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Entitled

A Contingency Model of Web-Based EC Use: A Supply Chain Approach

by

Carlo A. Mora-Monge

Submitted as partial fulfillment of the requirements for

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An Abstract of

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As a result of the “dot com” downfall in the early 2000’s, companies are more wary when it comes to committing resources to Electronic Commerce (EC) projects, because of changing and turbulent environments, market uncertainties (Microsoft Corporation, 2002), among other factors. Despite the challenges, the outlook for EC appears promising and companies remain hopeful that it will bring dynamic and exciting business opportunities. In fact, recent studies suggest that the volume of goods and services exchanged in EC will continue to grow into the trillions of dollars worldwide in the near future (e.g., A.T. Kearney, 2003; International Data Corporation, 2004). However, before embarking on Web-Based EC projects, companies need to assess how it can be used to seamlessly integrate processes internally and with trading partners. This becomes even more relevant today as new e-commerce technologies emerge because they have far-reaching ramifications on the way businesses are conducted (Kheng and Al-Hawamdeh, 2002), from supporting internal processes to supply chain

integration (Clark and Lee, 2000; Keskinocak, Goodwin et al., 2001; Lee, 2002; Oliver, Chung et al., 2003). However, it is also recognized that these technologies also demand an increased interdependence and expanded coordination among firms along the supply chain (Clark and Lee, 2000). One of the major challenges faced by companies is how to leverage the inherent benefits of e-commerce to establish forms of interorganizational systems with their suppliers and customers in hope of improved benefits along the supply chain.

In order successfully overcome the challenges of EC and obtain the expected benefits, research must identify the factors that lead to improvements in organizational benefits in the context of Web-Based EC and furthermore determine what is the likely impact the Web-Based EC use on organizations. Through an extensive review of the extant literature, this study proposes a research model that investigates the factors that affect organizational benefits in the context of Web-Based EC usage and its impact on the firm. In doing so, this study addresses the dimensions of Web-Based EC use by developing reliable and valid instruments. Similarly, valid and reliable measures are adapted and validated from previous research to fit the context of the present study.

A large scale online survey was conducted with a sample representative of different geographical areas, industries and firm sizes to achieve greater generalizability of the findings. A total of 180 valid responses were obtained and were subjected through a rigorous statistical methods (e.g. CFA, reliability analysis) to validate the constructs considered in the study.

Using multiple hierarchical regression analysis, the theory-based model was tested by using the sample previously mentioned. In addition to validating the positive impact of Web-Based EC usage on the organizational benefits of the firm, this study finds statistical support of the importance of E-Infrastructure, Trading Partner Power, Strategic Flexibility and We-Based EC use on Organizational Benefits. Furthermore, the interaction effects of Web-Based EC use on Trading Partner Trust, Technology Trust Mechanisms, and Supply Chain Integration were found to be significant. In addition, this study also developed valid and reliable measures to capture the Web-Based EC use, E-Infrastructure, and Organizational Benefits. These measures should be valuable to both academicians and practitioners alike for further studying Web-Based EC use and its organizational impact. Guidelines for future research are also mentioned.

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Dedication

A mi padre Juan de Dios, Que Dios lo tenga en su gloria. Te amo papi

A mi amada madre, Yadira, por ser cada día una fuente de inspiración

Gracias a Dios por tener una familia tan especial. Todo se los debo a ellos

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Chapter 1

Introduction

The “dot com” explosion in the early 1990’s is believed to be the most heavily hyped business phenomenon of the twentieth century (Rosenbloom, 2002). Electronic commerce (also known as e-commerce) 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 (Rosenbloom, 2002).

Despite the “dot com” downfall, many believe e-commerce (EC) offers companies of all sizes dynamic and exciting business opportunities. This is particularly true for interorganizational relationships, known as Business-to-Business (B2B) in an e-commerce context. However, companies are now more wary when it comes to committing resources to EC projects because of changing environments riffed with uncertainties and challenges (Microsoft Corporation, 2002). Even though analysts sustain that the volume of goods and services exchanged in EC will continue to grow into the trillions of dollars worldwide (e.g., Greenspan, 2002; A.T. Kearney, 2003; International Data Corporation, 2004) there are many uncertainties yet to be answered, challenges to be overcome, and lessons to be learned (Deans and Strachan, 2002).

The use of technology for doing business is not a new topic. In fact, it has been with us for over three decades. Research has investigated the impact of IT use

on business relationships in different contexts: Interorganizational Systems (IOIS), Electronic Data Interchange (EDI), etc., and the results have been mixed. While some results shown positive impacts on organizations (Vijayasarathy and Robey, 1997), others have reported negative impacts (Clemons and Row, 1993; Hart and Saunders, 1997). These mixed results about the payoff of IT continue to generate debate among academicians and practitioners alike. Indeed, as far back as the 1980s the term "IT productivity paradox," was crafted to express the frustration with expensive systems that do not produce demonstrable business advantage or bottom-line impact (Brynjolfsson, 1993; Rollins, Marchand et al., 2000).

This paradox becomes even more relevant today as new e-commerce technologies emerge because they have far-reaching ramifications on the way businesses are conducted (Kheng and Al-Hawamdeh, 2002), from supporting internal processes to seamlessly support supply chain integration (Clark and Lee, 2000; Keskinocak, Goodwin et al., 2001; Lee, 2002; Oliver, Chung et al., 2003). It is also recognized that these technologies also demand an increased interdependence and expanded coordination among firms (Clark and Lee, 2000). One of the major challenges faced by companies is how to leverage the inherent benefits of EC to establish forms of interorganizational systems with their suppliers and customers in hope of improved supply chain performance.

In this chapter, we introduce the research by exploring the problem area, establishing its importance and pointing out the research questions to be answered in this study. We end the chapter by describing the organization of this

dissertation.

1.1. Problem Statement and Research Objectives

Before embarking on the e-commerce wagon, companies need to assess how it can be used to integrate seamlessly internal processes with their suppliers and customers. This requires companies to answer two fundamental questions:

1) What factors influence Organizational Benefits in a Web-Based EC context? and 2) What role does the use of Web-Based EC play in an organizational context?

Through an analysis of relevant theories from the business, information systems, and organizational relationships research streams, this study attempts to answer the questions previously posited. A rigorous process of empirical research is used to identify the antecedents and consequences of Web-Based EC use in an organization using a contingency model. Next, a brief description of the major areas to be covered is presented in an attempt to highlight the objectives set forth in this research.

1.1.1 Antecedents of Web-Based EC use

The last few years have shown that, despite its failure stories, e-commerce is here to stay and it will continue to be a fundamental part of every business, both brick – and – mortar and online. Indeed, we have witnessed a myriad of innovations, some related to technology (e.g. enterprise resource planning, client-server computing, Web-Based EC, widespread of Internet protocols, etc.) and some business related (e.g. customer relationship management, supply

chain management, process reengineering, etc.). However, this diversity brings many complexities that could turn out to be inhibitors of EC use (Cooper and Zmud, 1990; Premkumar and King, 1994; Min and Galle, 1999). Companies need to realize that not all technological advantages will be beneficial for their business, therefore they must clearly understand their core capabilities and how EC technology can enable and improve those capabilities.

One of the capabilities frequently mentioned in the literature is the IT infrastructure, which has been described as a critical resource in highly information demanding environments. Origins of IT Infrastructure can be traced to the Resource Based Theory (Wernerfelt, 1984; Barney, 1991; Powell and Dent-Micallef, 1997). Moreover, some authors have suggested that IT infrastructure represents a mix of technological and human factors consisting of technical and human infrastructure (Rosenbloom, 2000; Chung, Rainer Jr. et al., 2003). **Thus, an objective of this research is to identify the factors that conform what we coined "E-Infrastructure".**

Though technical infrastructure is a very important factor, it would be wrong to consider Web-Based EC solely from a technological perspective. In fact, technology may be the easiest part of what a firm needs to get done with respect to Web-Based EC (Sawhney and Zabin, 2001), and has been considered as an enabler of the buyer - supplier relationships (Sabath and Fontanella, 2002). For example, previous research studied the effect of multiple trading partners on the adoption of IT (e.g., Ratnasingam, 2000; Ratnasingam, 2001). The results indicate that non-technological factors such as trading partner power (Hart and

Saunders, 1997; Hart and Saunders, 1998) and trading partner trust (Hart and Saunders, 1997; Pavlou, 2002) play an important role in the success of buyer-supplier relationships. Also, it has been found that even with proper technology, trading partners distrust the information they share through electronic mechanisms (Sabath and Fontanella, 2002).

We believe that the research of those factors in the context for Web-Based EC is scarce, and thus there is a need to understand the **effect that Trading Partner Trust, Technology Trust Mechanisms and Trading Partner Power have on Organizational Benefits in a Web-Based EC context.**

From a strategic point of view, the pressures that EC puts on organizations, demands an adaptive capability or flexibility by the organization to effectively respond to market threats and opportunities (Grewal and Tansuhaj, 2001). Therefore, it is also important to understand **the role of strategic flexibility in a Web-Based EC context.**

Because Web-Based EC is an interorganizational system, it is critical to study its impact not only on the focal firm, but also along the supply chain. In fact, previous research suggests that information systems use can have a direct influence on the integration of a supply chain (Kim and Narasimhan, 2002). Thus, another **objective of the present dissertation is to ascertain the impact of Supply Chain Integration.** Integration is viewed from both internal and external perspectives.

1.1.2 Consequences of Web-Based EC use

While sizeable investments in EC are being made, researchers and practitioners are struggling to determine whether and how these expenditures improve the business performance of firms (Nakayama, 2000; Zhu and Kraemer, 2002). The effectiveness of Web-Based EC depends not only on the use of IT to integrate processes along the supply chain, but also on the dynamics between firms (Nakayama, 2000).

Past research looked at the impact of IT in the context of EDI use. Some studies have found increased benefits in logistics operations (Srinivasan, Kekre et al., 1994), while others have found second-order effects such as impact on the integration of the supply chain (Kim and Narasimhan, 2002; Narasimhan and Kim, 2002). While some of these studies have reported positive impacts of IT (e.g., Vijayasarathy and Robey, 1997), others noted negative repercussions (Clemons and Row, 1993; Venkatraman, 1994; Vijayasarathy and Robey, 1997). This implies that the benefits of Web-Based EC are not guaranteed.

Because Web-Based EC provides the infrastructure to facilitate the flow of information along the supply chain (Premkumar, 2000), it is expected that information will allow for improvements in the information quality, communications efficiency, business efficiency, and ultimately allow an organization to gain competitive advantages (Leonard and Cronan, 2000; Rajkumar, 2001; McLaren, Head et al., 2002; Pant, Sethi et al., 2003). Consequently, **another objective of this research is to explore the Organizatisonal Benefits gained by an organization in a Web-Based EC context.**

1.1.3 Research Objectives and Contributions

The primary objective of this research is to develop and empirically test a contingency model of Web-Based EC use as described above. The aim of this study is to provide theoretical and empirical insights on the following questions within the context of Web-Based EC:

- What is the role of Trading Partner Trust?
- What is the impact of Technology Trust Mechanisms?
- What role does Trading Partner Power play?
- What is the impact of E-infrastructure?
- What role does Supply Chain Integration play?
- What is the role of Strategic Flexibility?
- What role does Web-Based EC use has on the above mentioned factors?
- What Organizational Benefits are gained through Web-Based EC use?

To successfully accomplish these objectives, valid and reliable measurement instruments are needed. Therefore, a major contribution of the current research is the development valid and reliable measurement instruments for 1) Web-Based EC use, 2) E-Infrastructure, and 3) Organizational Benefits. The measurements for other constructs proposed in this research were adapted with modifications from previous research.

The measurement instruments should serve as a valuable resource for practitioners to evaluate and benchmark their current status of Web-Based EC use.

1.2. Organization of this Dissertation

In summary, the current research is a collection of lucubrations that study the role of Web-Based EC use in interorganizational relationships, their antecedents and outcomes. The remainder of this research is structured as follows. In Chapter 2 an extensive review of the relevant literature is presented that will serve as the theoretical framework for the hypotheses to be investigated in this study. The process followed to develop the research instrument as well as the pilot study (Q-sort) that validates this instrument it is covered in Chapter 3 Chapter 4 provides a description of the large scale administration and the results are then presented. Chapter 5 focuses on the testing of the hypotheses posited in this study. In, Chapter 6 a dimension level analysis is conducted to gain deeper insights beyond the findings obtained in the hypotheses testing phase. Finally, Chapter 7 highlights the major conclusions of the study, the implications for researchers and practitioners, the limitations and guidelines for future research.

Chapter 2

Theory Development and Hypothesis Development

This chapter describes literature relevant to the research questions posited in the previous chapter. The surveyed literature spans several disciplines including management, marketing, operations management, supply chain management, and information technology. The primary objective is to organize and synthesize the existing knowledge on the constructs investigated in this study in an attempt to highlight the gaps in the research area. In light of these gaps and with the purpose of deepening our understanding of the research areas, several hypotheses are proposed.

In their research commentary, Straub and Watson (2001) urged about the need to conduct research in several areas of e-commerce, Web-Based EC being one important component. In the succeeding sections of the chapter, we set the theoretical foundation for the research model by identifying the relevant factors in the context of Web-Based EC that might lead to higher benefits and propose relationships among these factors.

2.1. An Overview of Electronic Commerce (EC) and Web-Based EC Use Research

The use of Electronic Commerce (EC) can be traced back to the 1950s, when

the U.S. government and some financial institutions began to use networked computers to conduct financial transactions (Urbaczewski, Jessup et al., 2002). Soon after, organizations in other industries sought ways to facilitate work through networking, which was mainly supported through proprietary networks. The major disadvantage of this approach was that one network could not communicate with another unless they both used the network solution from the same vendor (Urbaczewski, Jessup et al., 2002). In the late 1970's the term "electronic commerce" began to emerge to refer to newer technologies (e.g. EDI, EFT, etc) which facilitated communication even more, though seamless communication was far from being a reality (Wigand, 1997; Holsapple and Singh, 2000). It was not until the introduction of the Internet that EC became viable and widely available in the early nineties. The Internet's open and ubiquitous standards propelled EC to a mainstream practice for both business-to-business (B2B) and business-to-consumer (B2C) segments. It is important to mention that B2B has received more attention from researchers and practitioners alike mainly because of its tremendous growth potential. Additionally, this segment has also been coined Web-Based EC in previous research to differentiate activities/processes that occur through Internet enabled means. Therefore, in this research we have adopted this term.

Research wise, the field of EC 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 (Malone,

Yates et al., 1987; Malone, Yates et al., 1989; Bakos, 1991; Bakos and Brynjolfsson, 1993; Bailey and Bakos, 1997). Other research has looked at the development of EC from a stage model perspective, ranging from a mere online presence on the Web to a complete enterprise integration (Rao, Glenn et al., 2003).

Before discussing the theoretical underpinnings of Web-Based EC usage, it is important to provide an overview of the numerous definitions of EC as it relates to the segment (B2B) of our interest. Indeed, there are plenty of definitions coming from both practitioners and researchers alike, and rather than list all these definitions, we believe is important to highlight some common and important aspects in those definitions that serve as a reference for the following discussions.

> "Includes **electronic trading** of physical goods and of intangibles such as information. This encompasses all the **trading steps** such as online marketing, ordering, payment and support for delivery" (Timmers, 1999).
>
> "Any **transaction completed over a computer-mediated** network that involves the transfer of ownership or rights to use goods or services" (U.S Census Bureau 2000).
>
> "Encompasses a **wider spectrum of potential commercial activities** and information exchanges" (OECD, 2000)
>
> "**Use of electronic media** in the exchange of goods, services, information " (Baron, Shaw et al., 2000) .
>
> "Carrying out **business activities that lead to exchange of value**, where

the parties interact electronically, using network or telecommunications technologies" (Jones, Wilikens et al., 2000).

"**Full spectrum of** electronic commerce **activities** that can occur **between two organizations"** (Ratnasingam, 2000; Ratnasingam, 2001).

"Facilitates the management of suppliers, inventory, distribution and logistics, channel, and payment systems over the Internet and/or private networks" (Khazanchi and Sutton, 2001).

"Any **activity that connects critical business systems directly** to their critical constituencies (**customers, employees, vendors and suppliers**) via intranets, extranets and over the world-wide web" (Koushik, 2000).

2.2. A Theoretical Framework of Web-Based EC use

To answer the questions posited in Chapter 1 a theory-based model for Web-Based EC use was developed based on comprehensive review of the literature and is depicted in Figure 2.2.1. In this model, we contend that Organizational Benefits of a firm is influenced by a number of internal and external factors. These factors are analyzed in the context of Web-Based EC. Further, the model describes the effect of Web-Based EC use on the firm in terms of organizational benefits (e.g. Information Quality, Communications Efficiency, Business Efficiency, and Competitive Advantage). These various factors are described in subsequent sections. Additionally, the proposed hypotheses are also presented. Table 2.2.1 summarizes the framework's constructs and their relevant literature support.

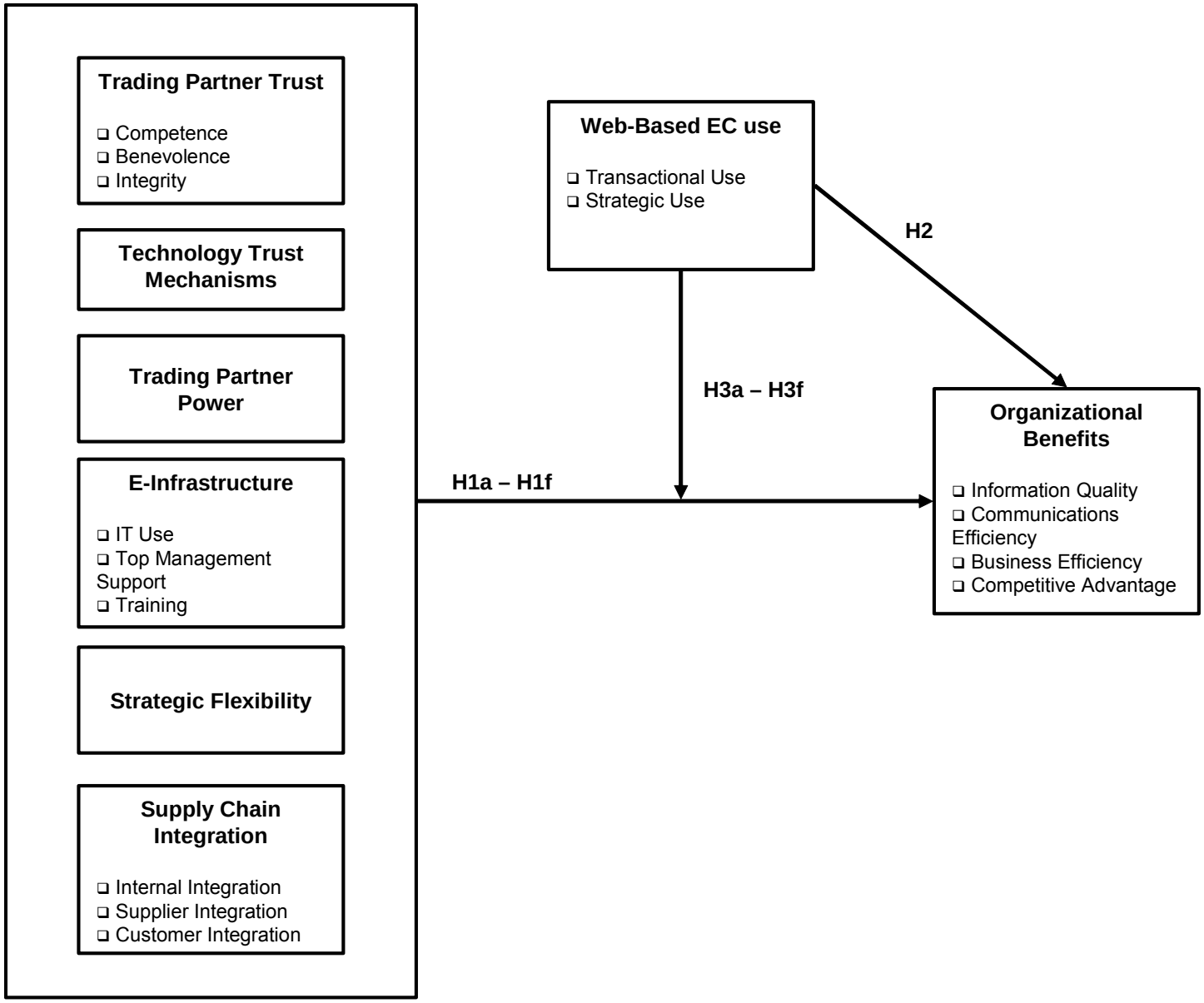


Figure 2.2.1. Theoretical Framework

Construct	Definition	Reference(s)
Trading Partner Trust	The extent with which organizations assess that another organization will perform potential dyadic transactions according to their confident expectations.	(Shapiro) (1987); (McKnight and Chervany) (1996); (McKnight, Cummings et al.) (1996); (Jarvenpaa, Knoll et al.) (1998); (McKnight, Cummings et al.) (1998); (Ratnasingam) (2000); (Ratnasingam) (2000); (Tan and Thoen) (2000); (Tan and Thoen) (2000); (Tan, Yao-Hua et al.) (2000); (Chircu, Davis et al.) (2000); (Papadopoulou, Kanellis et al.) (2001); (Pavlou) (2001); (Ratnasingam and Klein) (2001); (McKnight and Chervany) (2001); (Ratnasingam) (2001); (Pavlou and Gefen) (2002); (Ba and Pavlou) (2002); (Bhattacherjee) (2002); (Bryant) (2002); (McKnight, Choudhury et al.) (2002); (Pavlou and Chai) (2002); (Pavlou) (2002); (Chen and Dhillon) (2003); (Gefen, Karahanna et al.) (2003); (Ratnasingam and Phan) (2003); (Stewart) (2003); (Urban) (2003); (Grabner-Krauter and Kaluscha) (2003); (Sitkin and Roth) (1993); (Williamson) (1993); (Mohr and Spekman) (1994); (Ganesan) (1994); (Barney and Hansen) (1994); (Korsgaard and Schweiger) (1995); (McAllister) (1995); (Mayer and Davis) (1995); (Hart and Saunders) (1997); (Nooteboom and Berger) (1997); (Weiss and Kurland) (1997); (Doney and Cannon) (1997); (Hart and Saunders) (1998); (Monczka and Petersen) (1998); (Shon and Swatman) (1998); (Wilson and Vlosky) (1998); (Zaheer, McEvily et al.) (1998); (Krause and Handfield) (2001); (Dirks and Ferrin) (2001); (Welty and Becerra-Fernandez) (2001); (Adobor and McMullen) (2002); (Li) (2002); (Love, Irani et al.) (2002); (Malhotra and Murnighan) (2002); (Andersen and Kumar) (2003); (Dyer and Chu) (2003); (Gallivan and Depledge) (2003); (Huff and Kelley) (2003); (McEvily, Perrone et al.) (2003)
Technology Trust Mechanisms	The extent of security infrastructure and control mechanisms embedded in Web-Based EC linkages capable of facilitating reliable transactions	(Schneider and National Research Council (U.S.)) (1999); (Ahuja) (2000); (Jones, Wilikens et al.) (2000); (Rosenbloom) (2000); (DeMaio) (2001); (Chulikavit and Tansuhaj) (2001); (Hsiung, Scheurich et al.) (2001); (Viega, Kohno et al.) (2001); (Head and Hassanein) (2002); (Becerra and Gupta) (2003); (Ratnasingam and Pavlou) (2003);
Trading Partner Power	The ability of a trading partner to control or influence the adoption of Web-Based EC	(Gaski) (1984);(Gaski) (1984);(Gaski and Nevin) (1985);(Gaski and Nevin) (1985);(Gaski) (1986);(Astley and Zajac) (1991);(Lee) (1991);(Clemons and Row) (1993);(D'Aveni and Kesner) (1993);(Bunn) (1993);(Yan and Gray) (1994);(Premkumar and Ramamurthy) (1995);(Hart and Saunders) (1997);(Cool and Henderson) (1998);(Hardy and Phillips) (1998);(Hart and Saunders) (1998);(Hayward and Boeker) (1998);(Grover and Ramanlal) (1999);(Ratnasingam) (2000);(Nakayama) (2000);(Wells, Urbaczewski et al.) (2001);(Chwelos, Benbasat et al.) (2001) ;(Kheng and Al-Hawamdeh) (2002);(Ratnasingam and Pavlou) (2003)

