms and B2B EC usage.

## 2.4. Enacted Trading Partner Power

In the inter-organizational literature, power has been another area that has received a considerable amount of interest. Although the concept of power may seem intuitive at first, empirical evidence does not provide a clear cut on a single dimensional power construct [78], and in fact, it is a complex construct with many facets [78, 79].

From the economics and inter-organizational research streams, two main threads of research in power that can be identified as they relate to e-commerce [44]: market structure as a primary source of bargaining power, and a firm's power as one of the behaviors in the context of interorganizational relationships [7, 27, 80-84]. In this study we concentrate on the latter for two reasons. First, in the market structure view, the use of IT is merely one factor in structural changes in markets [44, 85]. Second, the vast majority of the interorganizational and logistics research perceives this type of power as a key component in a supply chain context.

Enacted or coercive power can be defined as when one organization "encourages" or coerces its trading partners to follow a particular path (e.g. adopt EDI). Hart and Saunders [7] developed a theoretical framework, positing relative power between trading partners as one of the determinants of EDI adoption and usage. They also empirically examined the impact of customer power on the use of EDI [27] with mixed findings, showing among other things that increased customer power leads to reduced diversity of EDI use.

Theoretical contributions sustain that lower industry profits can be expected when an industry's buyer and supplier power is high [86]. Thus, we believe that enacted trading power will also have an impact on B2B EC usage. Following these lines of reasoning, we propose

**Proposition 3.** Trading Partner Enacted Power is associated with B2B EC usage.

## 2.5. E-Infrastructure

A precondition of success in B2B EC is for a company to implement in parallel an organizational and technical infrastructure to support the new business processes and procedures [87]. Despite its importance, IT infrastructure research is in its early theory development stage [88, 89].

The theoretical grounds of this area can be traced primarily on the Resource Based Theory [90, 91], that sustains resources are composed of unique capabilities difficult to imitate capable of predicting performance [92]. Following the RBT, some definitions of IT infrastructure have been presented that serve as the foundation for the E-Infrastructure construct. For example, Earl [93] defines IT infrastructure as the technological foundation of computer, communications, data and basic systems. His view of IT infrastructure is as an enabler to satisfy business and management needs. Broadbent and Weill [94], on the other hand, describe IT infrastructure as the base foundation of budgeted-for IT capability (both technical and human), shared throughout the firm.

These definitions provide some interesting insights. First, IT infrastructure has been viewed in a somewhat narrow sense, including only the technical assets such as computer and communications technologies [95]. However, nowadays, these systems can be easily duplicated by competitors in no time, thus will unlikely serve as a source for competitive advantage. Second, it is needed to take a broader approach to include human and technical assets [94, 96-100], which would create in fact a source of competitive advantage difficult to imitate. More recently, others have suggested that these critical resources may span the firm's boundaries and be embedded within interorganizational processes and activities [101].

In summary, E-Infrastructure can be viewed as the combination of human and technical resources of a firm. The E-Infrastructure includes the extent of applications/technologies used by a firm, the willingness of top management to allocate adequate resource to B2B EC, and Support, and training activities to support those individuals involved in B2B EC. This leads us to propose

**Proposition 4.** There is a relationship between E-Infrastructure and B2B EC usage.

## 2.5. Supply Chain Integration

In today's turbulent environments, companies need to constantly find new capabilities to remain competitive. One of such capabilities is the seamless integration of activities/processes with suppliers and customers [102]. Depending on the firm, this

integration could occur at different levels: physical (distribution of tangible goods), financial (exchange of currency or payment), and informational players [103-105]. It is been recognized that attaining such integration is a daunting task due to conflicting objectives among players and the inherent dynamic nature of a supply chain [106].

The concept of Supply Chain Integration is a recent term that has emerged as a result of better understanding of the Supply Chain Management philosophy. In fact, Mentzer, DeWitt et al [107] described three categorizations for SCM and mentioned that a key component in the implementation activities of SCM is the concept of integration with the players of a supply chain. Other authors have additionally validated the SCI construct empirically [108-112]. Thus, we define SCI as the extent to which activities within an organization with its customers and suppliers are integrated. Following the previous discussions, we propose

**Proposition 5.** Supply Chain Integration is associated with B2B EC usage.

## 2.5. Information Quality

The success of any information system depends not only in the usage of that system, but also it is dependent in whether it provides the expected outcomes. Thus, issues such as accuracy, timeliness, adequacy, and credibility of the information exchanged between trading partners is very important [113]. Those issues have been explored in previous research under the term Information Quality (IQ) [113-116], or Data Quality [117, 118].