Table 2.2.1. Definitions of the Constructs in the Theoretical Framework

Construct	Definition	Reference(s)
E-Infrastructure	The extent to which an organization uses its IS/IT resources (Applications/Technologies, Top Management Support, and Training) in its systems to facilitate Web-Based EC	(Wernerfelt) (1984); (Raghunathan and Raghunathan) (1988); (Earl) (1989); (Barney) (1991); (Grant) (1991); (Premkumar and King) (1992); (Weill) (1992); (Mahmood and Mann) (1993); (Jelassi and Figon) (1994); (Premkumar and King) (1994); (Compeau and Higgins) (1995); (Duncan) (1995); (Holsapple and Luo) (1995); (Lewis and Snyder) (1995); (Premkumar and Ramamurthy) (1995); (Mata, Fuerst et al.) (1995); (Guimaraes, Yoon et al.) (1996); (King and Teo) (1996); (Powell and Dent-Micallef) (1997); (Rai and Bajwa) (1997); (Sriram, Stump et al.) (1997); (Thong, Chee-Sing et al.) (1997); (Broadbent and Weill) (1997); (El Sawy and Malhotra) (1999); (Lee and Kim) (1999); (Ramamurthy, Premkumar et al.) (1999); (Broadbent and Weill) (1999); (Bharadwaj) (2000); (Chircu and Kauffman) (2000); (Narasimhan and Kim) (2001); (Wixom and Watson) (2001); (Setzekorn, Rai et al.) (2002); (Dai and Kauffman) (2002); (Kim and Narasimhan) (2002); (Schroeder, Bates et al.) (2002); (Stratman and Roth) (2002); (Weill, Subramani et al.) (2002); (Xia and William) (2002); (Li) (2002); (Chung, Rainer Jr. et al.) (2003); (Ryssel, Ritter et al.) (2004); (Quesada) (2004); (Ragu-Nathan, Apigian et al.) (2004); (Li, Ragu-Nathan et al.) (2006); (Li, Rao et al.) (2005)
Strategic Flexibility	The organizational ability to manage change by promptly responding in a proactive or reactive manner to market threats and opportunities	(Evans) (1991); (Eardley, Avison et al.) (1997); (Young-Ybarra and Wiersema) (1999); (Zhang) (2001); (Grewal and Tansuhaj) (2001); (Swafford) (2003)
Supply Chain Integration	The extent to which the activities within an organization, with its customers, and with its suppliers are integrated	(Choi and Hartley) (1996); (Singh) (1996); (Lee, So et al.) (1997); (Krause, Handfield et al.) (1998); (Monczka and Petersen) (1998); (Narasimhan and Jayaram) (1998); (Narasimhan and Das) (1999); (Alt, Fleisch et al.) (2000); (Clark and Lee) (2000); (Croom, Romano et al.) (2000); (Kaufman, Wood et al.) (2000); (Krause and Scannell) (2000); (Premkumar) (2000); (Stroeken) (2000); (Stock, Greis et al.) (2000); (Lee, So et al.) (2000); (Frohlich and Westbrook) (2001); (Tan) (2001); (Fawcett and Magnan) (2001); (Mentzer, DeWitt et al.) (2001); (Narasimhan and Kim) (2001); (Pavlou) (2002); (Frohlich) (2002); (Hill and Scudder) (2002); (Kim and Narasimhan) (2002); (McLaren, Head et al.) (2002); (Narasimhan and Kim) (2002); (Sahin and Robinson) (2002); (Ellram) (2002); (Li) (2002); (Rudberg, Klingenberg et al.) (2002); (Beth, Burt et al.) (2003); (Rosenzweig, Roth et al.) (2003); (Min and Mentzer) (2004); (Le, Rao et al.) (2004); (Li, Ragu-Nathan et al.) (2006); (Li, Rao et al.) (2005)

Table 2.1.1. Definitions of the Constructs in the Theoretical Framework (cont)

Construct	Definition	Reference(s)
Web-Based EC Use	The extent to which an organization uses Web-Based EC in Supply Chain Processes	(Premkumar and King) (1994); (Singh) (1996); (Stewart) (1997); (Roberts and Mackay) (1998); (Min and Galle) (1999); (Ramamurthy, Premkumar et al.) (1999); (Young, Carr et al.) (1999); (Alt, Fleisch et al.) (2000); (Irani and Love) (2000); (Johnston and Mak) (2000); (Jones, Wilikens et al.) (2000); (Nambisan) (2000); (Prasad and Tata) (2000); (Warkentin, Bapna et al.) (2000); (Koushik) (2000); (Wondergem) (2001); (Humphreys, Lai et al.) (2001); (Khazanchi and Sutton) (2001); (Kumar) (2001); (Tumolo) (2001); (Warkentin, Bapna et al.) (2001); (Smart Chemicals Forum) (2001); (Straub and Watson) (2001); (Le) (2002); (Leonard and Cronan) (2002); (Mieczkowska, Barnes et al.) (2002); (Murphy and Simon) (2002); (Stratman and Roth) (2002); (Tomak and Xia) (2002); (Vakharia) (2002); (Subramani) (2002); (Microsoft Corporation) (2002); (Power) (2002); (Auger, Barnir et al.) (2003); (Grover and Malhotra) (2003); (Mackay, Altmann et al.) (2003); (Oliver, Chung et al.) (2003); (Pant, Sethi et al.) (2003); (Teo, Wei et al.) (2003); (Yau) (2003); (Narasimhan, Talluri et al.) (2003); (Le, Rao et al.) (2004); (Ranganathan, Dhaliwal et al.) (2004)
Organizational Benefits	The extent of benefits gained by the use of Web-Based EC.	(DeLone and McLean) (1992); (Sethi and King) (1994); (Raymond and Bergeron) (1996); (Bergeron and Raymond) (1997); (Stewart) (1997); (Mirani and Lederer) (1998); (Beamon) (1999); (Beamon) (1999); (Giaglis, Paul et al.) (1999); (Lee and Kim) (1999); (Ramamurthy, Premkumar et al.) (1999); (Leonard and Cronan) (2000); (Irani and Love) (2000); (Shin, Collier et al.) (2000); (Aberdeen Group Inc.) (2000); (Sawhney and Zabin) (2001); (Wondergem) (2001); (Humphreys, Lai et al.) (2001); (Rajkumar) (2001); (Teo and Choo) (2001); (Wixom and Watson) (2001); (Anderson) (2001); (Fawcett and Magnan) (2001); (Lederer, Mirchandani et al.) (2001); (Warkentin) (2002); (Hill and Scudder) (2002); (Keller, Savitskie et al.) (2002); (Kim and Narasimhan) (2002); (Leonard and Cronan) (2002); (McLaren, Head et al.) (2002); (Murphy and Simon) (2002); (Stratman and Roth) (2002); (Subramaniam and Shaw) (2002); (Thatcher) (2002); (Li) (2002); (Grover and Malhotra) (2003); (Rosenzweig, Roth et al.) (2003); (Narasimhan, Talluri et al.) (2003); (DeLone and McLean) (2003)

Table 2.1.1. Definitions of the Constructs in the Theoretical Framework (cont)

2.3. Organizational Benefits

The ultimate aim of any technology is to bring benefits to an organization and ultimately lead to improvements in competitiveness. The assessment of the value of technology has been a key issue for decades and continues to generate interest among academicians and practitioners (Chan, 2000; Kohli and Devaraj, 2003).

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 measure the impact of Web-Based EC usage on a firm, we focus on different research streams that investigate technology value at a firm level. Further, 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. Before we begin the discussion of the literature, it is important to emphasize that organizational performance is considered to be multi-dimensional in nature, and thus it is advantageous to integrate different dimensions of organizational benefits in empirical studies (Jackson, Chang et al., 2002).

In the supply chain literature, several empirical studies measure organizational benefits using a comprehensive approach. For example, Kim and Narasimhan (2002) and Narasimhan and Kim (2001) comprehensively captured performance using multi-dimensional scales ranging from financial factors reflecting the level of cost reduction to non-financial factors reflecting the level of differentiation.

The measurement of IT payoff has caused a lot of discussion since empirical

evidence show both positive and negative impacts (Kivijärvi and Saarinen, 1995; Mukhopadhyay and Kekre, 1995; Grover, Teng et al., 1998; Thatcher and Oliver, 2001). The well known “IT productivity paradox” (Brynjolfsson, 1993) is still being debated and no clear cut exists as to ascertain the real value of IT. There have been arguments to explain the contradictory results and recommendations are numerous. According to Barua, Ravindran et al. (1997) the business value if IT needs to be assessed at the core business process level. This perspective reveals that true business value lies at the process level, where technology impacts can be easily seen and measured. In this line of thought, several empirical studies measure IT performance. For instance, Murphy and Simon (2002) conceptualized and measured ERP benefits in three levels: operational, managerial, and strategic. Similarly, Irani and Love (2000) used case studies to capture IT benefits in three dimensions: Strategic; Tactical; and Operational; and Raymond and Bergeron (1996) use the same categorization to measure EDI performance in a field study.

More recently, the literature has attempted to measure the organizational performance gains obtained from e-commerce. In being another type of IT, it is equally difficult to evaluate the performance gains obtained by their use (Giaglis, Paul et al., 1999). Most of this work has been anecdotal and only a few empirical pieces exist. Among them, Mukhopadhyay and Kekre (2002) quantify both operational and strategic impacts of electronic integration in a e-procurement environment. The findings indicate that both strategic and operational benefits are increased by the use of electronic integration. Narasimhan, Talluri et al.

(2003) 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 (Ratnasingam and Klein, 2001; Ratnasingam and Pavlou, 2003). More recently, empirical studies have emerged that measured procurement performance as it relates to e-procurement (Quesada, 2004), and the expected benefits obtained by the use of electronic marketplaces (Truong, 2004).

In summary, and in light of the previous discussions, we conceptualize Organizational Benefits in four dimensions: Information Quality, Communication Efficiency, Business Efficiency, and Competitive Advantage.

2.4. Trading Partner Trust

The concept of trust in an EC environment has received a lot of attention from researchers and practitioners alike in recent years (Pavlou, 2002), particularly because of: 1) impersonal nature of the digital environment, 2) 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 (Pavlou, 2002). It has been argued that trust is of major concern in EC as information exchange between two parties is critical in business processes and will not happen without trust (Yen and Ng, 2002). Further, in the strategy and marketing research, trust has been associated with successful buyer-seller relationships (Barney and Hansen, 1994; Zaheer and Venkatraman, 1994; Doney and Cannon, 1997; Zaheer, McEvily et al., 1998).

Despite the interest, researchers have acknowledged the confusion that exists in the field (McKnight, Cummings et al., 1996; McKnight, Cummings et al., 1998). This is clearly stated by Williamson (1993), who stated "...trust is a term with many meanings…".

The confusion with the concept of trust is due in part to the fact it has been studied by different disciplines, including psychology, marketing, and others. Thus, researchers have tried to define trust according to their field, which has lead to divergent trust definitions (McKnight, Cummings et al., 1996). Another problem is that trust is a vague term and has been used in previous research to measure different constructs.

To overcome these issues, some typologies have been proposed to have a better conceptualization of trust (McKnight and Chervany, 1996; McKnight and Chervany, 2001; Gefen, Karahanna et al., 2003). For example, McKnight and Chervany (2001) propose a conceptualization of trust at three levels: institution-based trust, disposition to trust, and trusting beliefs and trusting intentions, which are further decomposed into measurable components. ***Institution-based*** trust means one believes that favorable conditions are in place that are conducive to situational success in an endeavor or aspect of one's life founded upon social or institutional structures in the situation of the trusted parties (Shapiro, 1987; Zucker, 1987; McKnight and Chervany, 2001). It is an institutional property dependent on the social/organizational (Shapiro, 1987) situation. In an organizational level, it represents how members collectively perceive the conditions to conduct successful transactions (Pavlou, 2002). ***Disposition to***

trust means “the extent to which one displays a consistent tendency to be willing to depend on others in general across a broad spectrum of situations and persons” (McKnight and Chervany, 2001). ***Trusting beliefs*** means that “one believes that the other party has one or more characteristics beneficial to oneself” (McKnight and Chervany, 2001).

Gefen et al. (2003), on the other hand, summarize the conceptualizations of trust into four groups: 1) a set of ***trusting beliefs*** (Ganesan, 1994; Doney and Cannon, 1997), 2) a set of ***trusting intentions*** (Mayer and Davis, 1995; McKnight, Cummings et al., 1998; Gefen, 2000), 3) ***feelings of confidence and security*** in the caring response of the other party, and 4) a combination of these elements.

In a comprehensive study of the literature on trust, McKnight and Chervany (2001) found four common measurable subconstructs by which trust is captured: competence, benevolence, integrity, and predictability. Each of them is defined as:

> **Competence** “means one beliefs that the other party has the ability or power to do for one what one needs done”.
>
> **Benevolence** means that “one believes that the other party cares about one and is motivated to act in one’s interest”.
>
> **Integrity** means that “one believes that the other party makes good-faith agreements, tells the truth, acts ethically, and fulfills promises”.
>
> **Predictability** means that “one believes the other party’s actions

(good or bad) are consistent enough that one can forecast them in a given situation".

Additionally, Mayer and Davis (1995) proposed a comprehensive model of trust that includes ability, benevolence, and integrity.

These conceptualizations have been studied in an EC context. For example, Chircu, Davis et al. (2000), studying the role of trust in the adoption of electronic intermediaries, measured trust through benevolence, integrity, ability, and predictability. Also, Jarvenpaa, Knoll et al. (1998) and Jarvenpaa and Leidner (1999) conceptualize trust in virtual teams through: ability, benevolence, and integrity. More recently, Pavlou (2002) studies trust in B2B marketplaces by conceptualizing trust with credibility and benevolence. Further, Ratnasingam and Pavlou (2003) treats trust proposes three subconstructs of trust – competence, goodwill, and predictability.

Rather than provide yet another trust conceptualization, we draw upon the previous discussion and define **Trading Partner Trust** as the extent with which an organization believes their trading partners will perform business transactions with them according to their own expectations. We believe this is a critical prerequisite for Web-Based EC usage to succeed because if trading partners do not trust one another, business relationships will not flourish. In fact, it has been argued that business relationships will only flourish when a party has confidence in an exchange partner's reliability and integrity (Kent and Mentzer, 2003). This leads us to propose,

Hypothesis 1a. Trading Partner Trust positively influences the Organizational

Benefits of a firm.

2.5. Technology Trust Mechanisms

Hacker attacks worldwide are the norm nowadays, positing a real disruptive treat to companies that might hinder e-commerce use at all levels (Mohr and Spekman, 1994; Ratnasingam and Klein, 2001). By placing strategic data (e.g. financial data, manufacturing specifications, etc.) on digital formats, companies open themselves to security breaches (Soliman, 2003).

A challenge firms face today is how to successfully embed trusted means of communications over public and private networks (Pabrai, 2000). To mitigate the uncertainties and risks embedded in EC, firms rely on both formal structures, such as hierarchies, regulations, and contracts (Williamson, 1975; Malhotra and Murnighan, 2002). In a technical context, these structures and regulations can be translated into integrated solutions based on firewall systems, intrusion detection systems, among others.

As discussed before, trading partner trust has received a lot of attention from practitioners and researchers. However, in an EC environment, there are other aspects of dimensions trust (Papadopoulou, Kanellis et al., 2001) that although are equally important, have received less attention (Ratnasingam and Klein, 2001; Misiolek, Zakaria et al., 2002). One such dimension is technology trust mechanisms, that even though is not a substitute for trust (Friedman, Khan et al., 2000; Olson and Olson, 2000; Stafford, 2002), it can be an enabler of EC (Pavlou, 2002).

The conceptualization of trust discussed in the previous section can also be

useful to identify the theoretical underpinnings for the technology trust mechanisms construct. In particular, institution based trust that reflects the security an individual feels as a consequence of safeguard mechanisms, safety nets, among others (Shapiro, 1987; Zucker, 1987; McKnight, Cummings et al., 1998). In fact, Zucker (1987) suggests that institutional trust is one of the most important modes by which trust is created in an impersonal economic environment without familiarity and similarity (communality). In her review, she describes two dimensions of institutional trust. First, third party certifications (e.g. licenses, regulations, and laws) that define a party's trustworthiness and expected behaviors. Second, escrows which guarantees the expected outcome of a transaction.

More recently, McKnight and Chervany (2001) describe institution-based trust as a critical part of Internet transactions. Considering this, recent research have proposed the concept technology trust to measure the institution based trust that exists among trading partners (Ratnasingam, 2000; Ratnasingam, 2001; Pavlou, 2002; Ratnasingam and Pavlou, 2003) and encompasses technical standards, protection mechanisms, and security procedures.

From the previous discussion, and following recent research (McGee, Vasireddy et al., 2003; Ratnasingam and Pavlou, 2003), we define technology trust mechanisms as the extent of security infrastructure and control mechanisms embedded in Web-Based EC linkages capable of facilitating reliable transactions. Technology trust mechanisms include security services such as; digital signatures, encryption methods, and authorization mechanisms, that provide

reliable, timely, accurate, and complete transactions (Landwehr, 2001; Ratnasingam and Pavlou, 2003). Further, it includes control mechanisms, that are the procedures and protocols that monitor and control the successful performance of a transaction (Tan and Thoen, 2000; Tan and Thoen, 2000; Tan, Yao-Hua et al., 2000). We argue that the existence of these mechanisms will enhance the benefits to the firm and this leads us to propose,

Hypothesis 1b. Firms with high levels of Technology Trust Mechanisms will exhibit high levels of Organizational Benefits.

2.6. 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 (Cool and Henderson, 1998), and if fact, it is a complex construct with many facets (Cool and Henderson, 1998; Hardy and Phillips, 1998).

From the economics and inter-organizational research streams, two threads of research in power can be identified as it relates to EC. One is using the market structure as a primary source of bargaining power, rooted in the transaction cost economics (Williamson, 1975; Malone, Yates et al., 1989; Bakos, 1991; Bakos and Brynjolfsson, 1993). The second stream views a firm's power as one of the behaviors in the context of interorganizational relationships (Gaski, 1984; Gaski and Nevin, 1985; Gaski, 1986; Bunn, 1993; Choudhury, 1997; Hart and Saunders, 1997; Hart and Saunders, 1998). 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. (Nakayama, 2000; Nakayama, 2003). Second, most of the interorganizational and logistics research concentrate on the latter.

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 Web-Based EC).

Hart and Saunders (1997) developed a theoretical framework positing that relative power between trading partners is one of the determinants of EDI adoption and usage. This framework was illustrated with a case study of an office supplies retailer. In a later study, the same authors (1998) empirically examined the impact of customer power on the use of EDI. Their overall empirical findings are mixed, showing among other things that increased customer power leads to reduced diversity of EDI use (opposite to hypothesized effect). Furthermore, other theoretical contributions sustain that lower industry profits can be expected when an industry's buyer and supplier power is high (Porter, 1980). Thus, we believe that trading power will also have an impact on the Organizational Benefits of a firm. Therefore, we propose that:

Hypothesis 1c. Organizational Benefits of a firm are negatively influenced by Trading Partner Power.

2.7. E-Infrastructure

A precondition of success in EC is for the company to have adequate organizational and technical infrastructures in place to support existing and new

business processes and procedures (Madie, 1999). If the infrastructure of the company is not sufficient to support the demands of EC, problems will arise. Despite its importance, IT infrastructure research is in its early theory development stage (Broadbent and Weill, 1997; Xia and William, 2002), specially in the context of EC. Therefore, it is paramount to determining the resources needed for a firm to be successful in a Web-Based EC environment (Zhuang and Lederer, 2001; Eid, Trueman et al., 2002).

The theoretical grounds of this area can be traced primarily on the Resource Based Theory (RBT) (Wernerfelt, 1984; Barney, 1991; Grant, 1991), that sustains resources are made up of unique capabilities difficult to imitate and capable of predicting performance (Powell and Dent-Micallef, 1997). According to the RBT, a firm's performance is founded on its unique capabilities (i.e., resources) and its competitors' difficulty in imitating them. The resources must be valuable, heterogeneous, immobile, and non-substitutable (Barney, 1991; Mata, Fuerst et al., 1995). More recently, researchers have recognized that these critical resources may span the firm's boundaries and be embedded within interorganizational processes and activities (Jap, 1999).

Following the RBT, some definitions of IT infrastructure have been proposed in the literature which constitutes the foundations for the E-Infrastructure construct. For example, Earl (1989) argues that IT infrastructure is a combination of computer, communications, and data systems that allows management to satisfy a business need. Broadbent and Weill (1999), on the other hand, describe IT infrastructure as the base foundation of IT capability of a firm (both technical and

human). Further, Duncan (1995) view IT infrastructure as the set of IT resources that facilitate innovations and improvements of IT systems.

These definitions provide some interesting insights that are worth mentioning. First, IT infrastructure in some cases has been viewed in a somewhat narrow sense, including only the technical assets such as computer and communications technologies (Bharadwaj, 2000). However, nowadays, these systems can be easily duplicated by competitors in no time, thus will unlikely serve as a source for competitive advantage. Second, other research has taken a broader approach to include human and technical assets. For example, Chung, Rainer Jr., et al. (2003), conceptualize infrastructural aspects that include both human and technical aspects. Dubosson-Torbay, Osterwalder, et al. (2002) even distinguishes between tangible, intangible and human assets when describing IT infrastructure.

In the empirical literature, Peter Weill and his colleagues have conducted several fields studies to identify the characteristics of IT infrastructure (Weill, 1992; Broadbent and Weill, 1997; Broadbent and Weill, 1999; Weill, Subramani et al., 2002; Weill and Vitale, 2002). They have looked at ten clusters of tangible and intangible factors grouped into two major layers (Weill, Subramani et al., 2002): physical layer, and management oriented layer. Additionally, Stratman and Roth (2002), in an empirical study on ERP, identified a portfolio of managerial, technical, and organizational skills needed for attaining the benefits of ERP.

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 resources to Web-Based EC, and Support, and training activities to those individuals involved in Web-Based EC.

IT Infrastructure refers to the extent of applications/technologies used by the firm. It includes: Electronic Data Interchange (EDI); Groupware; Electronic Fund Transfer (EFT), Transaction Processing Systems (TPS), Office Automation, Data Warehousing (DW), Intranet, Extranet, Material Requirements Planning (MRP), Manufacturing Resource Planning (MRPII), Data Warehousing (DW), Enterprise Resource Planning (ERP), Forecasting System, Inventory and Warehouse Management, Distribution Requirement Planning (DRP), Customer Relationship Management (CRM), Supplier Relationship Management (SRM), Vendor Managed Inventory (VMI), Automatic Ordering System, Transportation Management System, Enterprise Resource Planning (ERP), Forecasting System, Inventory and Warehouse Management. Top Management support refers to the willingness to make Web-Based EC a success, by allocating the appropriate resources when needed. Finally, Training refers to the processes involved in instructing the various Web-Based EC systems efficiently to carry out day – to – day activities. Based on this conceptualization of E-Infrastructure, it is hypothesize that:

Hypothesis 1d. Firms with high levels of E-Infrastructure will have high levels of Organizational Benefits.

2.8. Strategic Flexibility

Firms operating in today's economy are experiencing increased pressures due to several factors including a rapidly changing business environment, shorter product life cycles, increasingly demanding customers, and fiercer competition (Dreyer and Gronhaug, 2004). In fact, a critical component for attaining the benefits of Web-Based EC Usage is the realization of the constant changes that occur in the environment, posing additional challenges to organizations.

To overcome those challenges, strategic decisions in a firm may need to be continually reexamined to effectively respond to a wide variety of changes in the competitive environment (Young-Ybarra and Wiersema, 1999). This needs an adaptive capability or flexibility by the organization that allows for a promptly respond in a proactive or reactive manner to market threats and opportunities (Grewal and Tansuhaj, 2001). This capability has been explored under the umbrella of strategic flexibility and in the context of organizational capabilities and risk management (Grewal and Tansuhaj, 2001), strategic alliances (Young-Ybarra and Wiersema, 1999), and as a critical component of value chain flexibility (Zhang, 2001), and supply chain agility (Swafford, 2003), among others.

Strategic flexibility is commonly viewed as a multidimensional construct (Evans, 1991) and has been defined as the ability to adapt to environmental changes and continuously develop strategies based on internal competences and external customer needs (Wheelwright and Hayes, 1985); to continuously respond to unanticipated changes, and to adjust to unexpected changes (Young-Ybarra and Wiersema, 1999). As suggested by Grewal (2001), we consider strategic

flexibility as a polymorphous construct, meaning that its conceptualization varies context that studies it. In this sense, we define strategic flexibility as the organizational ability to manage change by promptly responding in a proactive or reactive manner to market threats and opportunities. It is a concept developed based on the capability-based strategy literature. Here, strategy flexibility can defined as

> "A type of capability that emphasizes the key role of strategic management in appropriate adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences to match the requirements of a changing environment" (Zhang, 2001).

Therefore, we expect strategic flexibility will positively influence the Organizational Benefits of a firm, consequently we propose,

Hypothesis 1e. Strategic Flexibility positively influences the Organizational Benefits of a firm.

2.9. Supply Chain Integration

It is commonly known that to remain a competitor today's turbulent markets; companies must deliver products to customers faster and without errors. In fact, this is no longer seen as a competitive advantage, but a requirement to be in the market (Mentzer, DeWitt et al., 2001). In search of such capability, companies are looking to integrate suppliers and customers in their supply chain (Keng and Messersmith, 2002). The main argument is that this integration will ultimately cut costs, eliminate wasted time and redundant data, while at the same time

providing added value to the customer. This integration takes place in at least three levels: the integration physical distribution of tangible goods, the integration of exchange of currency or payment, and the integration of the information between various players (Forrester, 1958; Forrester, 1961; Warkentin, Bapna et al., 2000). However, attaining such integration is a daunting task due to conflicting objectives among players and the inherent dynamic nature of a supply chain (Sahin and Robinson, 2002). This leads to the question, what entails supply chain?

Supply Chain as a management philosophy originated in the late 1950's, when Forrester introduced the concept of Industrial Dynamics (Forrester, 1958; Forrester, 1961). He demonstrated that company success depends on the interdependence among members of a supply chain. Since then, several research streams (e.g. marketing, economics, management, operations management, etc.) have studied this phenomenon from different angles. This has led to the inconsistent use of the term. While some have restricted the view to just the "relational" activities between a buyer and seller, others use of this term take a broader view by including all "upstream" suppliers to a firm as part of the supply chain. A third view takes a "value chain" approach, in which all activities required to bring a product to the marketplace are considered part of the supply chain (Mabert and Venkataramanan, 1998).

In light of such complexities and to minimize the inconsistency in the use of the term, several researchers have done an extensive work on this area. For example, Fawcett and Magnan (2001; 2002) compare and contrast several

definitions of supply chain. These definitions share several characteristics in common that should be highlighted in the context of the current research:

- It involves a network of organizations, through upstream and downstream linkages, which may include suppliers, customers, vendors, carriers, third-party companies, and information systems providers.
- It entails a series of integrative and coordinated processes and activities across functional, geographical, and organizational interfaces that produce value to the customer.
- It requires a synchronized management of the flow of physical goods and related information that ultimately provides sustainable competitive advantage.

Additionally, Mentzer (2001) and Mentzer DeWitt et al. (2001) argue that the numerous definitions found in the literature can be classified into three categories: SCM as a management philosophy, SCM as the implementation activities of a management philosophy, and SCM as a set of management processes. All of these views stress the importance of integration. They contend integration is a critical component of SCM, and this is stressed by the definitions previously summarized. Integration in a SCM has been coined with the term Supply Chain Integration (SCI) and has received some attention from previous research (Narasimhan and Jayaram, 1998; Frohlich and Westbrook, 2001; Narasimhan and Das, 2001; Frohlich, 2002; Narasimhan and Kim, 2002; Sakaguchi, Dibrell et al., 2002). For instance, Frohlich and Westbrook (2001) demonstrated the consensus in literature about the strategic importance of

integrating suppliers, manufacturers and customers. They conceptualized and measured integration using what they coined “arcs of integration”, representing the direction (towards suppliers and/or customers) and degree of integration for different processes/activities. In a later study, Frohlich (2002) modified this construct in the context of EC, which was empirically validated and found to be positively related to performance.

Along the same lines of research, Narasimhan and Das (2001) studied the impact of purchasing integration and purchasing practices on manufacturing performance and found through empirical data that purchasing integration moderates the relationship between purchasing practices and manufacturing performance. They also discovered that different levels of IS utilization have an impact on Supply Chain Integration, which in turn leads to gains in competitive advantage. In another study, Narasimhan and Kim (2002) found that Supply Chain Integration (Internal and External) served as moderators for firm performance. Other studies have reached similar conclusions indicating that SCI is an important predictor of business performance (Rosenzweig, Roth et al., 2003).

Following previous research, we define Supply Chain Integration (SCI) as the extent to which activities within an organization with its direct customers and suppliers are integrated. It reflects the relative importance of external integration as an expression of business-cross-business activities with upstream suppliers and downstream distributors and customers. Additionally, the definition reflects the importance of internal integration within a business as an equally important

component of the construct. The SCI construct is recognized by previous research as a strategic avenue for improving business performance in highly competitive environments (Narasimhan and Das, 2001; Takeishi, 2001). And yet, attaining supply chain integration is not an easy task. The often-conflicting objectives of trading partners and the continuously evolving dynamic nature of the supply chain impose many challenges for effective system integration (Sahin and Robinson, 2002). This leads us to hypothesize that

Hypothesis 1f. Firms with high levels of Supply Chain Integration will exhibit high levels of Organizational Benefits.

2.10. Web-Based EC Use

In section 2.1. several definitions of EC were presented that serve as reference to conceptualize the Web-Based EC use construct. Several issues can be uncovered from these definitions. First, it is the notion that Web-Based EC involves two or more parties. Generally speaking, all the definitions discussed the participation of different players in the Supply Chain, including internal participants to the focal firm, as well as external participants such as customers and suppliers. Second, the definitions refer to a wide range of activities that can be done electronically. To that extent, previous research has tried to capture these in different ways: at an activity level (e.g., Iacovou, Benbasat et al., 1995; Premkumar and Ramamurthy, 1995; Hart and Saunders, 1998; Chwelos, Benbasat et al., 2001) in the particular case of EDI, and at a process level (e.g., Singh, 1996; Jones, Wilikens et al., 2000; Auger, Barnir et al., 2003; Teo, Wei et al., 2003) in the case of Web-Based EC, and at an exchange level (e.g., Jap and

Mohr, 2002; Le, 2002; Le, Rao et al., 2004; Truong, 2004). Third is the notion of the use of electronic means, being public or private different but supplemental ways of communication.

Theoretical support for the construct can be found in the IS use literature at an individual level, and in the EDI use at an organizational level.

One of the most well known models that explain IS use at the individual level is the Technology Acceptance Model (TAM) (Davis, Bagozzi et al., 1989), which has also been empirically validated (Chau, 1996). The TAM model indicates how individual perceptions concerning technology ease of use and usefulness are important determinants of adoption intentions.

Another stream of research has used the innovation diffusion theory (Rogers, 1983) to study adoption. This theory posits that a series of factors, including relative advantage, compatibility, complexity, trialability and observability, innovativeness and external influences, influence individual adoption. In e-commerce, these theories have been used as the foundation to explain individual behaviors of online shopping (e.g., Chau, Tam et al., 2000; Gefen, Karahanna et al., 2003).

At the organizational level, the previously mentioned theories have been, either explicitly or implicitly, a foundation for much of IT use research (e.g., Premkumar and King, 1994; Teo, Tan et al., 1997). Most of this research has concentrated in EDI. There are a number of overlapping, opposing models that have partially explained the EDI use or adoption decision by examining severa factors: the technological, the organizational, and the interorganizational (Chwelos, Benbasat

et al., 2001).

The EDI research has captured the diffusion and the use of the technology in several ways. For example, Ramamurthy et al. (1999) 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 extent that EDI information is integrated with other key in-house IS applications.

Massetti and Zmud (1996) provide an excellent review of the different conceptualizations of EDI use by describing four facets of use: volume, diversity, breadth, and depth. Diversity is the extent to which different types of a firm's documents are handled through connections. Volume refers to the extent to which document exchanges among trading partners are done through EDI. Breadth is the extent to which an organization has established EDI links with each of its trading partners. Finally, depth captures the extent to which a firm's business processes are linked to their trading partners through EDI.

These facets have been used extensively in the empirical research. For example, Hart and Saunders (1998) developed measures for EDI use using the volume and diversity dimensions. Volume, a single-measure item, was the estimated percentage of EDI transactions of the total number of business document transactions exchanged over a typical monthly period. Diversity was the number of transaction sets implemented by the firm. Additionally, Nakayama (2000) assessed diversity by the number of EDI transaction sets used. Diversity and volume were weighted according to the types of transaction set used.

Similarly, Bensaou (1997) measured the scope of EDI use as sum of 6 dichotomous items measuring each whether data is exchanged in electronic form with this supplier in this function (purchasing, engineering, quality, production control, transportation, and payment).

The research of Web-Based EC use 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 a specific set of predefined transactions whereas because of nature of We-Based EC, that might not be the case. To that extent, researchers have proposed the use of processes instead of activities to capture Web-Based EC use. For instance, Auger et al. (2003) used a set of 8 processes to capture what he calls “Internet based activities”. They include: (a) Advertising/marketing (b) Sales (c) Market/consumer research (d) Competitive benchmarking (e) Information gathering (f) Customer service/support (g) General administration (h) Shipping/distribution (i) Purchasing (e.g., firm or office supplies). Similar approaches have been used by other research (Jones, Wilikens et al., 2000; Khazanchi and Sutton, 2001; Thatcher, 2002; Teo, Wei et al., 2003). Following a similar line of thinking, we define Web-Based EC usage as level of electronic means used in processes that can occur between organizations. The range of processes can include from Information Gathering/Market Research, Product Development, Vendor and Contract Management, Order Management, Planning, Forecasting & Replenishment (CPFR), Sales Support, After-Sales Service and Support, Payment Processing, and Distribution/Transportation/Logistics (Smart Chemicals Forum, 2001).

We have taken into consideration previous recommendation that mention the need to have a multidimensional measure for performance (Jackson, Chang et al., 2002). Considering this recommendation, we hypothesize:

Hypothesis 2. Web-Based EC use positively influences the Organizational Benefits of a firm.

One way of gaining a better understanding of the relationship between a set of independent variables and a dependent variable is through the use of a moderator variable. In some cases, it is plausible that the predictive efficacy of the independent variable is a function of another variable mediating the relationship. A moderator variable modifies either the form or the strength of the relationship between an independent and a dependent variable (Angeles, Nath et al., 2001). In this study, we investigate the moderating effect of Web-Based EC use on the relationship between the contextual factors previously mentioned and Organizational Benefits. In general, previous research has found that IT use, whether is EDI, ERP, or Electronic Commerce, in addition to having a direct effect on performance, also has a moderating effect on various organizational factors. For example, Angeles, Nath et al. (2001) investigated the status of the constructs level of EDI implementation and business application complexity and explored their moderating effect between EDI implementation factors (e.g. top management support, information technology compatibility, use of security and auditing tools, training programs, etc) and system success measures (e.g. customer service quality, user satisfaction, overall success, etc). In their research, the authors found a significant moderating effect of level of EDI

implementation, which can be extrapolated to Web-Based EC use. In another context, Becerra and Gupta (2003) found that in a dyadic relationship the frequency of communication enhances trustworthiness and thus is likely to impact benefits. In the information systems literature, several studies have assessed the moderating effect of Information Intensity, which can be thought of as an extrapolation of the Web-Based EC use. For example, Bhatt (2001) explored empirically the moderating effect of information intensity of the industry on the relationship between EDI systems and business process improvements. His findings were not conclusive as to the moderating effect of information intensity, however, he did find to have a direct and significant impact of information intensity on business process improvement factors.

In a more recent study, Truong (2004) analyzed the moderating effect of the construct e-business readiness (made up of dimensions it usage, internet usage, related to some extent to the notion of Web-Based EC use) on the relationship between expected benefits and perceived risks, and electronic markets usage. He found empirical support of the moderating effect of e-business readiness between expected benefits and extent of electronic markets usage.

Based on the previous arguments, it is believed that Web-Based EC use besides having a direct effect on organizational benefits; it is likely to have moderating effects of the dimensions analyzed in this study. Thus we hypothesize that

Hypothesis 3a. Web-Based EC use positively moderates the relationship between Trading Partner Trust and Organizational Benefits.

Hypothesis 3b. Web-Based EC use positively moderates the relationship between Technology Trust Mechanisms and Organizational Benefits.

Hypothesis 3c. Web-Based EC use positively moderates the relationship between Trading Partner Power and Organizational Benefits.

Hypothesis 3d. Web-Based EC use positively moderates the relationship between E-Infrastructure and Organizational Benefits.

Hypothesis 3e. Web-Based EC use positively moderates the relationship between Strategic Flexibility and Organizational Benefits.

Hypothesis 3f. Web-Based EC use positively moderates the relationship between Supply Chain Integration and Organizational Benefits.

2.11. Chapter Summary

The chapter is intended to build theoretical arguments for later empirical tests. An overview of the EC research was first presented to set the context for the research. The research framework was then presented, followed by a detailed description of key constructs through an extensive literature review. Relationships among these constructs are established and the appropriate hypotheses proposed. The following chapters will deal with the development of the instrument and the testing of the hypotheses presented here.

Chapter 3

Instrument Development (1) – Item Generation and Pilot Study

This chapter reports the item-generation process and the results of a pilot study conducted to ensure their reliability and validity. First, potential measurement items are generated for the constructs depicted in Figure 2.2.1 based on previous relevant theoretical and empirical research, and trade journal publications. Second, the pool of items is pre-tested with academicians and practitioners, whose feedback is used for improving the clarity and quality of the measurement items, the anchors and instructions, and length of the questionnaire. In the third stage, and based on the input obtained in the previous phase, a pilot study (Q-sort) is conducted to pre-asses the discriminant validity of the scales. This is to ensure that items included in the final version of the instrument will be reliable and valid.

3.1. Item Generation

The survey instrument design focused on developing a sound instrument and, at the same time, generating an acceptable response rate. The theoretical constructs are based on a thorough review of the literature and are well grounded in existing theory. Further, each of the constructs are made up of

multi-item scales, which are especially useful for researching latent concepts and, if properly developed, will withstand rigorous statistical evaluation to assure meaningful measurement characteristics (Keller, Savitskie et al., 2002). In fact, Churchill (1979) advocates the application of summated items to achieve more valid and reliable responses that better represent the entire domain of a latent construct. Thus, all of the theoretical constructs in this research are made up four or more items (Cronbach and Meehl, 1955; Cureton, Cronbach et al., 1996). As depicted in the research model (Figure 2.2.1), there are eight major constructs. This research developed the instruments to measure: 1) Web-Based EC Use, and 2) E-Infrastructure. The items for the remaining constructs, namely 1) Trading Partner Trust, 2) Technology Trust Mechanisms, 3) Trading Partner Power, 4) Strategic Flexibility, 4) Supply Chain Integration, and 5) Organizational Benefits were adapted from previous empirical research. Since considerable modifications were made to the items to fit the context of this research, they were included in the pilot study. The literature support for the items in each constructs is discussed below.

The items from **Trading Partner Trust** (Competence, Benevolence, and Integrity) were adopted from previous empirical interdisciplinary research on psychology, sociology, and social psychology in the context of Impersonal Trust and EC (Ratnasingam, 2000; McKnight and Chervany, 2001; Ratnasingam, 2001; Ba and Pavlou, 2002; McKnight, Choudhury et al., 2002; Pavlou, 2002; Ratnasingam and Pavlou, 2003); and the literature on interpersonal trust in strategic partnering (Williamson, 1993; Hart and Saunders, 1998; Zaheer,

McEvily et al., 1998; Li, 2002; McEvily, Perrone et al., 2003). The items from **Technology Trust** Mechanisms were drawn from an empirical study on the impact of Technology Trust on Electronic Commerce (Ratnasingam and Pavlou, 2003), and from technical and managerial books on the infrastructural requirements for trusted communications in EC (DeMaio, 2001; Sawhney and Zabin, 2001). The items for the **Trading Partner Power** construct were drawn from empirical works in the technology adoption model theory of information systems (Premkumar and Ramamurthy, 1995), EDI Adoption (Hart and Saunders, 1998; Chwelos, Benbasat et al., 2001), and the marketing literature on buyer-supplier relationships (Bunn, 1993). The items for the **E-Infrastructure** construct (IT Tools, Top Management Support, and Training) were primarily based upon empirical studies on the Resource Based Theory as it relates to technology management, implementation, and diffusion (Weill and Vitale, 2002; Ryssel, Ritter et al., 2004), IT as a capability (Stratman and Roth, 2002; Xia and William, 2002), and the infrastructural use of IT for Supply Chain Management (Li, 1997; Quesada, 2004; Li, Rao et al., 2005; Li, Ragu-Nathan et al., 2006). The items for **Strategic Flexibility** were drawn from previous empirical works in the marketing and strategic alliances literature (Young-Ybarra and Wiersema, 1999; Grewal and Tansuhaj, 2001) and the supply chain literature (Zhang, 2001). The items for **Supply Chain Integration** were based on previous empirical studies on the effects of supply chain integration as a moderator of performance (Narasimhan and Kim, 2002), as a driver for electronic commerce (Barua, Konana et al., 2000), and as a measure of Supply Chain Performance (Li, Rao et

al., 2005; Li, Ragu-Nathan et al., 2006). The items for Web-Based EC use were based on the electronic markets theory (Malone, Yates et al., 1987; Malone, Yates et al., 1989), the technology acceptance model diffusion theory (Davis, 1989; Davis, Bagozzi et al., 1989), and the diffusion of technology theory (Rogers, 1983). In particular, we focused on the use at a process level along the supply chain. Finally, the items for **Organizational Benefits** (Information Quality, Communications Efficiency, Business Efficiency, and Competitive Advantage) were assessed at the firm level and are primarily based on a blend of measures from the SCM literature (Beamon, 1999; Li, Rao et al., 2005; Li, Ragu-Nathan et al., 2006), and the IT Benefits literature (DeLone and McLean, 1992; Lederer, Mirchandani et al., 2001; Wixom and Watson, 2001; DeLone and McLean, 2003).

Following the literature review, the next step involved assessing the content validity of the items. Content validity is the degree to which a test measures an intended content area, and it is normally determined by expert judgment during the pilot stages of the research (Kerlinger, 1986; Gay and Airasian, 2003). To assess content validity, the pool of items was reviewed by three practitioners in the supply chain field, four academicians, and two Ph.D. students. Based on their input, redundant and ambiguous items were either modified or deleted, and new items were added where necessary. The outcome of this stage is a number of items summarized in Table 3.1.1 and listed in Appendix A. These items were used in the Q-sort analysis, described next.

Construct ID	Construct	Subconstruct	Number of items
1	Trading Partner Trust	Competence	4
		Benevolence	6
		Integrity	6
2	Technology Trust Mechanisms		10
3	Trading Partner Power		5
4	E-Infrastructure	IT Use	16
		Top Management Support	6
		Training	8
5	Strategic Flexibility		7
6	Supply Chain Integration	Internal Integration	8
		Supplier Integration	6
		Customer Integration	7
7	Web-Based EC use	Transactional Use	5
		Strategic Use	5
8	Organizational Benefits	Information Quality	10
		Communications Efficiency	5
		Business Efficiency	8
		Competitive Advantage	8
	Total		130

Table 3.1.1. Pool of items entering the Q-sort analysis

3.2. Scale Development. The Q-Sort Methodology

The Q-sort methodology covers a distinctive set of psychometric and operational principles that, when used in combination with specialized statistical applications, it allows researchers to systematically examine human subjectivity with quantitative rigorousness (McKeown and Thomas, 1988). One of the objectives of this methodology is to pre-assess the convergent and discriminant validity of scales by examining how the items are sorted into various factors or dimensions by knowledgeable people in the field of study. In entails an iterative process in

which the extent of agreement between objects is used as the basis of assessing construct validity and to improve the reliability of the dimensions (Nahm, Solis-Galvan et al., 2002). The method consists of two stages (Nahm, Solis-Galvan et al., 2002):

1. First, two judges are asked to sort the survey items according to the different dimensions. Based on this, an inter-judge agreement is calculated.
2. Second, ambiguous items discovered in stage 1 are modified or removed in order to improve the agreement between the judges. The process is repeated until a satisfactory level of agreement is reached.

In this research, items were placed in a common pool and subjected to three Q-sort rounds with two independent judges per round. All of the participants in the Q-sort analysis were representative of the population targeted for this study, and considered to be knowledgeable in the field. The people who participated held the following positions: Supply Chain Director (1), Supply Chain Management Consultant (2), Materials Manager (2), and Purchasing Manager (1). They were presented with a list of items and were asked to sort them into groups, each one representing one of the 8 constructs, based on the similarities and differences found among items, and thus this serves as an indicator of construct validity. In case an item was placed within a particular category by several judges, then this is an indicator of convergent validity with the related construct, and discriminant validity with the others. Additionally, inter-judge disagreements about item placement identified bad items and/or weaknesses in the original definitions of

the dimensions. Based on the judges' misplacements of the items, they were either modified or eliminated.

3.2.1 Sorting Procedures

The judges were presented with the research model and a table with all eight constructs and their definition. Additionally, the items (printed on a 3" by 5" card) were shuffled and given to the judges. After explaining the purpose of the research, the Q-sort procedure, and answering any additional question they might have, they were asked to place each item (card) under one of constructs according to the best of their knowledge. Besides the categories for the 8 constructs under consideration, A Not Applicable category was also included to ensure that the judges did not force any item into a particular category. Additionally, judges were allowed to ask as many as questions as necessary throughout the process to guarantee their understanding of the whole procedure.

3.2.2 Inter-Rating Reliabilities

The criteria for evaluating the Q-sort results are based on three measures: 1) the inter-judge agreement level; 3) Moore and Benbasat's "hit ratio" (Moore and Benbasat, 1991); and Cohen's Kappa (Cohen, 1960) index. The inter-judge agreement level is determined by counting the number of items that both judges agree to place into certain category, even though the category into which items are sorted by both judges may not be the intended one. Then, the percentage of the percentage of total items agreed is computed to obtain the rate of inter-judge raw agreement scores. The second measure, Moore and Benbasat's "hit ratio", is an indicator of how many items were placed in the intended category by the

judges. This ratio is computed by counting all items that are correctly grouped according to their intended theoretical construct by each of the judges, and divide them by twice the total number of items. The third measure, Cohen's Kappa index, is the proportion of joint judgment in which there is agreement after chance agreement is excluded, thus evaluating the true agreement score between two judges. For example, assuming that assuming two judges independently classified a set of N components as either acceptable or rejectable, one can summarize the findings as

		Judge 1		
Judge 2		Acceptable	Rejectable	Totals
	Acceptable	X_{11}	X_{12}	X_{1+}
	Rejectable	X_{21}	X_{22}	X_{2+}
	Totals	X_{+1}	X_{+2}	N

The Cohen's Kappa index, denoted as k, can be computed as:

$$k = \frac{N_i * X_{ii} - \sum_i \left(X_{i+} X_{+i} \right)}{N^2 - \sum_i \left(X_{i+} X_{+i} \right)}$$

Figure 3.2.1. Cohen's Kappa Index

where

N_i: total number of items
X_{ii}: number of items agreed on by two judges
X_{i+}: number of items in the i^{th} row
X_{+i}: number of items in the i^{th} column

With regards to an acceptable score of the Kappa index, no general agreement exists. However, previous studies have considered scores greater than 0.65 to be acceptable (Jarvenpaa, 1989; Todd and Benbasat, 1993). Landis and Koch (1977) provided guidelines for interpreting kappa by associating different values to the degree of agreement beyond chance (see Table 3.2.1).