At the organizational level, research has looked at the impact of IQ in interorganizational information systems (IOIS) [116, 118]. Also, IQ has been studied in the context of Supply Chain Management. For example Monczka and Petersen [113] analyzed its on the success of strategic supplier alliances. They found a significant relationship between IQ and the success of the partnership. The impact of IQ has also been discussed by means of the distortion data suffers when it travels along the supply chain, the well known “bull-whip effect” [119, 120]. Li [121] found that IQ is a factor that has an impact on Supply Chain Performance. Following previous research, we define IQ as the extent to which information exchanged between trading partners is accurate, timely, complete, adequate, and credible. It is expected that IQ will have an impact on B2B EC usage and thus our next proposition asserts that

**Proposition 6.** There is a relationship between Information Quality and B2B EC usage.

## 2.6. Organizational Performance

The aim of any technology is to improve the performance of an organization and ultimately lead to improve competitiveness. The assessment of the value of technology has been a key issue for decades and continues to generate interest among academicians and practitioners [122, 123].

Literature identifies three levels on which the value of technology can be assessed: macroeconomic level, firm level, and individual level. Since the purpose of this research is to study the impact of B2B EC usage on a firm, we focus at a firm level. We discuss the literature on Supply Chain performance, IT performance, and e-commerce performance in an attempt to blend them in the context of this study. This is important because organizational performance (OP) is multi-dimensional in nature, and thus it is advantageous to integrate different dimensions of performance in empirical studies [124].

In the supply chain literature, several empirical studies have measured OP. For example, Kim and Narasimhan [125] and Narasimhan and Kim [112] comprehensively captured OP using multi-dimensional indices ranging from financial to non-financial factors.

The measurement of IT payoff has caused a lot of discussion since empirical evidence show both positive and negative impacts [126-129]. There have been arguments to explain the contradictory results. According to Barua, Ravindran et al. [130] the measurement of business value from technology has to be performed at the level of core business processes. This perspective points out that the process level is the locus of true business value, where the impacts of technology accrue and are easily discernable. In this line of thought, several empirical studies measure OP from IT. For instance, Murphy and Simon [131] explored the benefits of ERP at three levels: operational, managerial, and strategic. Similarly, Irani and Love [132] used case studies to capture IT benefits in three levels: Strategic; Tactical; and Operational; and Raymond and Bergeron [133] use the same categorization to measure EDI performance in a field study.

More recently, the literature has attempted to measure OP by the use of e-commerce. In being another type of IT, it is equally or more difficult to evaluate the performance gains obtained by their use [134]. Most of this work is anecdotal and just a few empirical pieces exist. Among them, Mukhopadhyay

and Kekre [135] quantify both operational and strategic impacts of electronic integration in a B2B procurement environment for a supplier. The findings indicate that both strategic and operational benefits are increased by the use of electronic integration. Narasimhan, Talluri et al. [136] evaluate the benefits of e-procurement in terms of cost, time, flexibility, and consistency. Other empirical work captures the benefits of e-commerce in the context of B2B EC by using perceived direct benefits, perceived indirect benefits, and perceived strategic benefits [61, 63].

In summary, we can conceptualize Organizational Performance from the previous discussion and in light of our study as the Operational and Strategic performance gains obtained by the use of B2B EC. Further, as suggested by Kohli and Sherer [137] we identify the class of dependent variable (e.g. operational and strategic performance), for the type of IT use (e.g. transactional B2B EC usage, relational B2B EC usage). Considering this recommendation, we propose

**Proposition 7.** Transactional B2B EC usage is associated with Operational Performance.

**Proposition 8.** Relational B2B EC usage is associated with Strategic Performance.

### 3. Summary and Directions for Future Research

B2B EC will continue to play a major factor determining future success of businesses and without a doubt will change the shape of competition. In this paper we have presented a comprehensive model that tries to answer how a company can successfully integrate B2B EC with their trading partners, and what benefits are obtained from this integration? The model includes a series of antecedent factors, develops the conceptualization for B2B EC and the organizational performance factors in order to set the grounds for future research. The proposed contingency model provides a better understanding and interpretation of the multivariate nature of B2B EC. The constructs defined in this model need refinement and it is expected that the model will be tested in the future. We intent to pursue future research to accomplish this end. The authors expect to do these through empirical

research developing appropriate instruments, and conducting surveys.

### 4. References

Available upon request from Carlo A. Mora-Monge