Value of Kappa	Degree of Agreement Beyond Chance
0.76 - 1.00	Excellent
0.40 - 0.75	Fair to Good (Moderate)
0.39 or less	Poor

Table 3.2.1. Cohen's kappa guidelines

The results of all three sorting rounds are summarized in Table 3.2.2 and described in detail in subsequent sections.

Agreement Measure	Round 1	Round 2	Round 3
Inter-judge raw agreement	61%	71%	89%
Cohen's kappa	0.604	0.708	0.885
Placement Ratio Summary			
Trading Partner Trust	94%	97%	100%
Technology Trust Mechanisms	70%	80%	94%
Trading Partner Power	90%	100%	100%
E-Infrastructure	72%	75%	93%
Strategic Flexibility	86%	86%	100%
Supply Chain Integration	43%	58%	79%
Web-Based EC use	35%	75%	80%
Organizational Benefits	73%	88%	85%
Average	**68%**	**80%**	**90%**

Table 3.2.2. Q-sort results summary

3.2.3 Results of the first round

The first round consisted of 130 items for the eight constructs. The judges in the first round were a Supply Chain Director, and a Supply Chain Consultant. The combined inter-judge raw agreement scores averaged 61% (Table 3.2.3), and the initial overall placement ratio of items within the target constructs was 68% as 178 of 260 items were correctly classified (Table 3.2.4).

	Judge 1									
Judge 2	Construct1	1	2	3	4	5	6	7	8	NA
	1	14								
	2		7		2					
	3			4						
	4		1		21		5			
	5					5				
	6				6	1	6		1	
	7				1		2	0		
	8					2	3		22	
	NA									0
	Total Items: 130		**Number of Agreement: 79**				**Agreement Ratio: 61%**			

Table 3.2.3. Inter-judge Raw Agreement Scores: First Sorting Round

	Actual Categories											
Theoretical Categories	Construct[1]	1	2	3	4	5	6	7	8	NA	Total	%
	1	30		2							32	94%
	2		14		5		1				20	70%
	3	1		9							10	90%
	4		4		43		13				60	72%
	5					12			2		14	86%
	6	1			16	3	18	1	3		42	43%
	7				2		11	7			20	35%
	8				1	7	7	2	45		62	73%
	NA										0	0%
	Total Items: 260		**Number of agreements: 178**				**Hit Ratio: 68%**					

Table 3.2.4. Moore and Benbasat Hit Ratio. First Sorting Round

As indicated by these results, there is evidence of some confusion among some of the constructs. The first step to understand this confusion is to examine off-diagonal items in Table 3.2.4 to look for clusters. This examination reveals eight clusters. On the Technology Trust Mechanisms, five out of the six misclassified items are in the E-Infrastructure area. This is expected since in both constructs there are items that relate to IT/tools applications for Web-Based EC. A similar effect appears in the E-Infrastructure construct, where 4 of the 19 misplaced

1 Legends for the constructs can be found in Table 3.1.1.

items are in Technology Trust Mechanisms. Another cluster appears on E-Infrastructure, where 13 misclassified items were placed in Supply Chain Integration. This is also understandable from the fact that some of the IT / tools applications enhance the capability of an organization to integrate their processes in the supply chain. Similarly, 16 misclassified items in the Supply Chain Integration were placed on E-Infrastructure, enforcing the need to further clarify the difference between these constructs in later rounds. Another cluster is on Web-Based EC use, where 11 of the 13 misclassified items were placed in Supply Chain Integration. This confirms the confusion between these two constructs. Finally, on the Organizational Benefits construct, there are two clusters; one on Strategic Flexibility (7 out of 17 misclassified items placed on this construct) and one on Supply Chain Integration (7 out of 17 misclassified items placed on this construct).

Cohen's kappa for this round was computed as 0.604 which indicates a fair level of agreement (beyond chance) for the judges.

$$k = \frac{130 * 79 - 178}{130^2 - 178} = 0.604$$

Figure 3.2.2. Cohen's kappa for First Sorting Round

To further identify the cause of the misclassifications in round one, the individual judge classifications for each item were investigated, and remediate actions were taken. First, a clearer distinction between Technology Trust Mechanisms and E-Infrastructure Tools was done by rewording the construct definitions and highlighting the key difference between them, namely that Technology Trust refers to those mechanisms that "provide or enhance security" means for

conducting Web-Based EC. Similar actions were taken for a clearer distinction between Supply Chain Integration and Web-Based EC use. In this case, we made the distinction by emphasizing that Supply Chain Integration entails activities whereas Web-Based EC use describes the extent of usage of Web-Based EC in **supply chain processes.** Finally, with regards to the clusters in the Organizational Benefits construct, the items were reworded to better distinguish the benefits items to emphasize that these items are related to improvements. Overall, some constructs' definitions were reworded and five items were deleted that were consistently misclassified by both judges or were not properly understood.

3.2.4 Results of the second round

The first round consisted of 125 items for the eight constructs. A Supply Chain Consultant and a Materials Managers were the judges in this round. The combined inter-judge raw agreement scores averaged 71% (Table 3.2.5), a 10% improvement over the first round, and the initial overall placement ratio of items within the target constructs was 80% as 200 of 250 items were correctly classified (Table 3.2.6).

	Judge 1									
Judge 2	Construct1	1	2	3	4	5	6	7	8	NA
	1	15								
	2		7							
	3			5						
	4				18			3		
	5					5				
	6				1		9			
	7						2	7		
	8				1	1			23	
	NA									0
	Total Items: 125		**Number of Agreement: 89**				**Agreement Ratio: 71%**			

Table 3.2.5. Inter-judge Raw Agreement Scores: Second Sorting Round

	Actual Categories											
Theoretical Categories	Construct[1]	1	2	3	4	5	6	7	8	NA	Total	%
	1	31				1					32	97%
	2		16		2		1	1			20	80%
	3			10							13	77%
	4		1	2	45		5	7			57	79%
	5					12			2		14	86%
	6	2			7	1	22	3	3		38	58%
	7					1	4	15			20	75%
	8				2	3		2	49		56	88%
	NA										0	0%
	Total Items: 250		**Number of agreements: 200**					**Hit Ratio: 80%**				

Table 3.2.6. Moore and Benbasat Hit Ratio. Second Sorting Round

Although the results show much improvement over the first round, there is still evidence of confusion among some of the constructs. As in the first round, we examined the off-diagonal items in Table 3.2.6 to look for clusters. The examination shows seven clusters. On the E-Infrastructure items 5 out of the 15 misclassified items were placed in Supply Chain Integration and 7 in Web-Based EC use. Another three clusters appear on the Supply Chain Integration construct, where 7, 3, and 3 misclassified items (out of a total of 16) were placed

1 Legends for the constructs can be found in Table 3.1.1.

in the E-Infrastructure, Web-Based EC use, and Organizational Benefits constructs respectively. Also, there were 4 items (out of 5) of the Web-Based EC use misplaced in the Supply Chain Integration construct. Finally, on the Organizational Benefits construct, 3 out of 7 misclassified items were placed on the Strategic Flexibility construct.

Cohen's kappa for this round was computed as 0.708, an increase of about 15% with respect with first round, but still indicates a fair level of agreement (beyond chance) for the judges.

$$k = \frac{125 * 89 - 200}{125^2 - 200} = 0.708$$

Figure 3.2.3. Cohen's kappa for Second Sorting Round

Several steps were taken to address the issues presented earlier in order to improve the convergent and discriminant measures. First, we renamed the items of the E-Infrastructure construct that caused misclassification problems. In particular, we included the word system to several of the items to better distinguish them from other constructs. Additionally, the judges were intrigued by the meaning of two items, indicating that these had to be removed. Also, taking a further review of the misplaced items for the Supply Chain Integration construct, most of them have the word "system", which might be have caused the misclassification of the items by the judges. Therefore, to correct this problem, we eliminated these five items. To correct the problems related to the cluster in Organizational Benefits, we further reviewed the items and determined two items could lead to confusion as they tend to be directed towards the strategic flexibility of the firm (e.g. enable organization to respond more quickly to change). Thus,

the two items were removed.

3.2.5 Results of the third round

In the third round, a Purchasing Manager and a Materials Manager participated as judges. This round consisted of 115 items for the eight constructs. The combined inter-judge raw agreement scores averaged 89% (Table 3.2.7), a 19% improvement over the previous round. The overall placement ratio of items within the target constructs was 90%, a 10% improvement from round two, as 207 of 230 items were correctly classified (Table 3.2.8).

	Judge 1									
Judge 2	Construct1	1	2	3	4	5	6	7	8	NA
	1	16								
	2		7							
	3			5						
	4				25					
	5					7				
	6						11			
	7				1		1	8		
	8					1	1		23	
	NA									0
	Total Items: 115		**Number of Agreement: 102**				**Agreement Ratio: 89%**			

Table 3.2.7. Inter-judge Raw Agreement Scores: Third Sorting Round

	Actual Categories											
Theoretical Categories	Construct[1]	1	2	3	4	5	6	7	8	NA	Total	%
	1	32									32	100%
	2		15		1						16	94%
	3			10							10	100%
	4		2		52		2				56	93%
	5					14					14	100%
	6				1	3	22	1	1		28	79%
	7				2		2	16			20	80%
	8					3	4	1	46		54	85%
	NA										0	0%
	Total Items: 230		**Number of agreements: 207**				**Hit Ratio: 90%**					

Table 3.2.8. Moore and Benbasat Hit Ratio. Third Sorting Round

1 Legends for the constructs can be found in Table 3.1.1.

The third round confirms the overall improvement of the measures with the changes done in rounds one and two. There is however, a need to examine the off-diagonal items in Table 3.2.8 as evidence of clusters still is present. There are two relatively small clusters around the Organizational Benefits construct. A closer look to the items causing these clusters indicates that all of them relate to strategic benefits, causing a slight confusion with Strategic Flexibility. Additionally, the items clustered around the Supply Chain Integration had words like “supplier”, or “customer”. We decided to leave the items for at least three reasons. First, we considered important to capture the strategic benefits obtained by an organization as the use of Web-Based EC. Second, Table 3.2.7 shows that all constructs have a high degree of validity (the lowest placement ratio is 79%). Third, Cohen’s kappa in the third round was 0.885 (Figure 3.2.1), indicating excellent agreement between the judges. At this point, we decided to stop the Q-sort analysis.

$$k = \frac{115 * 102 - 207}{115^2 - 207} = 0.885$$

Figure 3.2.4. Cohen's kappa for Second Sorting Round

The resulting number of items after the third round of Q-sort is summarized in Table 3.3.1

3.3. Chapter Summary

Chapter 3 described the item generation process and the results of the pilot study conducted to ensure the reliability and validity of the measures. Based on a pool of 130 items, three rounds of Q-sort methodology were completed to

ensure that the instrument used in the large-scale study is reliable and valid. After the Q-sort analysis, 115 items remained and are reported in Appendix B. The following chapter tests for the quantitative assessment of construct validity and reliability using the large-scale sample.

Construct ID	Construct	Subconstruct	Number of items
1	Trading Partner Trust	Competence	4
		Benevolence	6
		Integrity	6
2	Technology Trust Mechanisms		8
3	Trading Partner Power		5
4	E-Infrastructure	IT Use	14
		Top Management Support	6
		Training	8
5	Strategic Flexibility		7
6	Supply Chain Integration	Internal Integration	4
		Supplier Integration	5
		Customer Integration	5
7	Web-Based EC use	Transactional Use	5
		Strategic Use	5
8	Organizational Benefits	Information Quality	8
		Communications Efficiency	5
		Business Efficiency	8
		Competitive Advantage	6
	Total		**115**

Table 3.3.1. Pool of items after the third sorting round

Chapter 4

Instrument Development (2) – Large Scale Survey Administration and Instrument Validation

In Chapter 3 the steps to partially validate the research model and the construct measurement items were presented through an extensive literature review and the pilot study (Q-sort technique). The end result of this stage was a set of 115 items and an additional 15 contextual variables, listed in the large scale instrument (Appendix C). The next logical step is to further validate the measurement instrument using a larger sample size, which is the main objective of the current chapter. The following steps are undertaken in this chapter. First, the appropriate methods for administering the questionnaire are selected. Second, respondents for this study are identified. Third, the data gathering process is selected. Finally, instrument assessment to show validity, reliability, and sampling adequacy is conducted for all the constructs. In the subsequent sections, these steps are explored in greater detail.

4.1. Delivery methods for administering the questionnaire

The method(s) for administering the questionnaire were carefully planned to maximize the response rate, while keeping the data gathering process as error-free as possible. To this extent, different alternatives were developed to complete the questionnaire, namely: on-line, pdf form with email submission, and paper based. As we will discover in the following section, the vast majority of responses were gathered from the on-line questionnaire, therefore, we will discuss its design in more detail.

Internet as a survey tool has grown rapidly in the last few years with mixed results (Batagelj and Vehovar, 1998). Previous research has found statistically higher response rates for online surveys (Bowker and Dillman, 2000; Klassen and Jacobs, 2001) compared to other methods (e.g. fax, regular mail). There are other obvious advantages in terms of costs and in the elimination of hand coding, through the automation of data coding. In designing the online version of the questionnaire, several aspects were taken into consideration. First, it was decided to present the survey as a multi-page form, rather than a single page form. Even though previous research had not found significant differences between these two presentation methods (Batagelj and Vehovar, 1998), we choose a multi-page format because we did not want the respondent to see the whole questionnaire and get discouraged by the total number of questions presented at once. Second, the layout was designed by placing the responses to the right, which has been found to produce desirable outcomes with respect to item response rate, and quality of measurement (Bowker and Dillman, 2000).

Third, the online survey was designed as simple as possible in terms of format and navigation, which has been found of paramount importance in previous research (Dillman, Tortora et al., 1998; Bowker and Dillman, 2000). This design included light background color, adequate font style and size, among others. Fourth, to limit the access of unauthorized individuals that could had led to invalid conclusions, it was decided to make the survey password protected; thus, only the target population who received an invitation by email had access to the survey. Fifth, an indication of completion rate allowing respondents to track their progress was provided, a suggested step to improve response rate (Schonlau, Fricker et al., 2002). Finally, we decided to force answers in all the questions related to the constructs to eliminate unanswered questions. Even though this might have had an effect on the final response rate, we incorporated this safeguard to eliminate this type of non-response. In summary, in the development of the online version of the survey, we have considered to a large extent recommendations made in previous research to minimize sampling, coverage, measurement, and non-response errors (Dillman, Tortora et al., 1998; Dillman, Tortora et al., 1999; Dillman and Bowker, 2001; Schonlau, Fricker et al., 2002).

4.2. Sampling

In any large scale data collection study, there are two important factors that determine the quality of the empirical study. First, it is critical to assure the quality of the respondents. Since this research focused on Web-Based Electronic Commerce and Supply Chain Management aspects, respondents

were expected to have adequate knowledge in these areas, in addition to firm's performance indicators. For this reason, and based on the literature (e.g., Min and Mentzer, 2004) and recommendations from practitioners a decision was made to target top and middle management subjects in the following business areas: logistics, purchasing/procurement, supply chain, manufacturing, and operations. It is assumed that the target respondents understand the concepts of SCM and Web-Based EC. This assumption was verified through the procedures described in Chapter 3 , therefore we felt confident that the target respondents were qualified to provide valid responses to this study. Furthermore, a modified "snowballing" technique described in previous research (Kaufmann and Carter, 2000; Quesada, 2004; Truong, 2004) was used, in which this initial informant was asked to either complete the questionnaire or pass it along to the appropriate manager in the organization who might be more qualified to answer the questionnaire.

Additionally, efforts were made to obtain a sample representative of different geographical areas, industries and firm sizes to achieve greater generalizability and minimize respondent bias. The main reason why target firms were not limited to those in any single industry, but open to firms in various industries, is because we believe the practices analyzed in this study should be applicable to many industries and organizations.

Two mailing lists were obtained and compiled to generate the sample frame. The first mailing list was obtained from the Institute for Supply Management (ISM). The mailing list contained 5000 names randomly selected from the ISM

United States membership database. Priorities were given to members in the following SIC classifications: Chemicals & Allied Products (SIC 28), Primary Metal Industries (SIC 33), Fabricated Metal Products (SIC 34), Industrial, Commercial & Computer Equipment (SIC 35), Electronic, Electrical Equipment & Components (SIC 36), Transportation Equipment (SIC 37). The second mailing list was purchased from Lead411.com, a marketing company that provides business and executive email lists. The mailing list contained 1200 names randomly selected from their database. Although SIC code selection was not available, industry types were selected to match closely those of the ISM database. The industries selected were: Automotive/Transportation, Chemical Manufacturing, Construction/Agric Machinery, Hardware, Iron/Steel, Materials/Manufacturing, Industrial Equipment, and eCommerce.

The sample was further refined by eliminating duplicates and records with invalid email addresses. After this first screening, a total of 6058 records remained for the large scale data collection process. These records were divided into four different groups for the large scale data collection process for several reasons. First, dividing them into smaller groups made the process of handling returned emails and responses easier. Second, one of the mailing lists was acquired at a later stage. Third, it was advised by the network administrator to send mass emails in groups of no larger than 1500 to prevent the server from collapsing.

An invitation email was sent to each of the groups in the sample described before briefly stating the purpose of the research, the approximate time of completion, ensuring the respondents' privacy, and the methods to answer the questionnaire

among other details. The email also contained information on how to access the password protected online survey, the password to access the pdf version, or the request of a paper copy of the survey (see Appendix D). Finally, the email had a link to a page that described in further detail the research project (http://business.nmsu.edu/~cmora/research.html). Two waves followed the first email. The first one was sent two weeks after the first invitation, followed by a final reminder email three weeks after the original invitation. Besides the waves of emails, phone calls were made when possible to encourage participation. After each round of emails, necessary refinements were made to the sample because: 1) the email was undeliverable, 2) the person was no longer employed in the company, and 3) the respondent declined to participate (no time, company policy, not using any type of Web-Based EC, etc). Consequently the sample size had to be modified accordingly. In total, 186 responses were received (Table 4.2.1). The effective response rate was 5.32%, considered low for empirical studies, although others subscribe to the philosophy that there is no generally accepted minimum response rate (Fowler, 2002).

	Group 1	Group 2	Group 3	Group 4	Totals
Sample Size	1471	1996	1516	1075	6058
Undelivered	532	815	490	544	2381
Opt-Out	48	53	48	35	184
Completed	68	50	39	29	186
Response rate	**7.63%**	**4.43%**	**3.99%**	**5.85%**	**5.32%**

Table 4.2.1. Survey Response Rates

4.3. Sample Characteristics

As mentioned earlier, one of the purposes in targeting different industries was to improve the generalizability of the results. First, the majority of the respondents

indicated their industry to be the Primary Metal Industry, Fabricated Metal Products, and the Electronic and Electrical Equipment (Table 4.3.1 and Figure 4.3.1).

Metric	Frequency	Percentage
Chemicals & Allied Products (SIC 28)	15	8.2%
Primary Metal Industries (SIC 33)	46	25.0%
Fabricated Metal Products (SIC 34)	21	11.4%
Industrial, Commercial & Computer Equipment (SIC 35)	17	9.2%
Electronic, Electrical Equipment & Components (SIC 36)	16	8.7%
Transportation Equipment (SIC 37)	7	3.8%
Rubber And Miscellaneous Plastics Products (SIC 30)	1	0.5%
Other	**61**	33.2%

effective sample size: 184

Table 4.3.1. Profile of Survey Respondents (Industry Type)

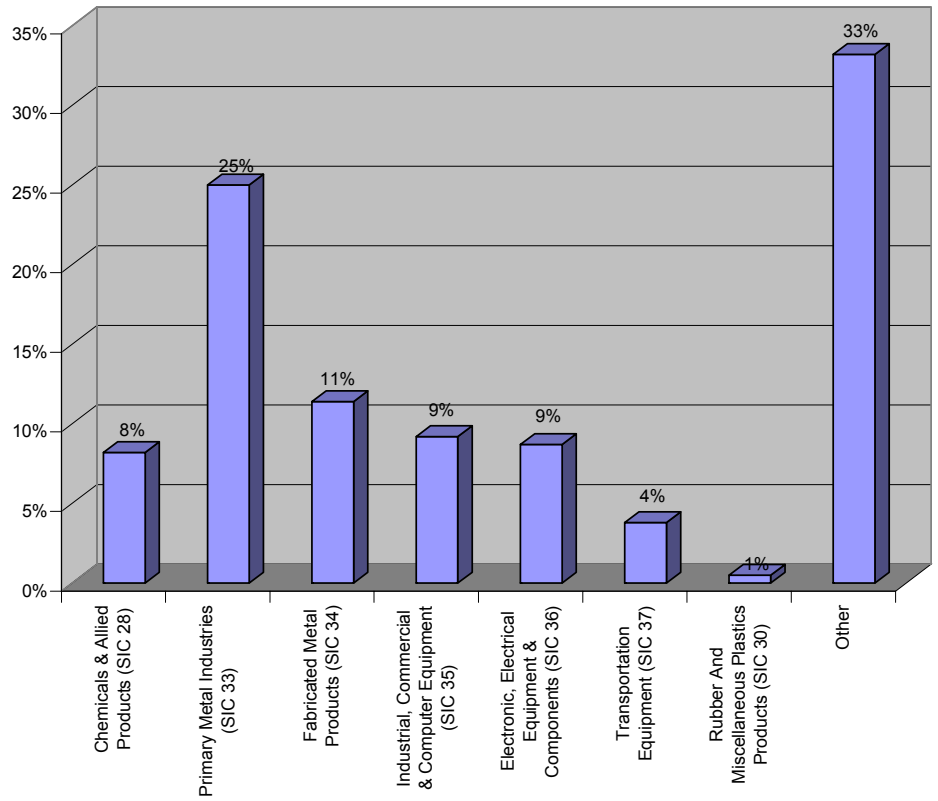


Figure 4.3.1. Profile of Survey Respondents (Industry Type)

Other demographic in this study relate were intended to capture the relative size of the respondents by measuring annual sales and number of employees (Table 4.3.2, Table 4.3.3, Figure 4.3.2, and Figure 4.3.3). With regards to annual sales, approximately 32% of the respondents fall under the "large companies" with sales over a billion dollars; whereas another 35% of the respondents have annual sales between 100 and 999 million dollars. Additionally, the majority of the sample has over 1000 employees (51.1%).

Metric	Frequency	Percentage
Less than 10	18	10.3%
10-49	26	14.9%
50-99	8	4.6%
100-249	33	19.0%
250–499	21	12.1%
500–999	12	6.9%
1000 and above	**56**	32.2%

effective sample size: 174

Table 4.3.2. Profile of Survey Respondents (Annual Sales in US $ millions)

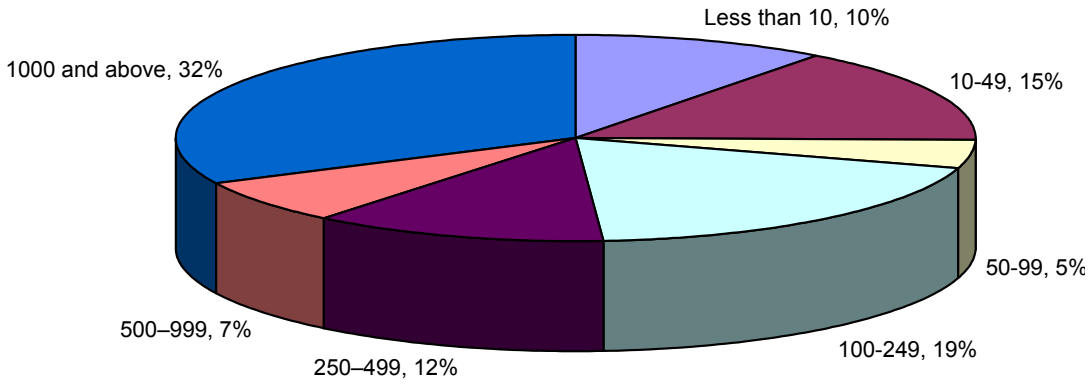


Figure 4.3.2. Profile of Survey Respondents (Annual Sales in US $ millions)

Metric	Frequency	Percentage
Less than 50	14	7.6%
51-100	16	8.7%
101-250	24	13.0%
251-500	25	13.6%
501–1000	11	6.0%
Over 1000	94	51.1%

effective sample size: 184

Table 4.3.3. Profile of Survey Respondents (Number of Employees)

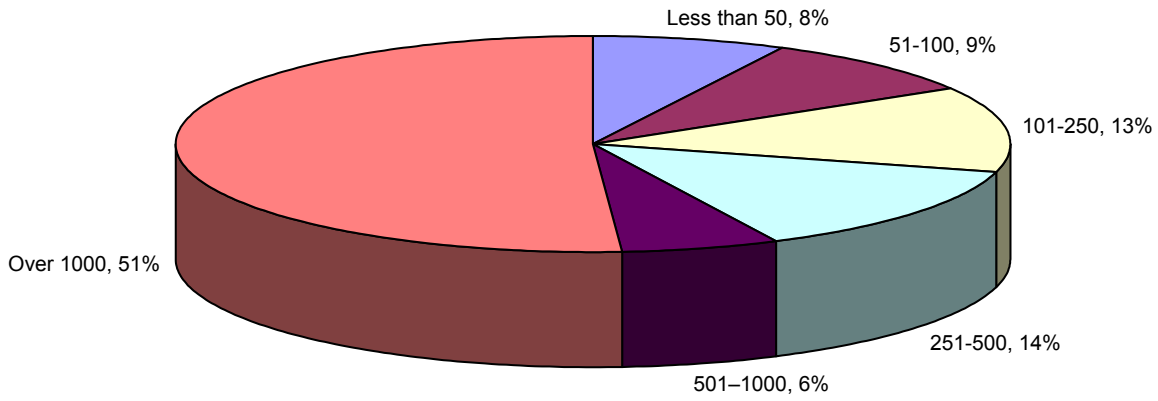


Figure 4.3.3. Profile of Survey Respondents (Number of Employees)

Finally, the majority of the respondents hold a middle level management position, as indicated by 46.7% of the sample (see Table 4.3.4 and Figure 4.3.4). A vast majority of the respondents hold job functions related to purchasing (75.5%), logistics and SCM (22.8%), and corporate executive (17.4%). Participating organizations initiated Web-Based EC as early as 1985, and as late as 2006, with the majority initiating efforts in the years 1999-2001 (42.4% of sample).

Metric	Frequency	Percentage
Top Level Management (e.g. CEO, President)	26	14.1%
Middle Level Management (e.g. Manager, Director)	86	46.7%
First Level Supervisor (e.g. Supervisor, Coordinator)	14	7.6%
Professional employee without supervisory role	51	27.7%
Other	7	3.8%

effective sample size: 184

Table 4.3.4. Profile of Survey Respondents (Job Title)

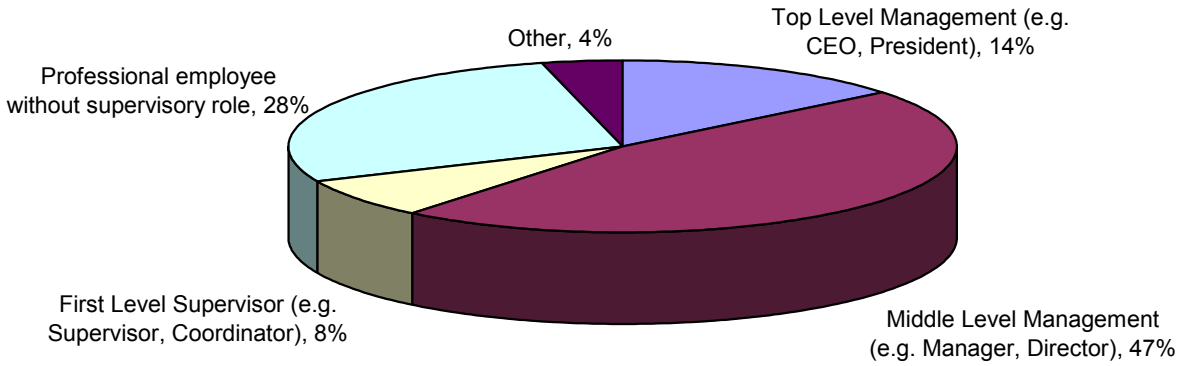


Figure 4.3.4. Profile of Survey Respondents (Job Title)

We also wanted to explore the role of the participating organizations in the supply chain of their primary product. To this extent, we asked three related questions based on a graphical representation of a supply chain (Figure 4.3.5). The majority of the respondents perceived their firm as being the dominant producer in the supply chain (51.4%), whereas in terms of supply chain power, their perception was mostly on the dominant producer (33.1%) and the end customer/retailer (29.8%). Also, the results indicate that technology decisions in the supply chain are made mostly by the respondents themselves, as indicated by a 44.3% of the sample, and not coerced by other players in the supply chain. These results are presented in the tables and figures below.

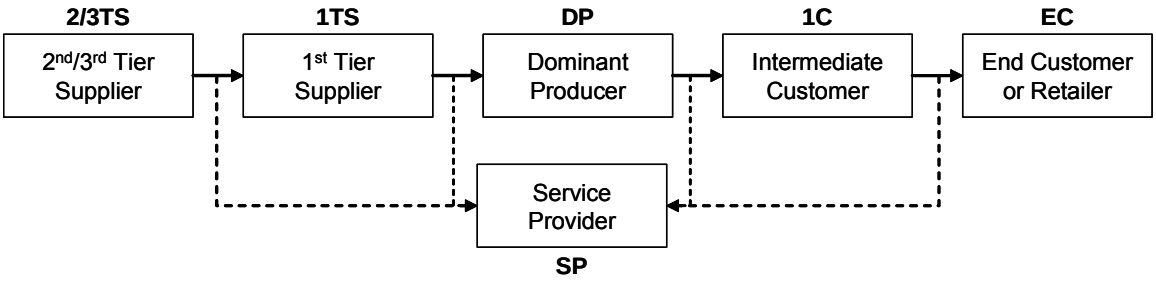


Figure 4.3.5. Graphical representation of a supply chain.

Firm's position in the supply chain	Frequency	Percentage
2nd/3rd Tier Supplier	12	6.6%
1st Tier Supplier	38	21.0%
Dominant Producer	93	51.4%
Intermediate Customer	13	7.2%
End Customer/ Retailer	7	3.9%
Service Provider	18	9.9%

effective sample size: 181

Table 4.3.5. Respondents position in their primary supply chain

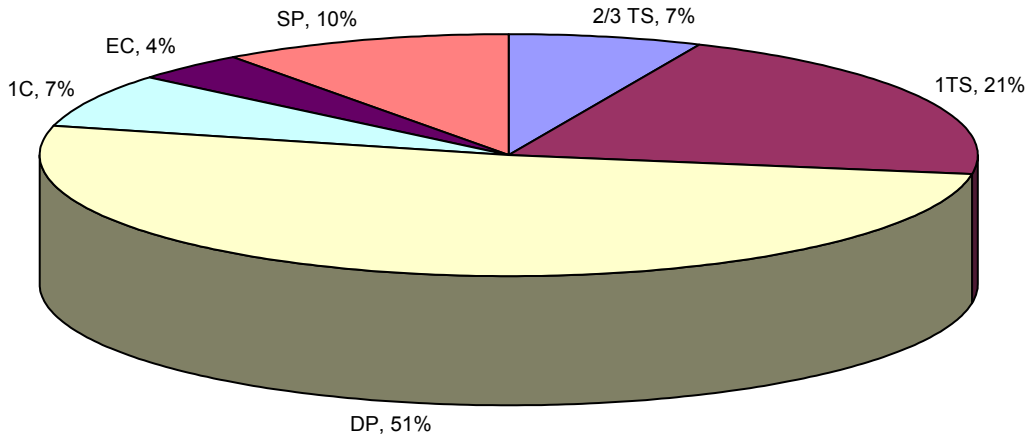


Figure 4.3.6. Respondents position in their primary supply chain

Firm with the most power in the supply chain	Frequency	Percentage
2nd/3rd Tier Supplier	7	3.9%
1st Tier Supplier	23	12.9%
Dominant Producer	59	33.1%
Intermediate Customer	28	15.7%
End Customer/ Retailer	53	29.8%
Service Provider	8	4.5%

effective sample size: 178

Table 4.3.6. Firm with the most power in the respondents' primary supply chain

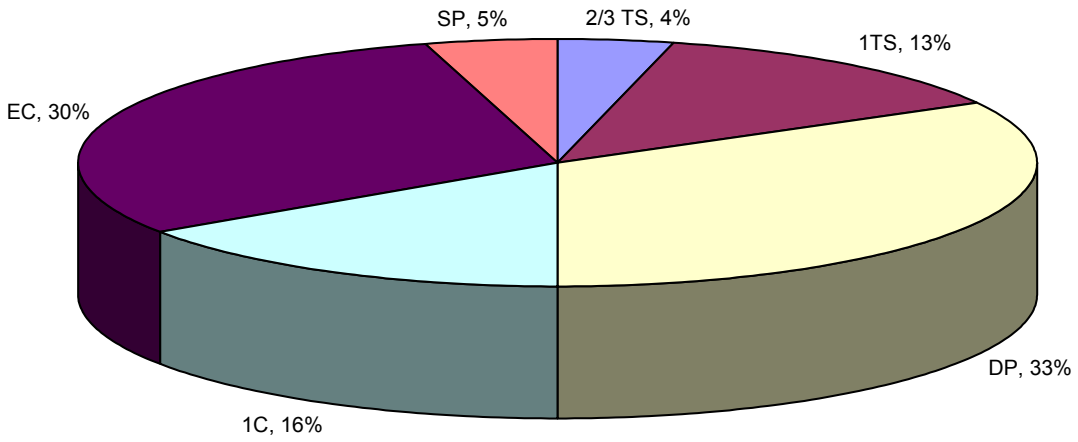


Figure 4.3.7. Firm with the most power in the respondents' primary supply chain

Firm that sets the technology in the supply chain	Frequency	Percentage
2nd/3rd Tier Supplier	4	2.3%
1st Tier Supplier	22	12.5%
Dominant Producer	78	44.3%
Intermediate Customer	21	11.9%
End Customer/ Retailer	33	18.8%
Service Provider	18	10.2%

effective sample size: 176

Table 4.3.7. Firm that sets the technology in the respondents' primary supply chain

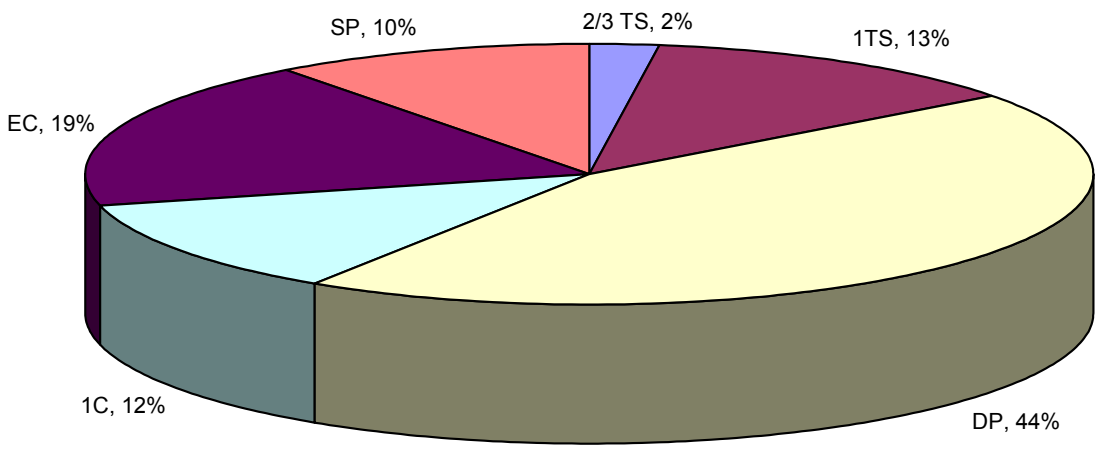


Figure 4.3.8. Firm that sets the technology in the respondents' primary supply chain

Another demographic issue explored the extent to which the firm conducts business transactions with suppliers and customers using Web-Based EC (Table 4.3.8, Table 4.3.9, and Table 4.3.10). As indicated by these results, over 60% of the respondents indicated that they interact with suppliers through Web-Based EC. A similar pattern was observed with customers. Based on these results, and as expected, the total monthly business transactions conducted through Web-Based EC follows a similar pattern, were 37.1% and 23.4% of the respondents indicated the conduct between 0-20% and 21-40% transactions through Web-Based EC respectively. It is important to highlight that the current level of Web-Based EC interactions of the respondents with their suppliers and customers is still relatively low as most of the respondents (41% for suppliers and 39% for customers) indicated a low level of interaction. Overall, the results indicate that the use of Web-Based EC among organizations is relatively low since most of the respondents indicated that they used a low percentage of Web-Based EC to conduct interactions with their trading partners. This finding is

similar in nature to previous research in the field, particularly in the use of Electronic Markets (Truong, 2004).

Extent of Web-Based EC Interactions with suppliers	Frequency	Percentage
0-20%	75	40.5%
21-40%	38	20.5%
41-60%	29	15.7%
61-80%	29	15.7%
81-100%	14	7.6%

effective sample size: 185

Table 4.3.8. Extent of Web-Based EC interactions with suppliers

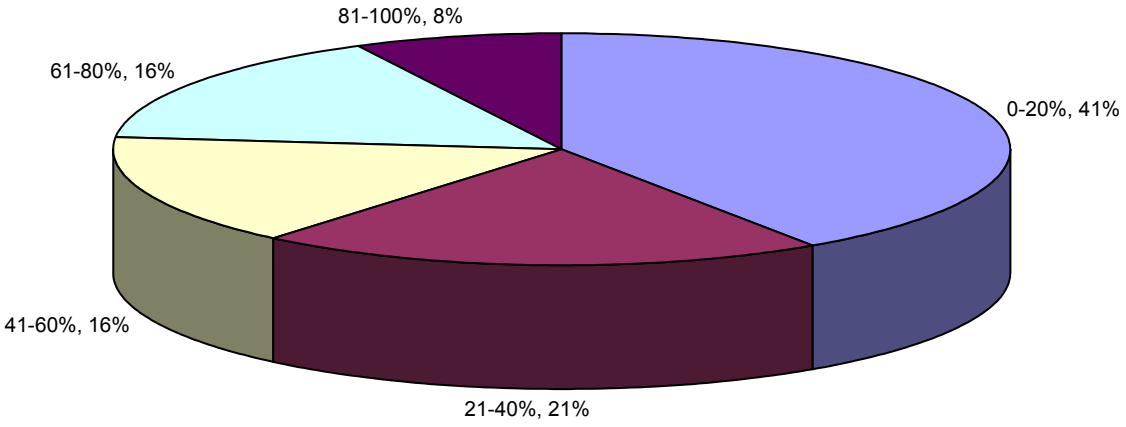


Figure 4.3.9. Extent of Web-Based EC interactions with suppliers

Extent of Web-Based EC Interactions with customers	Frequency	Percentage
0-20%	68	38.6%
21-40%	36	20.5%
41-60%	25	14.2%
61-80%	29	16.5%
81-100%	18	10.2%

effective sample size: 176

Table 4.3.9. Extent of Web-Based EC interactions with customers

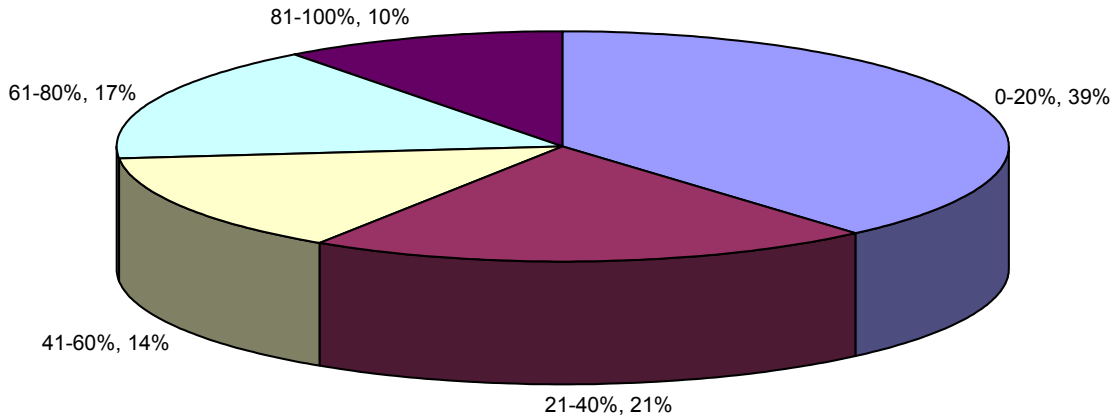


Figure 4.3.10. Extent of Web-Based EC interactions with customers

Extent of business transactions conducted through Web-Based EC	Frequency	Percentage
0-20%	65	37.1%
21-40%	41	23.4%
41-60%	33	18.9%
61-80%	24	13.7%
81-100%	12	6.9%

effective sample size: 175

Table 4.3.10. Extent of business transactions conducted through Web-Based EC

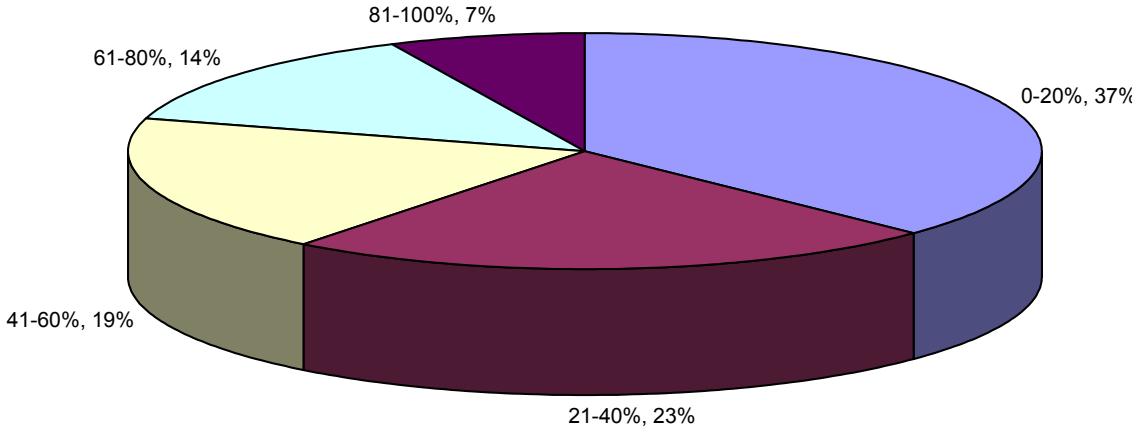


Figure 4.3.11. Extent of business transactions conducted through Web-Based EC

4.4. Nonresponse Bias

A concern in any empirical is nonresponse bias. If participants who respond differ substantially from those who do not, results do not directly allow the researcher to make any type of generalization of the results (Armstrong and Overton, 1977). In order to assess nonresponse bias, we conducted Chi-square test of homogeneity ($P < 0.05$). SIC code was compared between the target populations ($N_{ISM} = 3146$, $N_{Lead411} = 1075$) and all the responses ($n_{ISM} = 155$, $n_{Lead411} = 29$). As indicated in Table 4.4.1 and Table 4.4.2, no significant differences were found (χ^2=12.592, df = 6; χ^2=8.33, df = 6).

SIC Code	Sample Size	Observed Frequency (f_o)	Expected Frequency (f_e)	$\frac{(f_o - f_e)^2}{f_e}$
28	403	12	20	3.11
33	741	45	37	1.98
34	354	14	17	0.68
35	321	15	16	0.04
36	139	12	7	3.88
37	203	6	10	1.60
Other	985	51	49	0.13
Total	**3146**	**155**	**155**	**χ^2=11.41**

Table 4.4.1. SIC Comparison – Respondent vs. Non-respondent (ISM Sample)

SIC Code	Sample Size	Observed Frequency (f_o)	Expected Frequency (f_e)	$\frac{(f_o - f_e)^2}{f_e}$
28	61	3	2	0.50
33	75	1	2	0.50
34	303	7	8	0.13
35	227	2	6	2.67
36	7	4	0	0.00
37	132	1	4	2.25
Other	270	11	7	2.29
Total	**1075**	**29**	**29**	**χ^2=8.33**

Table 4.4.2. SIC Comparison – Respondent vs. Non-respondent (Lead411 Sample)

To further analyze the existence of nonresponse bias, we tested for significant differences between early and late respondents, the latter considered as a surrogate of non-respondents (Armstrong and Overton, 1977). In this case, we considered early respondents as those who answered after the first email was sent, whereas late respondents were those who completed the questionnaire after the second and third reminders. Table 4.4.3 shows no significant difference in number of employees, annual sales, and job title. Therefore, and based on the results from these tests, we concluded that nonresponse was not a problem in the sample used in this study.

Before attempting to analyze the large scale results, it is imperative to address the issues related to missing data to identify if patterns exist and determine the best way to deal with it (Hair, Anderson et al., 1995). The number of missing values for all cases and variables was identified and the appropriate steps to deal with them are further explained in Appendix E. From the analysis, we dropped 6 cases and two variables from further analysis (TTM_5 – Seal assurances and EIF_ITC2 – Groupware). This led to reduce the number of cases to 180. For the remaining missing data, we conducted a series of analysis (Appendix E), and it was found that is not missing at random. We therefore performed a series of transformations and determined that mean substitution would be an adequate replacement for missing values, and subsequent analyses took into account this substitution. According to Mertler and Vannatta (2002) replacement of less than 15% of the data will have little or no effect on the outcome of the analysis.

Metric	1st Wave	2nd/3rd Wave	Chi-square Test
Number of Employees			
Less than 10	9	9	$\chi^2 = 0.491$ df = 6 p > 0.01
10-49	17	9	
50-99	5	3	
100-249	18	15	
250–499	16	5	
500–999	9	3	
1000 and above	31	25	
Total	105	69	
Annual Sales (million US $)			
Less than 50	8	6	$\chi^2 = 0.903$ df = 5 p > 0.01
51-100	11	5	
101-250	13	11	
251-500	17	8	
501–1000	7	4	
Over 1000	56	38	
Total	112	72	
Job Title			
Top Level Management	19	7	$\chi^2 = 0.065$ df = 4 p > 0.05
Middle Level Management	58	28	
First Level Supervisor	7	7	
Professional employee without supervisory role	24	27	
Other	3	4	
Total	111	73	

Table 4.4.3. Comparison between The first wave and second wave

4.5. Large Scale Instrument Assessment Methodology

The next step in the instrument development phase involved submitting the instrument to a rigorous set of tests with the following objectives: purification, unidimensionality, convergent validity, discriminant validity. To this end, the remaining 180 valid responses were used in the analyses to follow. Validity is the degree to which a measure or set of measures correctly represents the concept of study and , consequently, permits appropriate interpretation of results (Hair, Anderson et al., 1995; Gay and Airasian, 2003). Validity needs to be

assessed at different levels: content, construct, and criterion-related. **Content validity** was explained and assessed in Chapter 3 .

Construct validity refers to the degree to which measures of the same construct correlate higher with each other than they do with measures of other constructs (Cook and Campbell, 1979; Schoenfeldt, 1984; Nidumolu and Knotts, 1998). This usually takes the form of convergent and discriminant validity. Convergence is the evidence that different items gathered in different ways indicate a similar meaning of the construct. Discriminant validity involves demonstrating that the construct can be differentiated from other constructs that may be somewhat similar.

Criterion-related validity deals with finding the presence or absence of one or more criteria considered to represent a construct. This type of validity is assessed through concurrent and predictive validity. Correlating a measure and the criterion at the same point in time assesses concurrent validity. Predictive validity is concerned with a future criterion and is assessed by correlating a composite score for each construct based on the hypotheses proposed.

Reliability has to do with the quality of measurement and it involves inter-rater reliability (assessed in Chapter 3), and internal consistency reliability which is concerned with the consistency of results across items within a measure(s).

Sampling adequacy assures that an effective sample size is found as it can be assessed at the factor analysis stage with the Kaiser-Meyer-Olkin (KMO) measure.

The methods used were: corrected-item total correlation (CITC) for purification;

exploratory factor analysis for unidimensionality, Cronbach's alpha for reliability, and correlation analysis for convergent and discriminant validity. Following Churchill's seminal work (1979), items were eliminated during purification if their CITC score was below a threshold value of 0.5. However, an item with a CITC score lower than the threshold value can be kept provided there is sufficient theoretical support. Similarly, an item with a CITC score higher than the threshold value can be dropped from further analysis.

The reliability (internal consistency) was determined by examining the Cronbach's alpha. As pointed out by Nunnally (1994), an alpha score of 0.7 or higher indicates a reliable scale.

After purifying the items, the examination of factor structure was carried out through exploratory factor analysis (EFA) to assess convergent validity at the dimension level and discriminant validity at the construct level. The remaining items after the purification were combined into their respective dimension and analyzed in factor analysis, with the principle component analysis method and VARIMAX rotation extraction method (Kaiser, 1958), which provides a clear separation of items and is considered the most popular rotation method (Abdi, 2003). Factor loadings greater than 0.5 are considered very significant (Hair, Anderson et al., 1995) and are used as a cut-off score, and thus items not loading on a particular dimension or having significant cross loadings were dropped from further analysis. Items with good measurement properties should exhibit high factor loadings on the intended factor and small factor loadings in other factors (Segars and Grover, 1993). If a dimension factored into two or

more dimensions, or if the opposite occurred, then theoretical justification was sought to justify the result. Factor loadings lower than 0.40 are not reported in the following sections for simplification purposes. Furthermore, during the EFA stage, a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was calculated. This measure indicates that the effective sample size is adequate for the factor analysis. Generally, KMO scores below 0.5 are unacceptable, in the 0.60's are tolerable, in the 0.70's are average, in the 0.80's are very good, and in the 0.90's are outstanding.

4.6. Large-Scale Study Results

The following sections present the results of the large-scale instrument validation for each of the eight constructs in the study, namely: Trading Partner Trust (TPT), Technology Trust Mechanisms (TTM), Trading Partner Power (TPP), E-Infrastructure (EIF), Strategic Flexibility (STF), Supply Chain Integration (SCI), Web-Based EC Usage (WEC), and Organizational Benefits (OBE). For each construct, the methodology described in the previous section was applied, and the results are presented in tables that describe: 1) the initial large-scale measurement items for each dimension; 2) the dimension level CITC scores, Cronbach's alpha, and dimension level factor analysis, 3) the construct factor analysis results with the final Cronbach's alpha coefficients, and 4) a final list of items for each dimension.

4.6.1 Trading Partner Trust

The Trading Partner Trust (TPT) construct was initially represented by three dimensions and 16 items in the large scale questionnaire, including Competence

(COMP – 4 items), Benevolence (BENE – 6 items) and Integrity (INTE – 6 items). The original items along with the codes are listed in Table 4.6.1.

Item Code	Survey Item
Competence (COMP)	
TPT_COMP1	Our trading partners are competent in our business relationships
TPT_COMP2	Our trading partners perform their role very well
TPT_COMP3	Our trading partners are capable in our business relationships
TPT_COMP4	Our trading partners are very knowledgeable about their business
Benevolence (BENE)	
TPT_BENE1	I believe our trading partners would act in our best interest
TPT_BENE2	If we require help, our trading partners would do their best to help us
TPT_BENE3	Our trading partners are interested in our well-being, not just their own
TPT_BENE4	Our trading partners are likely to care for our welfare
TPT_BENE5	If there is a problem, our trading partners are likely to go out on a limb for us
TPT_BENE6	Our trading partners are likely to make sacrifices for us if needed
Integrity (INTE)	
TPT_INTE1	Our trading partners are truthful in their dealings with us
TPT_INTE2	Our trading partners are honest
TPT_INTE3	Our trading partners would keep their commitments
TPT_INTE4	Our trading partners are likely to be honest in dealing with us
TPT_INTE5	Promises made by our trading partners are likely to be reliable
TPT_INTE6	Our trading partners are likely to be open with us if problems occur

Table 4.6.1. Trading Partner Trust – Initial Large Scale Survey Items

Reliability Analysis. A reliability analysis was done for each of the three dimensions of Trading Partner Trust (TPT), and the results are listed in Table 4.6.2. With the exception of item TPT_COMP4 (Initial CITC score below 0.50), all items in the three dimensions were above the 0.50 threshold. Even though the CITC score for item TPT_COMP4 was slightly lower than 0.50, it was decided to remove it because in doing so, the alpha score improved considerably for the Competence dimension. As suggested by a final CITC analysis for this dimension, the overall alpha score does not improve if further items are removed,

supporting that the remaining items have internal consistency. The final alpha scores for the dimensions COMP, BENE, and INTE were 0.90, 0.91, and 0.92 respectively.

Items	Initial CITC	Initial α if deleted	Final CITC	Final α if deleted	α	Factor Loading	KMO
Competence (COMP)							
TPT_COMP1	0.78	0.79	0.80	0.86	0.90	0.91	0.75
TPT_COMP2	0.79	0.79	0.82	0.85		0.92	
TPT_COMP3	0.79	0.79	0.79	0.87		0.91	
TPT_COMP4	0.49	0.90	Item dropped after purification				
Benevolence (BENE)							
TPT_BENE1	0.72	0.90			0.91	0.81	0.87
TPT_BENE2	0.68	0.91				0.78	
TPT_BENE3	0.79	0.90				0.86	
TPT_BENE4	0.82	0.89				0.88	
TPT_BENE5	0.81	0.89				0.88	
TPT_BENE6	0.75	0.90				0.83	
Integrity (INTE)							
TPT_INTE1	0.82	0.91			0.92	0.88	0.88
TPT_INTE2	0.81	0.91				0.88	
TPT_INTE3	0.80	0.91				0.86	
TPT_INTE4	0.86	0.90				0.91	
TPT_INTE5	0.75	0.91				0.83	
TPT_INTE6	0.66	0.93				0.75	

Table 4.6.2. Trading Partner Trust – Large Scale Reliability Analysis and Dimension Level Factor Analysis Results

Dimension Level Factor Analysis. To further ensure convergent validity for the three dimensions in the Trading Partner Trust (TPT) construct, a dimension – level factor analysis was conducted for each of the three dimensions in the construct. As indicated by Table 4.6.2, a single factor solution emerged for each of the three dimensions with all factor loadings greater than 0.75. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for each dimension was 0.75 for COMP, 0.87 for BENE, and 0.88 for INTE, indicating adequate results for the

study.

Construct Level Exploratory Factor Analysis. The remaining 15 items of the Trading Partner Trust construct were submitted to a construct level exploratory factor analysis to check for discriminant validity. Three factors emerged from this analysis. Most of the factor loadings were above 0.60 as seen in Table 4.6.3. The sample adequacy was very good at 0.88 and the three factors accounted for almost 75% of the total variance. The final items for the construct organized by dimension are listed in Table 4.6.4.

Item	F1: INTE	F2: BENE	F3: COMP
TPT_INTE4	0.86		
TPT_INTE2	0.84		
TPT_INTE1	0.84		
TPT_INTE3	0.76		
TPT_INTE5	0.74		
TPT_INTE6	0.57		
TPT_BENE5		0.88	
TPT_BENE6		0.83	
TPT_BENE4		0.79	
TPT_BENE3		0.72	
TPT_BENE1		0.66	
TPT_BENE2		0.65	
TPT_COMP2			0.89
TPT_COMP1			0.88
TPT_COMP3			0.83
Eigen Value	8.20	1.65	1.39
% Variance Explained	54.66	11.03	9.26
Cumulative % of Variance	54.66	65.69	74.95
Kaiser Mayer Orkin (KMO) Measure of sampling adequacy = 0.88			
Cronbach Alpha (α) = 0.94			

Table 4.6.3. Trading Partner Trust – Construct Level Factor Analysis Results

Item Code	Survey Item
Competence (COMP)	
TPT_COMP1	Our trading partners are competent in our business relationships
TPT_COMP2	Our trading partners perform their role very well
TPT_COMP3	Our trading partners are capable in our business relationships
Benevolence (BENE)	
TPT_BENE1	I believe our trading partners would act in our best interest
TPT_BENE2	If we require help, our trading partners would do their best to help us
TPT_BENE3	Our trading partners are interested in our well-being, not just their own
TPT_BENE4	Our trading partners are likely to care for our welfare
TPT_BENE5	If there is a problem, our trading partners are likely to go out on a limb for us
TPT_BENE6	Our trading partners are likely to make sacrifices for us if needed
Integrity (INTE)	
TPT_INTE1	Our trading partners are truthful in their dealings with us
TPT_INTE2	Our trading partners are honest
TPT_INTE3	Our trading partners would keep their commitments
TPT_INTE4	Our trading partners are likely to be honest in dealing with us
TPT_INTE5	Promises made by our trading partners are likely to be reliable
TPT_INTE6	Our trading partners are likely to be open with us if problems occur

Table 4.6.4. Trading Partner Trust – Final Large Scale Survey Items

4.6.2 Technology Trust Mechanisms

One dimension and eight items comprised the Technology Trust Mechanisms construct (TTM). Table 4.6.5 lists the items for this construct. It is important to highlight that item TTM_5 was removed from the analysis because of low response rate as indicated in Appendix E.

Item Code	Survey Item	
TTM_1	Extent to which the following mechanisms are used in your firm….	Firewall mechanisms
TTM_2		Encryption mechanisms
TTM_3		Logon procedures (IDs and Passwords)
TTM_4		Network access controls
TTM_5		Seal assurances
TTM_6		Digital signatures
TTM_7		Recovery mechanisms
TTM_8		Backup mechanisms

Table 4.6.5. Technology Trust Mechanisms – Initial Large Scale Survey Items

Reliability Analysis. The results of the reliability analysis for the Technology Trust Mechanisms (TTM) are shown in Table 4.6.6. As indicated by the results, all items had an initial CITC greater than 0.50. However, two of the items, TTM_2 and TTM_6, were borderline cases and, if dropped, the overall alpha score would improve considerably. Therefore, these items were removed from further analysis. The overall alpha score of 0.91 indicates a very high reliability (internal consistency) of the items. Because this construct consisted of a single dimension, no dimension level analysis is described.

Items	Initial CITC	Initial α if deleted	Final CITC	Final α if deleted	α
TTM_1	0.68	0.84	0.89	0.89	0.91
TTM_3	0.69	0.84	0.89	0.89	
TTM_4	0.76	0.83	0.88	0.88	
TTM_7	0.79	0.82	0.89	0.89	
TTM_8	0.68	0.84	0.90	0.90	
TTM_2	0.58	0.85	Items dropped after purification		
TTM_6	0.50	0.88			

Table 4.6.6. Technology Trust Mechanisms – Large Scale Reliability Analysis Results

Construct Level Exploratory Factor Analysis. One dimension was considered for the construct level exploratory factor analysis to check for discriminant

validity. All five items loaded into a single factor and their factor loadings were greater than 0.83 (see Table 4.6.7). Overall, the resulting factor accounted for 74.07% of the total variability. The KMO measure of 0.85 indicated a very good sampling adequacy and the overall Cronbach alpha score was 0.91.

Item	F1: TTM
TTM_4	0.90
TTM_1	0.86
TTM_7	0.86
TTM_3	0.85
TTM_8	0.83
Eigen Value	3.70
% Variance Explained	74.07
Cumulative % of Variance	74.07
Kaiser Mayer Orkin (KMO) Measure of sampling adequacy = 0.85	
Cronbach Alpha (α) = 0.91	

Table 4.6.7. Technology Trust Mechanisms – Construct Level Factor Analysis Results

The final set of items for the Technology Trust Mechanisms (TTM) construct are listed in Table 4.6.8.

Item Code	Survey Item	
TTM_1	Extent to which the following mechanisms are used in your firm….	Firewall mechanisms
TTM_3		Logon procedures (IDs and Passwords)
TTM_4		Network access controls
TTM_6		Digital signatures
TTM_8		Backup mechanisms

Table 4.6.8. Technology Trust Mechanisms – Final Large Scale Survey Items

4.6.3 Trading Partner Power

Trading Partner Power (TPP) construct is comprised of a single dimension and 5 items, presented along with their codes in Table 4.6.9.

Item Code	Survey Item
TPP_1	Our Trading Partners played a major role in our decision whether or not to adopt Web-Based EC
TPP_2	Our Trading Partners imposed their rules and regulations for using Web-Based EC
TPP_3	Our Trading Partners imposed the format and standards in Web-Based EC
TPP_4	When implementing Web-Based EC, we normally don't have much influence in the negotiations with our trading partners
TPP_5	Our trading partners were the force behind the implementation of Web-Based EC

Table 4.6.9. Trading Partner Power – Initial Large Scale Survey Items

Reliability Analysis. CITC scores and the overall alpha were computed to assess the reliability of the Trading Partner Power (TPP) construct and the results are shown in Table 4.6.10. Overall, all items in this construct have a CITC with a value greater of 0.69 or greater and the overall alpha score of 0.90 indicates a high reliability. Because this construct consisted of a single dimension, no dimension level analysis was conducted.

Items	Initial CITC	Initial α if deleted	Final CITC	Final α if deleted	α
TPP_1	0.69	0.90			0.90
TPP_2	0.83	0.87			
TPP_3	0.85	0.86			
TPP_4	0.66	0.90			
TPP_5	0.79	0.88			

Table 4.6.10. Trading Partner Power– Large Scale Reliability Analysis Results

Construct Level Exploratory Factor Analysis. The results of the confirmatory factor analysis for the Trading Partner Power (TPP) construct are presented in Table 4.6.11. As seen in the table, a single factor solution emerged from the analysis, and all factor loadings had values of 0.77 or greater. Furthermore, the

sampling adequacy KMO measure (0.82) indicated a very good result for this construct. Overall, the single factor solution accounted for almost 73% of the total variance, and the final Cronbach alpha score is 0.90, indicating a very good internal consistency. Because all items were retained after the large scale purification phase, all the items presented in Table 4.6.9 are carried forward into the next stage of the study.

Item	F1: TPP
TPP_3	0.91
TPP_2	0.90
TPP_5	0.87
TPP_1	0.80
TPP_4	0.77
Eigen Value	3.63
% Variance Explained	72.55
Cumulative % of Variance	72.55
Kaiser Mayer Orkin (KMO) Measure of sampling adequacy = 0.82	
Cronbach Alpha (α) = 0.90	

Table 4.6.11. Trading Partner Power – Construct Level Factor Analysis Results

4.6.4 E-Infrastructure

The E-Infrastructure (EIF) construct was initially represented by four dimensions and 28 items in the large scale questionnaire. These dimensions are IT Usage – Communications (ITC – 5 items), IT Usage – Logistics (ITL – 9 items), Top Management Support (TMS – 6 items), and Training (TRA – 8 items). The original items along with the codes are listed in Table 4.6.12. It is important to mention that item EIF_ITC2 (Groupware) was removed from further analysis because of low response as indicated in Appendix E.

Item Code	Survey Item	
IT Usage – Communications (ITC)		
EIF_ITC1	Extent of usage of the following IT applications / tools	Electronic Data Interchange (EDI)
EIF_ITC2		Groupware
EIF_ITC3		Electronic Fund Transfer (EFT)
EIF_ITC4		Intranet
EIF_ITC5		Extranet
IT Usage – Logistics (ITL)		
EIF_ITL1	Extent of usage of the following IT applications / tools	Data Warehousing System (DW)
EIF_ITL2		Customer Relationship Management System (CRM)
EIF_ITL3		Supplier Relationship Management System (SRM)
EIF_ITL4		Vendor Managed Inventory System (VMI)
EIF_ITL5		Transportation Management System (TMS)
EIF_ITL6		Forecasting System
EIF_ITL7		Inventory Management System
EIF_ITL8		Automatic Ordering System
EIF_ITL9		Resource Management System (ERP, MRP, MRPII)
Top Management Support (TMS)		
EIF_TMS1	Top management willingly assigns resources to Web-Based EC initiatives as they are needed	
EIF_TMS2	The need for long-term Web-Based EC support resources is recognized by top management	
EIF_TMS3	Top management is enthusiastic about the possibilities of Web-Based EC	
EIF_TMS4	Top management have invested the time needed to understand how Web-Based EC will benefit the firm	
EIF_TMS5	Top Management provides a work environment that is supportive of Web-Based EC	
EIF_TMS6	Top Management provides a clear vision for achieving excellence in Web-Based EC	
Training (TRA)		
EIF_TRA1	Specific user training needs have been identified early in the implementation	
EIF_TRA2	A formal training program has been developed to meet the requirements of Web-Based EC users	
EIF_TRA3	Training materials have been customized for each specific job	
EIF_TRA4	We seldom update training materials to reflect system changes	
EIF_TRA5	Training materials target the entire business task, not just the screens and reports	
EIF_TRA6	Employees are tracked to ensure that they have received the appropriate Web-Based EC system training	
EIF_TRA7	All users have been trained in basic Web-Based EC skills	
EIF_TRA8	Web-Based EC system training review sessions are scheduled	

Table 4.6.12. E-Infrastructure – Initial Large Scale Survey Items

Reliability Analysis. A reliability analysis was performed for the four

dimensions that form the E-Infrastructure (EIF) construct, and the results are listed in Table 4.6.13. Examination of the CITC scores and the importance of the items for the ITC dimension resulted in the elimination of this dimension. The reasoning followed that led to this decision is twofold: 1) two items (EIF_ITC1, and EIF_ITC2) had a CITC score below the 0.50 threshold and two items had a slightly higher score (EIF_ITC4 and EIF_ITC5), 2) the overall alpha score was very low and did not improve by removing further items. Thus the ITC dimension was dropped from further analysis.

A review of the CITC scores for the ITL dimension indicated that item EIF_ITL4 had a score below the suggested 0.50 limit. Additionally, if removed, the overall alpha score would slightly improve. Therefore, it was decided to remove this dimension from further analysis. The final alpha score for this dimension is 0.87, considered to be adequate for this study.

The six items for the TMS dimension had excellent CITC scores, with 0.86 being lowest and 0.92 the highest. The overall alpha score for this dimension is considered to be excellent at 0.96. Thus, all items for this dimension were retained in further analysis.

The final dimension of the EIF construct, TRA, consisted of 8 items. Analyzing the CITC scores of these items revealed that item EIF_TRA4 had a low CITC score and by removing it, the overall alpha score greatly improved, and so, this item was removed from further analysis. The overall internal consistency (alpha score) is considered to be quite good at 0.93.

Items	Initial CITC	Initial α if deleted	Final CITC	Final α if deleted	α	Factor Loading	KMO
IT Use – Communications (ITC)							
EIF_ITC1	0.47	0.64	Items Dropped after purification				
EIF_ITC3	0.44	0.64					
EIF_ITC4	0.50	0.62					
EIF_ITC5	0.51	0.61					
IT Use – Logistics (ITL)							
EIF_ITL1	0.57	0.86	0.58	0.86	0.87	0.68	0.85
EIF_ITL2	0.67	0.86	0.68	0.85		0.77	
EIF_ITL3	0.71	0.85	0.70	0.85		0.79	
EIF_ITL5	0.64	0.86	0.61	0.86		0.71	
EIF_ITL6	0.65	0.86	0.65	0.85		0.75	
EIF_ITL7	0.64	0.86	0.66	0.85		0.75	
EIF_ITL8	0.59	0.86	0.59	0.86		0.69	
EIF_ITL9	0.55	0.87	0.57	0.86		0.67	
EIF_ITL4	0.49	0.87	Item Dropped after purification				
Top Management Support (TMS)							
EIF_TMS1	0.86	0.95			0.96	0.90	0.93
EIF_TMS2	0.86	0.95				0.90	
EIF_TMS3	0.86	0.95				0.90	
EIF_TMS4	0.92	0.95				0.94	
EIF_TMS5	0.91	0.95				0.94	
EIF_TMS6	0.86	0.96				0.90	
Training (TRA)							
EIF_TRA1	0.80	0.85	0.81	0.92	0.93	0.86	0.91
EIF_TRA2	0.78	0.85	0.79	0.92		0.86	
EIF_TRA3	0.84	0.84	0.84	0.91		0.89	
EIF_TRA5	0.64	0.86	0.68	0.93		0.76	
EIF_TRA6	0.71	0.86	0.72	0.92		0.79	
EIF_TRA7	0.78	0.85	0.80	0.92		0.86	
EIF_TRA8	0.77	0.85	0.78	0.92		0.84	
EIF_TRA4	-0.09	0.93	Item dropped after purification				

Table 4.6.13. E-Infrastructure – Large Scale Reliability Analysis and Dimension Level Factor Analysis Results

Dimension Level Factor Analysis. Dimension level factor analysis was performed to each of the dimensions of the EIF construct. For the IT Use – Logistics dimension, the remaining 8 items were submitted to a factor analysis

and a single factor solution emerged with factor loadings above 0.66. Sampling adequacy (KMO) is very good at 0.85. The six items of TMS were submitted to a dimension level factor analysis and a clear one factor solution emerged. All items had factor loadings above 0.90 and sampling adequacy (KMO) is excellent at 0.93. The six remaining items that comprised the TRA dimension provided a clear one factor solution. All factor loadings were greater than 0.75 and the KMO score was 0.91, indicating an excellent sampling adequacy. The results of the dimension level factor analysis are presented in Table 4.6.13.

Construct Level Exploratory Factor Analysis. To further validate the convergent validity of the dimensions in the E-Infrastructure (EIF) construct, dimension level factor analyses were conducted for each of the three remaining dimensions and the results are shown in Table 4.6.13. Clear factor solutions emerged for the Top Management Support (TMS), Training (TRA), and IT Usage – Logistics (ITL), which was renamed to IT Usage (ITU) because of the purification phase explained earlier. No cross-loadings were observed, and all factor loadings have a value of 0.60 or greater. The variance explained by the three factors accounts for 68% of the total variance and the KMO measure of 0.93 indicates an excellent sample adequacy. The reliability was also very high, with a Cronbach alpha score of 0.93. Therefore, the three dimensions of E-Infrastructure are comprised of 21 items. The final list of items is presented in Table 4.6.15.

Item	F1: TMS	F2: TRA	F3: ITU
EIF_TMS2	0.87		
EIF_TMS4	0.87		
EIF_TMS5	0.87		
EIF_TMS1	0.84		
EIF_TMS3	0.83		
EIF_TMS6	0.79		
EIF_TRA3		0.81	
EIF_TRA8		0.79	
EIF_TRA7		0.78	
EIF_TRA1		0.75	
EIF_TRA2		0.74	
EIF_TRA6		0.73	
EIF_TRA5		0.65	
EIF_ITL7			0.77
EIF_ITL6			0.76
EIF_ITL3			0.71
EIF_ITL9			0.69
EIF_ITL2			0.69
EIF_ITL8			0.67
EIF_ITL5			0.61
EIF_ITL1			0.60
Eigen Value	10.06	2.65	1.60
% Variance Explained	47.91	12.64	7.63
Cumulative % of Variance	47.91	60.56	68.18
Kaiser Mayer Orkin (KMO) Measure of sampling adequacy = 0.93			
Cronbach Alpha (α) = 0.94			

Table 4.6.14. E-Infrastructure – Construct Level Factor Analysis Results

Item Code	Survey Item	
IT Usage (ITU)		
EIF_ITL1	Extent of usage of the following IT applications / tools	Data Warehousing System (DW)
EIF_ITL2		Customer Relationship Management System (CRM)
EIF_ITL3		Supplier Relationship Management System (SRM)
EIF_ITL5		Transportation Management System (TMS)
EIF_ITL6		Forecasting System
EIF_ITL7		Inventory Management System
EIF_ITL8		Automatic Ordering System
EIF_ITL9		Resource Management System (ERP, MRP, MRPII)
Top Management Support (TMS)		
EIF_TMS1	Top management willingly assigns resources to Web-Based EC initiatives as they are needed	
EIF_TMS2	The need for long-term Web-Based EC support resources is recognized by top management	
EIF_TMS3	Top management is enthusiastic about the possibilities of Web-Based EC	
EIF_TMS4	Top management have invested the time needed to understand how Web-Based EC will benefit the firm	
EIF_TMS5	Top Management provides a work environment that is supportive of Web-Based EC	
EIF_TMS6	Top Management provides a clear vision for achieving excellence in Web-Based EC	
Training (TRA)		
EIF_TRA1	Specific user training needs have been identified early in the implementation	
EIF_TRA2	A formal training program has been developed to meet the requirements of Web-Based EC users	
EIF_TRA3	Training materials have been customized for each specific job	
EIF_TRA5	Training materials target the entire business task, not just the screens and reports	
EIF_TRA6	Employees are tracked to ensure that they have received the appropriate Web-Based EC system training	
EIF_TRA7	All users have been trained in basic Web-Based EC skills	
EIF_TRA8	Web-Based EC system training review sessions are scheduled	

Table 4.6.15. E-Infrastructure – Final Large Scale Survey Items

4.6.5 Strategic Flexibility

The Strategic Flexibility (STF) construct is comprised of a single dimension and 7 items, listed in Table 4.6.16.

Item Code	Survey Item
STF_1	Our strategy can be continuously renewed to meet changing customers needs
STF_2	Our strategy emphasizes exploiting opportunities arising due to variability in the environment.
STF_3	Our strategy reflects high level of flexibility in managing risks.
STF_4	We can take actions quickly based on all the information continuously collected along the supply chain
STF_5	We can quickly develop strategies based on the coordination and integration of information along the value chain
STF_6	When an unexpected situation arises, our strategy allows us to quickly adapt to the new situation
STF_7	Our strategy allows us to react efficiently to new product or service launches by competitors.

Table 4.6.16. Strategic Flexibility – Initial Large Scale Survey Items

Reliability Analysis. The CITC scores and the overall alpha score were calculated to assess the reliability of this construct, and the results are shown in Table 4.6.17. Overall, the CITC scores are all above 0.78 and the Cronbach alpha score of 0.95 shows high reliability of the measures.

Items	Initial CITC	Initial α if deleted	Final CITC	Final α if deleted	α
STF_1	0.78	0.94			0.95
STF_2	0.78	0.94			
STF_3	0.84	0.94			
STF_4	0.85	0.94			
STF_5	0.83	0.94			
STF_6	0.87	0.94			
STF_7	0.82	0.94			

Table 4.6.17. Strategic Flexibility – Large Scale Reliability Analysis Results

Construct Level Exploratory Factor Analysis. A construct level factor analysis was done for the Strategic Flexibility construct and the results are presented in Table 4.6.18. As the results indicate, one factor solution emerged, and all the factor loadings were 0.84 or higher. Furthermore, the one factor solution accounted for over 76% of the total variance. Overall, sampling adequacy score

(KMO) of 0.90 is excellent, and the overall reliability of the items is 0.95. Therefore, the STF construct indicates a high level of reliability, sampling adequacy, and convergent discriminant validity. Because no items were removed in the large scale purification phase, all the items presented in Table 4.6.16 are carried forward into the next stage of the study.

Item	F1: STF
STF_6	0.91
STF_4	0.89
STF_3	0.89
STF_5	0.87
STF_7	0.87
STF_1	0.84
STF_2	0.84
Eigen Value	5.34
% Variance Explained	76.35
Cumulative % of Variance	76.35
Kaiser Mayer Orkin (KMO) Measure of sampling adequacy = 0.90	
Cronbach Alpha (α) = 0.95	

Table 4.6.18. Strategic Flexibility – Construct Level Factor Analysis Results

4.6.6 Supply Chain Integration

The Supply Chain Integration (SCI) construct was initially represented by 3 dimensions and 14 items. The Internal Integration (INT – 4 items), Supplier Integration (SUP), and Customer Integration (CUS) dimensions along with their respective items are listed in Table 4.6.19.

Item Code	Survey Item
Internal Integration (INT)	
SCI_INT1	Data integration among internal functions through information networks
SCI_INT2	Data integration in production process
SCI_INT3	The utilization of periodic interdepartmental meetings among internal functions
SCI_INT4	Cross-functional teams for process design and improvement
Supplier Integration (SUP)	
SCI_SUP1	The level of strategic partnership with suppliers
SCI_SUP2	The participation level of suppliers in the design stage
SCI_SUP3	The participation level of suppliers in the process of procurement and production
SCI_SUP4	Stable procurement through networks
SCI_SUP5	Upstream processes and systems automatically reflect order changes
Customer Integration (CUS)	
SCI_CUS1	Follow-up with customers for feedback
SCI_CUS2	The level of sharing on market information
SCI_CUS3	The agility level of the ordering process
SCI_CUS4	The level of communication with customers
SCI_CUS5	Downstream processes and systems automatically reflect order changes

Table 4.6.19. Supply Chain Integration – Initial Large Scale Survey Items

Reliability Analysis. An initial reliability assessment of the dimensions of SCI was conducted. Inspection of the CITC scores indicated that all the items have values above the 0.5 threshold. Additionally, inspection of the "alpha if deleted" showed that no improvements were gained if any of the items was to be removed. Therefore, all items were retained in this stage. The final Cronbach alpha scores are 0.86 for INT, 0.88 SUP, and 0.89 for CUS. Table 4.6.20 shows the results of the reliability analysis.

Dimension Level Factor Analysis. To further validate the convergent validity of each dimension of the Supply Chain Integration (SCI) construct, dimension level factor analysis were performed to each of the three dimensions in SCI (see Table

4.6.20). A single factor emerged for all dimension with factor loadings all above 0.70 and most over 0.80. KMO scores of sampling adequacy were 0.76 for INT, 0.84 for SUP, and 0.89 for CUS.

Items	Initial CITC	Initial α if deleted	Final CITC	Final α if deleted	α	Factor Loading	KMO
Internal Integration (INT)							
SCI_INT1	0.71	0.83			0.86	0.84	0.76
SCI_INT2	0.72	0.82				0.85	
SCI_INT3	0.70	0.83				0.84	
SCI_INT4	0.71	0.82				0.84	
Supplier Integration (SUP)							
SCI_SUP1	0.75	0.85			0.88	0.85	0.84
SCI_SUP2	0.61	0.88				0.75	
SCI_SUP3	0.80	0.84				0.88	
SCI_SUP4	0.77	0.85				0.86	
SCI_SUP5	0.68	0.87				0.80	
Customer Integration (CUS)							
SCI_CUS1	0.75	0.85			0.89	0.85	0.87
SCI_CUS2	0.72	0.86				0.83	
SCI_CUS3	0.72	0.86				0.83	
SCI_CUS4	0.77	0.85				0.86	
SCI_CUS5	0.68	0.87				0.79	

Table 4.6.20. Supply Chain Integration – Large Scale Reliability Analysis and Dimension Level Factor Analysis Results

Construct Level Exploratory Factor Analysis. To further ensure the convergent validity of the SCI dimensions, the 14 items were submitted to a construct level factor analysis. As indicated by Table 4.6.21, a clear three factor solution emerged all with factor loadings greater than 0.60 and no cross loadings, indicating no revision of the items was required. The KMO measure (0.91) indicates an excellent sampling adequacy, the variance accounted slightly over 70% and the overall Cronbach alpha score is 0.93. Because no items were removed in this phase of the analysis, the items listed in Table 4.6.19 were

retained in further analysis.

Item	F1: SUP	F2: CUS	F3: INT
SCI_SUP3	0.86		
SCI_SUP4	0.80		
SCI_SUP1	0.77		
SCI_SUP2	0.72		
SCI_SUP5	0.64		
SCI_CUS4		0.85	
SCI_CUS1		0.82	
SCI_CUS2		0.76	
SCI_CUS3		0.75	
SCI_CUS5		0.68	
SCI_INT1			0.83
SCI_INT2			0.80
SCI_INT3			0.68
SCI_INT4			0.67
Eigen Value	7.12	1.65	1.07
% Variance Explained	50.85	11.79	7.68
Cumulative % of Variance	50.85	62.64	70.32
Kaiser Mayer Orkin (KMO) Measure of sampling adequacy =0.91			
Cronbach Alpha (α) = 0.93			

Table 4.6.21. Supply Chain Integration – Construct Level Factor Analysis Results

4.6.7 Web-Based EC Usage

The Web-Based EC Usage (WEC) construct initially consisted of two dimensions and 10 items, named Strategic Use (STR – 5 items), and Transactional Use (TRS – 5 items). Table 4.6.22 shows the initial items for each dimension along with their respective codes.

Reliability Analysis. To test internal consistency of the items that made up the WEC construct, a reliability analysis was conducted, and the results are presented in Table 4.6.23. All CITC scores were above the 0.50 threshold, and the overall reliability of the items that composed each of the dimensions was 0.86 and 0.88 for STR and TRS respectively. None of the items would improve the

overall alpha score if deleted; therefore all items remained into the next phase.

Item Code	Survey Item	
Strategic Use (STR)		
WEC_STR1	Extent of Web-Based EC Use in the process of …	Information Gathering/Market Research
WEC_STR2		Product Development
WEC_STR3		Demand management
WEC_STR4		Sales Support
WEC_STR5		After-Sales Service and Support
Transactional Use (TRS)		
WEC_TRA1	Extent of Web-Based EC Use in the process of …	Supplier selection (getting quotes, bids, etc.)
WEC_TRA2		Purchase-order processing
WEC_TRA3		Procurement from suppliers (warehouse, logistics, etc.)
WEC_TRA4		Fulfillment to customers (distribution, logistics, etc).
WEC_TRA5		Invoicing and payment processing

Table 4.6.22. Web-Based EC Usage – Initial Large Scale Survey Items

Dimension Level Factor Analysis. Dimension level factor analysis was conducted for each dimension of the WEC construct, namely STR and TRS (see Table 4.6.23). For both dimensions, clear one single factor solutions emerged, with none of the factor loadings lower than 0.68. The sampling adequacy was adequate for both dimensions; 0.79 for STR and 0.81 for TRS.

Construct Level Exploratory Factor Analysis. For discriminant validity, the WEC items were submitted to a construct level exploratory factor analysis. Two clear factors emerged with all factor loadings close or above to 0.60. One item, WEC_STR3, had cross loading into both factors, thus it was removed from the analysis (see Table 4.6.24). Because of the removal of this item, a new construct level factor analysis was conducted. This is an important step since factor loadings may change with the removal of one or more items (Hair, Anderson et al., 1995).

Items	Initial CITC	Initial α if deleted	Final CITC	Final α if deleted	α	Factor Loading	KMO
Strategic Use (STR)							
WEC_STR1	0.55	0.87			0.86	0.69	0.79
WEC_STR2	0.66	0.84				0.78	
WEC_STR3	0.66	0.84				0.79	
WEC_STR4	0.75	0.82				0.86	
WEC_STR5	0.81	0.80				0.90	
Transactional Use (TRS)							
WEC_TRA1	0.62	0.87			0.88	0.75	0.81
WEC_TRA2	0.77	0.84				0.87	
WEC_TRA3	0.79	0.83				0.88	
WEC_TRA4	0.73	0.85				0.83	
WEC_TRA5	0.64	0.87				0.77	

Table 4.6.23. Web-Based EC Use – Large Scale Reliability Analysis and Dimension Level Factor Analysis Results

Item	F1: TRS	F2: STR
WEC_TRA2	0.91	
WEC_TRA3	0.90	
WEC_TRA4	0.69	
WEC_TRA5	0.66	
WEC_TRA1	0.62	
WEC_STR5		0.81
WEC_STR2		0.80
WEC_STR4		0.78
WEC_STR1		0.72
WEC_STR3	0.54	0.60
Eigen Value	5.56	1.27
% Variance Explained	55.61	12.69
Cumulative % of Variance	55.61	68.30
Kaiser Mayer Orkin (KMO) Measure of sampling adequacy =0.87		
Cronbach Alpha (α) = 0.91		

Table 4.6.24. Web-Based EC Use – Construct Level Factor Analysis Results (1)

As indicated by Table 4.6.25, two clear factors emerged with factor loadings 0.63 or greater. No cross loadings were found, and the total variance explained by the two factor solution was close to 70%. The sampling adequacy (KMO) was very good at 0.85 and the overall alpha coefficient of 0.90 showed high reliability.

The final items for the construct organized by dimension are listed in Table 4.6.26.

Item	F1: TRS	F2: STR
WEC_TRA2	0.91	
WEC_TRA3	0.90	
WEC_TRA4	0.69	
WEC_TRA5	0.66	
WEC_TRA1	0.63	
WEC_STR2		0.81
WEC_STR5		0.79
WEC_STR4		0.76
WEC_STR1		0.75
Eigen Value	4.96	1.27
% Variance Explained	55.13	14.07
Cumulative % of Variance	55.13	69.20
Kaiser Mayer Orkin (KMO) Measure of sampling adequacy = 0.85		
Cronbach Alpha (α) = 0.90		

Table 4.6.25. Web-Based EC Use – Construct Level Factor Analysis Results (2)

Item Code	Survey Item	
Strategic Use (STR)		
WEC_STR1	Extent of Web-Based EC Use in the process of …	Information Gathering/Market Research
WEC_STR2		Product Development
WEC_STR4		Sales Support
WEC_STR5		After-Sales Service and Support
Transactional Use (TRS)		
WEC_TRA1	Extent of Web-Based EC Use in the process of …	Supplier selection (getting quotes, bids, etc.)
WEC_TRA2		Purchase-order processing
WEC_TRA3		Procurement from suppliers (warehouse, logistics, etc.)
WEC_TRA4		Fulfillment to customers (distribution, logistics, etc).
WEC_TRA5		Invoicing and payment processing

Table 4.6.26. Web-Based EC Usage – Final Large Scale Survey Items

4.6.8 Organizational Benefits

Organizational Benefits (OBE) was initially represented by four dimensions and 27 items. The following dimensions were included in the OBE construct:

Information Quality (INQ – 8 items), Communications Efficiency (COE – 5 items), Business Efficiency (BUE – 8 items), and Competitive Advantage (COA – 6 items). The initial items and their codes are presented in Table 4.6.27.

Item Code	Survey Item
Information Quality (INQ)	
OBE_INQ1	Improve management of information for strategic planning
OBE_INQ2	Improve accuracy or reliability of information
OBE_INQ3	Improve information for operational control
OBE_INQ4	Improve timeliness of information
OBE_INQ5	Improve completeness of information
OBE_INQ6	Improve the retrieval or delivery of information or reports
OBE_INQ7	Improve the access to information
OBE_INQ8	Increase the flexibility of information requests
Communications Efficiency (COE)	
OBE_COE1	Save money by reducing communication costs
OBE_COE2	Save money by reducing search costs
OBE_COE3	Improve the search of information about product availability
OBE_COE4	Improve communication with suppliers
OBE_COE5	Improve communication with customers
Business Efficiency (BUE)	
OBE_BUE1	Save money by reducing operation costs
OBE_BUE2	Speed up transactions or shorten product cycles
OBE_BUE3	Reduce inventory levels
OBE_BUE4	Improve return on assets and sales
OBE_BUE5	Increase product sales
OBE_BUE6	Reach a larger number of suppliers and customers
OBE_BUE7	Increase transparency of business processes
OBE_BUE8	Improve logistics management
Competitive Advantage (COA)	
OBE_COA1	Enhance competitiveness or create strategic advantage
OBE_COA2	Catch up with competitors
OBE_COA3	Help establish useful linkages with other firms
OBE_COA4	Improve relationships with suppliers and customers
OBE_COA5	Provide better products or services to customers
OBE_COA6	Improve the overall coordination of the supply chain

Table 4.6.27. Organizational Benefits – Initial Large Scale Survey Items

Reliability Analysis. Each of the four dimensions of the OBE construct was submitted to a reliability analysis. Examination of the CITC and “alpha if deleted”

scores resulted in no elimination of items. Most of the CITC scores were 0.7 or above, and the alpha scores were 0.96 , 0.90, 0.94, and 0.92 for the dimensions INQ, COE, BUE, and COA respectively; thus indicating high internal consistency among the items for each dimension. Table 4.6.28 presents the reliability analysis results.

Dimension Level Factor Analysis. To further validate the unidimensionality of each dimension in the OBE construct, dimension level factor analyses were performed. A single factor emerged for all dimensions (INQ, COE, BUE, and COA) all with factor loadings 0.75 or above. KMO scores ranged from 0.83 to 0.93 indicating a very good to excellent sampling adequacy. Additionally alpha scores varied from 0.83 to 0.93. The dimension level factor analysis results are presented in Table 4.6.28.

Construct Level Exploratory Factor Analysis. To further confirm the convergent validity of the dimensions of the OBE construct, all 27 items were submitted to a construct level factor analysis. Unexpectedly, a three factor solution emerged, as opposed to four factors initially hypothesized. Furthermore, several items had cross loadings on dimensions that were not theoretically feasible. Since more than one item had to be removed, a step wise approach was used to eliminate the “bad” items, which means a new factor analysis was computed every time an item was removed (Note: for sake of simplicity only the first and last factor analysis results are presented). Following this approach items OBE_BUE7, OBE_BUE5, OBE_BUE6, and OBE_COE5 were eliminated due to cross loading or poor factor loadings. The initial construct level factor

analysis results are shown in Table 4.6.29.

Items	Initial CITC	Initial α if deleted	Final CITC	Final α if deleted	α	Factor Loading	KMO
Information Quality (INQ)							
OBE_INQ1	0.77	0.96			0.96	0.82	0.93
OBE_INQ2	0.85	0.95				0.89	
OBE_INQ3	0.86	0.95				0.89	
OBE_INQ4	0.87	0.95				0.90	
OBE_INQ5	0.85	0.95				0.89	
OBE_INQ6	0.87	0.95				0.91	
OBE_INQ7	0.86	0.95				0.90	
OBE_INQ8	0.78	0.95				0.83	
Communications Efficiency (COE)							
OBE_COE1	0.77	0.87			0.90	0.86	0.83
OBE_COE2	0.78	0.86				0.87	
OBE_COE3	0.76	0.87				0.86	
OBE_COE4	0.76	0.87				0.85	
OBE_COE5	0.65	0.89				0.77	
Business Efficiency (BUE)							
OBE_BUE1	0.82	0.92			0.94	0.87	0.92
OBE_BUE2	0.76	0.93				0.82	
OBE_BUE3	0.75	0.93				0.81	
OBE_BUE4	0.82	0.92				0.87	
OBE_BUE5	0.73	0.93				0.79	
OBE_BUE6	0.71	0.93				0.78	
OBE_BUE7	0.81	0.92				0.86	
OBE_BUE8	0.78	0.93				0.83	
Competitive Advantage (COA)							
OBE_COA1	0.83	0.90			0.92	0.88	0.89
OBE_COA2	0.66	0.93				0.75	
OBE_COA3	0.79	0.91				0.86	
OBE_COA4	0.86	0.90				0.91	
OBE_COA5	0.78	0.91				0.85	
OBE_COA6	0.79	0.91				0.86	

Table 4.6.28. Organizational Benefits – Large Scale Reliability Analysis and Dimension Level Factor Analysis Results

Item	F1: INQ	F2: BUE	F3: COA
OBE_INQ6	0.84		
OBE_INQ7	0.81		
OBE_INQ3	0.78		
OBE_INQ4	0.78		
OBE_INQ5	0.75		
OBE_INQ2	0.74		
OBE_INQ8	0.68		
OBE_INQ1	0.65		
OBE_COE1		0.74	
OBE_COE3		0.69	
OBE_COE2		0.67	
OBE_BUE1		0.66	
OBE_BUE4		0.65	
OBE_BUE3		0.65	
OBE_COE4		0.63	
OBE_BUE2		0.63	
OBE_BUE8		0.62	
OBE_BUE7		0.56	0.50
OBE_COA5			0.75
OBE_COA2			0.74
OBE_COA1			0.72
OBE_COA4			0.68
OBE_COA3			0.65
OBE_BUE5		0.52	0.63
OBE_COA6			0.58
OBE_BUE6		0.52	0.53
OBE_COE5			
Eigen Value	16.42	1.60	1.03
% Variance Explained	60.82	5.92	3.80
Cumulative % of Variance	60.82	66.74	70.54
Kaiser Mayer Orkin (KMO) Measure of sampling adequacy = 0.96			
Cronbach Alpha (α) = 0.98			

Table 4.6.29. Organizational Benefits – Construct Level Factor Analysis Results (1)

After the elimination of the items, a final construct level factor analysis revealed three factors. Because most of the COE items were removed, and those that remained pertain to “cost savings” it was decided to name the factor as Business Efficiency (BUE). As indicated by Table 4.6.30, the remaining items had factor loadings above 0.60, and the variance explained by the three factor solution

accounts for almost 73% of the total variance. Furthermore, the KMO score is excellent at 0.96 as well as Cronbach alpha score of 0.97. For details about the items remaining after the purification phase, please see Table 4.6.31.

Item	F1: INQ	F2: BUE	F3: COA
OBE_INQ6	0.83		
OBE_INQ7	0.80		
OBE_INQ4	0.78		
OBE_INQ3	0.78		
OBE_INQ5	0.77		
OBE_INQ2	0.73		
OBE_INQ8	0.67		
OBE_INQ1	0.61		
OBE_COE1		0.77	
OBE_COE2		0.71	
OBE_COE3		0.70	
OBE_BUE1		0.67	
OBE_BUE4		0.66	
OBE_BUE3		0.65	
OBE_COE4		0.65	
OBE_BUE2		0.63	
OBE_BUE8		0.62	
OBE_COA2			0.75
OBE_COA5			0.74
OBE_COA1			0.74
OBE_COA4			0.70
OBE_COA3			0.68
OBE_COA6			0.62
Eigen Value	14.36	1.38	1.02
% Variance Explained	62.44	5.99	4.45
Cumulative % of Variance	62.44	68.43	72.88
Kaiser Mayer Orkin (KMO) Measure of sampling adequacy = 0.96			
Cronbach Alpha (α) = 0.97			

Table 4.6.30. Organizational Benefits – Construct Level Factor Analysis Results (2)

Item Code	Survey Item
Information Quality (INQ)	
OBE_INQ1	Improve management of information for strategic planning
OBE_INQ2	Improve accuracy or reliability of information
OBE_INQ3	Improve information for operational control
OBE_INQ4	Improve timeliness of information
OBE_INQ5	Improve completeness of information
OBE_INQ6	Improve the retrieval or delivery of information or reports
OBE_INQ7	Improve the access to information
OBE_INQ8	Increase the flexibility of information requests
Business Efficiency (BUE)	
OBE_COE1	Save money by reducing communication costs
OBE_COE2	Save money by reducing search costs
OBE_COE3	Improve the search of information about product availability
OBE_BUE1	Save money by reducing operation costs
OBE_BUE2	Speed up transactions or shorten product cycles
OBE_BUE3	Reduce inventory levels
OBE_BUE4	Improve return on assets and sales
OBE_BUE6	Reach a larger number of suppliers and customers
OBE_BUE8	Improve logistics management
Competitive Advantage (COA)	
OBE_COA1	Enhance competitiveness or create strategic advantage
OBE_COA2	Catch up with competitors
OBE_COA3	Help establish useful linkages with other firms
OBE_COA4	Improve relationships with suppliers and customers
OBE_COA5	Provide better products or services to customers
OBE_COA6	Improve the overall coordination of the supply chain

Table 4.6.31. Organizational Benefits – Final Large Scale Survey Items

4.7. Chapter Summary

Chapter 4 presented a rigorous empirical scrutiny of all the constructs considered in this research. From the 115 items that were considered in this chapter, 99 of them are kept into further analysis. Similarly, the original 16 dimensions were reduced to 14 after the large scale purification. Table 4.7.1 presents a summary of the results. As indicated by this table, all constructs have alpha scores 0.91 or above and KMO scores of 0.82 and above, indicating the high reliability and

sampling adequacy of the constructs. Similar results are obtained at the dimension level, where all dimensions have alpha scores of 0.84 or better and KMO values of 0.75 and above. The final dimensions shown in Table 4.7.1 will be used in further sections for testing the hypotheses.

In order to do a preliminary assessment of the hypotheses proposed in Chapter 2 the Pearson correlation coefficients of the hypothesized relationships were computed using the statistical average of all the items in the construct as a composite measure. The results, presented in Table 4.7.2, indicate that 5 of the 7 correlations are statistically significant at the 0.01 level. In Chapter 5 , these relationships are further tested.

Construct Level Results	Dimension Level Results				
	Final Dimension	**# of items**	**Initial Dimension**	**α**	**KMO**
Trading Partner Trust (TPT) KMO = 0.88 α = 0.94	Competence (COMP)	3	Competence (COMP)	0.90	0.75
	Benevolence (BENE)	6	Benevolence (BENE)	0.91	0.87
	Integrity (INTE)	6	Integrity (INTE)	0.92	0.88
Technology Trust (TTM) KMO = 0.85 α = 0.91		5		0.91	0.85
Trading Partner Power (TPP) KMO = 0.82 α = 0.90		5		0.90	0.82
E-Infrastructure (EIF) KMO = 0.93 α = 0.94	Top Management Support (TMS)	6	Top Management Support (TMS)	0.96	0.93
	Training (TRA)	7	Training (TRA)	0.93	0.91
	IT Use (ITU)	8	IT Use – Communications (COM)	0.87	0.85
			IT Use – Logistics (LOG)		
Strategic Flexibility (STF) KMO = 0.90 α = 0.95		7		0.95	0.90
Supply Chain Integration (SCI) KMO = 0.91 α = 0.93	Supplier Integration (SUP)	5	Supplier Integration (SUP)	0.88	0.84
	Customer Integration (CUS)	5	Customer Integration (CUS)	0.89	0.87
	Internal Integration (INT)	4	Internal Integration (INT)	0.86	0.76
Web-Based EC Use (WEC) KMO = 0.87 α = 0.91	Transactional (TRS)	5	Transactional (TRS)	0.88	0.81
	Strategic (STR)	4	Strategic (STR)	0.84	0.79
Organizational Benefits (OBE) KMO = 0.96 α = 0.97	Information Quality (INQ)	8	Information Quality (INQ)	0.96	0.96
	Business Efficiency (BUE)	9	Business Efficiency (BUE)	0.94	0.92
			Communications Efficiency (COE)		
	Competitive Advantage (COA)	6	Competitive Advantage (COA)	0.92	0.89

Table 4.7.1. Summary – Large Scale Analysis Results

Hypothesis	Independent Variable	Dependent Variable	Pearson Correlation (p-value)
H1a	Trading Partner Trust (TPT)	Organizational Benefits (OBE)	0.233** (0.001)
H1b	Technology Trust Mechanisms (TTM)	Organizational Benefits (OBE)	0.132* (0.038)
H1c	Trading Partner Power (TPP)	Organizational Benefits (OBE)	0.118 (0.057)
H1d	E-Infrastructure (EIF)	Organizational Benefits (OBE)	0.669** (0.000)
H1e	Strategic Flexibility (STF)	Organizational Benefits (OBE)	0.581** (0.000)
H1f	Supply Chain Integration (SCI)	Organizational Benefits (OBE)	0.640** (0.000)
H2	Web-Based EC Use (WEC)	Organizational Benefits (OBE)	0.704** (0.000)

**: p< 0.01; *: p< 0.05

Table 4.7.2. Construct Level Correlation Analysis Results

Chapter 5

Hypotheses Testing

Chapter 4 described the steps undertaken and the results obtained during the large scale administration and instrument validation phase. Additionally, bivariate correlations were computed and most of them turned out to be statistically significant (see Table 4.7.2). However, these results might be misleading because in a multivariate model some of these relationships might not be actually true. Thus, this chapter focuses on testing the hypotheses using a more rigorous methodology, namely using a hierarchical regression model.

5.1. Multiple Hierarchical Regression Analysis

Multiple regression analysis is one of the most widely used of all statistical methods (Neter, Kutner et al., 1996). It is a highly general and therefore flexible data system that can be used when a quantitative variable (dependent variable) needs to be analyzed as a function of, or in relationship to, other factor(s) of interest (expressed as independent variables) (Cohen and Cohen, 1983). A first order multiple regression model for n predictor variables can be represented as:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n + \varepsilon$, where

Figure 5.1.1. Multiple Regression model general form

- Y is the dependent variable.
- X_i is a predictor variables (i=1 to n).
- β_0 is the Y intercept of the regression plane.
- β_i is the regression coefficient, indicating the change in the mean response Y per unit increase in X_i, holding the remaining predictor variables constant (i=1 to n)
- ε indicates the random error term

Additionally, cross-product terms can be considered as additional independent variables to allow the exploration of interaction effects, also known as moderating effects. The interaction effects can be accounted for by multiplying the predictor variables, thus Figure 5.1.1 now becomes,

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n + \beta_{n+1} X_1 X_2 + ... + \beta_{2n} X_{n-1} X_n + \varepsilon$, where

Figure 5.1.2. Multiple Regression model considering interaction effects

the interaction effects are represented by the product (X_{n-1}*X_n).

A multiple regression analysis can be done using a hierarchical approach (Cohen and Cohen, 1983), similar in nature to the widely known stepwise approach. In the stepwise approach, each variable is considered for inclusion prior to developing the equation, and the independent variable with the greatest explanatory power is added first; subsequent variables are added based on the incremental contribution. In the hierarchical method, however, the difference is

that the researcher, not the computer, determines the order of entry of the variables. In order to represent a hierarchical regression model, Figure 5.1.2 can be modified as follows:

$$Y = \beta_0 + \underbrace{\beta_1 X_1 + \beta_2 X_2}_{block\,1} + \ldots + \underbrace{\beta_n X_n}_{block\,2} + \underbrace{\beta_{n+1} X_1 X_2}_{block\,3} + \ldots + \underbrace{\beta_{2n} X_{n-1} X_n}_{blockM} + \varepsilon \text{ , where}$$

Figure 5.1.3. Multiple Hierarchical Regression model

block 1 to M represent the logical groupings in which the independent variables are entered into the regression model.

There are several reasons for the selection of a hierarchical method to test the hypotheses. First, it allows researchers to establish the percentage of variance explained by each independent variable separately (Cagliano, Caniato et al., 2006), providing more accurate significance tests compared with the stepwise inclusion procedure (Lai and Mahapatra, 2004). Second, dividing up the variance using hierarchical regression is an adequate choice when correlations exist among independent variables. Third, such variance partitioning procedures have been commonly used to assess the incremental effects of interactions and to study moderation effects in business research (e.g., Tatikonda and Montoya-Weiss, 2001; Rosenzweig, Roth et al., 2003; Anand and Ward, 2004; Lai and Mahapatra, 2004; Zhu and Sarkis, 2004; Closs, Swink et al., 2005; Cagliano, Caniato et al., 2006; Thomson, 2006)

In general, variables are entered in an order determined by theory or other prior considerations (Lai and Mahapatra, 2004). As suggested by Nunnally and Bernstein (1994), based on the principle of parsimony, simple effects must be evaluated before more complex effects in determining the regression order.

As with traditional multiple regression models, the interpretation of a hierarchical regression model can be done with the coefficient of determination (R^2), the significance of the regression (F-ratio) and the significance of the correlation coefficient. R^2 measures the proportion of the variance of the dependent variable that is explained by the predictor variables, and varies between 0 and 1 (Hair, Anderson et al., 1995). If the model is valid, a high value of R^2 indicates that the model has a greater explanatory power. The significance of the regression (F-ratio) specifies the significance of the overall model; in other words; if the F-test turns to be significant, then the relationship between the dependent variable and the independent variables is linear. With regards to hierarchical regression models, additional measures help in the interpretation of these types of models. F ratios are used to determine the significance of each added variable (or set of variables) to the explanation reflected in R^2.

5.2. Proposed Multiple Hierarchical Regression Model

In order to test the hypotheses posited in Chapter 2 , a multiple hierarchical regression model was developed and represented as follows:

$$OBE = \beta_0 + \beta_1 TPT + \beta_2 TMM + \beta_3 TPP + \beta_4 EIF + \beta_5 STF + \beta_6 SCI + \beta_7 WEC + \sum_{i=8}^{14} \beta_i WECxIV_i$$

Figure 5.2.1. Proposed Multiple Hierarchical Regression model

where

- OBE: Dependent Variables
- TPT, TMM, TPP, EIF, STF, SCI, WEC: Independent Variables

- $\sum_{i=8}^{14} WECxIV_i$: interaction terms representing the moderating effects of WEC on each of the independent variables (TPT, TMM, TPP, EIF, STF, SCI, and WEC).
- β_0: is intercept of the regression plane.
- β_k: regression coefficient indicating the change in the mean response OBE per unit increase in each of the independent variables (TPT, TMM, TPP, EIF, STF, SCI), holding the remaining predictor variables constant, which can help to discuss hypotheses 1a – 1f (k = 1 to 6).
- β_7: regression coefficient indicating the change in the mean response OBE per unit increase in WEC, holding the remaining predictor variables constant that can help discuss hypothesis 2.
- β_i: regression coefficient specifying the change in the mean response OBE per unit increase in each of the interaction effects of WEC on each of the independent variables (TPT, TMM, TPP, EIF, STF, SCI), holding the remaining predictor variables constant. These coefficients are helpful in reviewing hypotheses 3a – 3f that detail the presence of moderating effects (i = 8 to 14).

The analysis is conducted in the following steps. First, the variables TPT, TMM, TPP, EIF, and STF are entered as a block into the regression (model 1). Second, SCI is entered into the model (model 2). Third, WEC is considered as a block and entered into the model (model 3). Finally, the interactions of WEC with all six predictor factors are entered in the model as a block (model 4). The

contribution of each block of variables is assessed both individually, signified by the values of the betas, and collectively, signified the significance of the F-statistic associated with the change in R^2 after the block was entered (Pedhazur and Schmelkin, 1991).

An important assumption of multiple regression analysis is that all the independent variables are "uncorrelated"; this is referred to as the assumption of conditional independence. When independent variables are correlated, it is said that there is multicollinearity. Multicollinearity can be a serious problem in regression analysis (Hair, Anderson et al., 1995), because it can lead to inflated standard errors and misinterpretation of the statistical significance of the regression results (Zhu and Sarkis, 2004). In order to mitigate potential multicollinearity problems, Aiken and West (1991) and Neter et al. (1996) suggest centering the variables (subtracting the means). Thus, deviation scores were computed for each of the independent variables (IVs), and these recoded IVs were also used to compute the multiplicative interaction terms. Previous studies have used similar transformation to minimize multicollinearity problems (Anand and Ward, 2004; Zhu and Sarkis, 2004).

5.3. Multiple Hierarchical Regression Results

The results of the multiple hierarchical regression model presented in the previous section are shown in Table 5.3.1. In this table, each block of variables entered in the regression model is labeled as "model 1", "model 2", "model 3", and "model 4". The contribution of each block of variables was assessed by determining the significance of the F-statistic associated with the change in R^2

after the block was entered. This is represented in the rows “Change in F-value” and “p-value (change)” in Table 5.3.1. Most of variance inflation factors (VIFs) in all the regressions were found to be acceptable at just over 1.0 and none of them exceeded 4.1 (Hair, Anderson et al., 1995), which gives confidence that multicollinearity is not an issue in this model.

The interpretation of the model is done by analyzing each of the models described in Table 5.3.1.

Model 1. In this model, the variables TPT, TMM, TPP, EIF, and STF are entered in the model as a single block, having OBE as dependent variable. The overall measures of the model (R^2 =0.52; F = 43.62; p = 0.00) indicate the adequacy of the model. This model also provides insights to hypotheses 1a – 1f, by exploring the beta coefficients for each of the predictor variables and its significance. After examining the beta coefficients, two of the predictor variables turned out to be significant, namely EIF (β=0.560; p<0.01) and Strategic Flexibility (β=0.257; p<0.01), providing strong support to hypothesis 1d and 1e.

Model 2. In this model, a new block consisting of SCI was entered into the regression model. The reason why SCI was entered as a separate block is because we wanted to evaluate the impact of SCI after the significance of the factors in the first block was assessed. The variables in the first block are considered to be pertaining more internal of the organization. To measure the significance of the added variable, we evaluated the change in R^2 and F – value (0.01 and 3.34 respectively) and the associated p-value of 0.07. These results provide a weak support to hypothesis 1f. Despite this, the overall explanatory

power of the model is stronger than model as the R^2 increased to 0.57.

Block	Independent Variable(s) (IVs)	DV: Organizational Benefits (OBE)			
		Model 1	**Model 2**	**Model 3**	**Model 4**
1	Trading Partner Trust (TPT)	0.032	0.018	0.002	-0.005
	Tech. Trust Mechanisms (TTM)	-0.011	-0.018	-0.035	0.026
	Trading Partner Power (TPP)	0.084	0.098*	0.076^{+}	0.090*
	E-Infrastructure (EIF)	0.548**	0.473**	0.302**	0.283**
	Strategic Flexibility (STF)	0.270**	0.205**	0.224**	0.208**
2	Supply Chain Integration (SCI)		0.159^{+}	0.033	0.048
3	Web-Based EC Use (WEC)			0.389**	0.377**
4	TPT x WEC				0.133**
	TTM x WEC				0.135*
	TPP x WEC				-0.024
	EIF x WEC				-0.068
	STF x WEC				0.113
	SCI x WEC				0.187^{+}
	R^2	0.56	0.57	0.63	0.65
	F – value	43.62	37.40	43.82	26.75
	d. f.	(5,174)	(6,173)	(7,172)	(13,166)
	p-value	0.00	0.00	0.00	0.00
	Change in R^2	–	0.01	0.08	0.04
	Change in F-value	–	3.34	36.43	3.09
	d.f.	–	(1,173)	(1,172)	(6,166)
	p-value (change)	–	0.07	0.00	0.01

* : $p < 0.05$; **: $p < 0.001$; +: $p < 0.1$

Table 5.3.1. Multiple Hierarchical Regression Results

To further evaluate the significance of SCI to the model, the beta coefficient of 0.188 is significant at the 0.1 reinforcing the partial support for hypothesis 1f. Interestingly, results indicate that after entering SCI in the model, the beta coefficient for TPP became significant at the 0.05 level. We will retake this finding later in the chapter.

Model 3. The next block entered in the regression model consisted of the WEC factor. One of the objectives of this research was to determine the variance explained by this factor, and thus, we entered it as a single block. The reasoning behind this is that we wanted to determine separately how important WEC is to the overall model. Results presented in Table 5.3.1 provide a strong support for

hypothesis 2 that posited a positive relationship between WEC and OBE. This is also evidenced by the change in R^2 and F (0.08 and 36.46 respectively) and by the significance of that change (p-value = 0.00). Additionally, the overall explanatory power of the model increased 8%. With respect to the beta coefficient of WEC, we found a moderate effect in terms of magnitude and significance (β=0.404; p<0.01).

Model 4. The final model presented in Table 5.3.1 accounted for the interaction effects of WEC on TPT, TMM, TPP, EIF, STF, and SCI, with OBE, as depicted in hypotheses 3a – 3f in Figure 2.2.1. Changes in the R^2 and F values (0.04 and 3.09 respectively) are significant (p=0.01) indicating the significance of the moderator effect of WEC. Furthermore, the explanatory power of the model also increased to 0.65. Evidence of the individual beta coefficients shows that the interaction accounts for a significant amount of the incremental variance in the independent variables TPT (β=0.229; p<0.01), TMM (β=0.186; p<0.05), and SCI (β=0.187; p<0.1), supporting the hypotheses of a moderating effect of WEC (hypotheses 3a, 3b, and 3f). However, the beta coefficients of the interaction effects of WEC on the factors TPP, EIF, and STF turned out to be not significant, indicating that hypotheses 3c, 3d, and 3e respectively were not supported at this time considering OBE as dependent variable.

5.4. Summary of the Hypotheses Testing Results

The previous section reported the results on the proposed research model and the implications to the hypotheses proposed in Chapter 2 . In summary, five hypotheses were fully supported (1d, 1e, 2, 3a, 3b), three partially supported (1c,

1f, 3f), and five were not supported (1a, 1b, 3c, 3d, 3e).

However, statistical significance is not the ultimate objective of academic research, but simply an alternative to acquire a better understanding better the subject under investigation. In fact, results and implications of this study can provide insights to academicians wishing to further explore the exciting topic of Web-Based EC use. Similarly, practitioners can also benefit from this study when considering the implications, the success factors, and the possible outcomes of Web-Based EC. In this section, the theoretical and practical implications of the test of each hypothesis are discussed in greater detail.

Hypothesis 1a. Trading Partner Trust positively influences the Organizational Benefits of a firm.

Results indicate that this hypothesis was not supported. Even though Trust has been reported to have an impact on transaction costs and promote an open and influential information exchange (Jarvenpaa, Knoll et al., 1998), the results in this study do not show a significant impact of Trading Partner Trust (TPT) on Organizational Benefits (OBE). A plausible explanation for this result is that in itself, TPT will not suffice to increase OBE, but rather act in combination with other factors. Additionally, it can be argued that TPT might influence increase transactions between trading partner, which in turn might have an impact on performance. As discussed in a later hypothesis, this is in fact a finding of this study.

Hypothesis 1b. Firms with high levels of Technology Trust Mechanisms will exhibit high levels of Organizational Benefits.

This hypothesis was not supported. Although previous research (Ratnasingam and Pavlou, 2003) indicated a significant relationship between Technology Trust Mechanisms (TTM) and Perceived Benefits, the results imply that TTM do not precisely translate into OBE. Similar to the previous hypothesis, one reasonable explanation for this finding might be that TTM alone will not translate into higher OBE, but might be influenced by usage.

Hypothesis 1c. Organizational Benefits of a firm are negatively influenced by Trading Partner Power.

This hypothesis was partially supported. Even though the relationship between Trading Partner Power (TPP) and Organizational Benefits (OBE) was found to be significant, the sign of the relationship turned out to be opposite as what we originally proposed. Theoretical contributions have sustained that lower industry profits are expected when an industry's buyer and supplier power is high (Porter, 1980). Some arguments can be made regarding the apparent contradictory results of this study. First is the distribution of respondents in the sample and their perception of the power player in their respective supply chains. According to Table 4.3.7, over 50% of the respondents perceived themselves as the dominant producer in their supply chain. Moreover, over 33% of the respondents perceived that they have the most power in their supply chain. Thus, from the dominant player perspective, it might appear that the higher the TPP, the higher

OBE would be. Second, it could be argued that the nature of power in a dyadic buyer supplier relationship in the context of Web-Based EC could be different. In such environments, switching trading partners is not as complex as in a purely EDI environment, where standards are rigid. Therefore, companies can exercise power to their benefit. Future research must study this finding in greater detail.

Hypothesis 1d. Firms with high levels of E-Infrastructure will have high levels of Organizational Benefits.

This relationship was found to be significant. Following the Resource Based Theory (Wernerfelt, 1984; Barney, 1991; Grant, 1991) that sustain competitiveness is built upon unique capabilities difficult to imitate, results indicate that E-Infrastructure (EIF), composed of IT tools, Top Management Support, and Training, do in fact have an impact on Organizational Benefits. This is consistent with previous research that linked competence factors such as the ones considered in the EIF construct to positive outcomes (Stratman and Roth, 2002).

Hypothesis 1e. Strategic Flexibility positively influences the Organizational Benefits of a firm.

This hypothesis is fully supported with significant relationship between Strategic Flexibility (STF) and Organizational Benefits (OBE). This result confirms the importance of STF on today's highly competitive environment. As companies become more adaptive in their strategies and more responsive to market

changes, they are able to attain higher OBE. It confirms previous research that found significant relationship between STF and OBE in a supply chain context (Zhang, 2001; Swafford, 2003).

Hypothesis 1f. Firms with high levels of Supply Chain Integration will exhibit high levels of Organizational Benefits.

This hypothesis was partially supported. This indicates that Supply Chain Integration (SCI) does not appear to be significantly related to Organizational Benefits (OBE). Even though in model 2, SCI was partially significant, subsequent models (2 and 3) do not provide a significant relationship. It appears that the contribution of SCI on OBE was overshadowed by other "stronger" factors which in turn did not provide full support to this hypothesis.

Even though there is an increasing sentiment that believes that the nature of the future competition will not be between companies but rather between supplies; and it as even been coined as one of the most significant paradigm shifts of modern business management (Lambert and Cooper, 2000), our results did not provide strong evidence of such statement. In fact, Rice and Hoppe (2001) argue that examples of supply chain competition will be limited, and a more likely scenario will find companies competing and succeed based on their unique capabilities developed across their supply chains. We found empirical support of such statement in that contextual factors that are well known to build unique capabilities were found significant predictors of Organizational Benefits, such as Strategic Flexibility, E-Infrastructure, among others.

Nevertheless, it is imperative nowadays that inter-relationship between different players in a supply chain are recognized and properly aligned and have been found to significantly impact performance (Li, 2002; Narasimhan and Kim, 2002; Li, Ragu-Nathan et al., 2006).

Hypothesis 2. Web-Based EC use positively influences the Organizational Benefits of a firm.

This hypothesis was fully supported, providing empirical evidence on the notion that higher use of Web-Based Electronic Commerce (WEC) leads to improved Organizational Benefits (OBE). Previous research has linked EC use and performance (Mukhopadhyay and Kekre, 2002; Narasimhan, Talluri et al., 2003) and this study empirically validated those results. Needless to say, electronic commerce in general has become a decisive factor for performance in today's increasingly turbulent business environment and our results imply that companies weighting the possibilities of bringing WEC into their business processes will rip the benefits.

Hypothesis 3a-f. Web-Based EC use positively moderates the relationship between Predictor Factors and Organizational Benefits.

These hypotheses were partially supported. First, results indicate a significant moderating effect between Trading Partner Trust (TPT) and Web-Based EC use (WEC). This is an important finding because TPT does in fact have an impact when the moderating effect of WEC is brought into the picture. As represented

by model 4 in Table 5.3.1, this relationship turned out to be highly significant contributor for OBE. From a theoretical perspective, this finding provides interesting insights in the Trust literature because it provides empirical evidence that even though Trust as an independent construct does not appear to provide gains in performance, when moderated by usage, it proved to be significant.

Second, results showed a significant moderating effect between Technology Trust Mechanisms (TMM) and Web-Based EC use (WEC). As in the previous case, this is another important contribution of this study because it empirically supported the notion that trust building mechanisms along with usage would in fact result in performance gains, whereas the individual effect of TMM on OBE was not significant.

With regards to hypotheses 3c, 3d, and 3e, results indicate no significant moderator effect existed between Trading Partner Power (TPP), E-Infrastructure (EIF), and Strategic Flexibility (STF) and WEC respectively. Despite the direct significant effects of TPP, EIF, and STF on OBE, the moderator effects were not.

5.5. Chapter Summary

Table 5.5.1 presents the overall results of the hypotheses testing phase, as indicated, five hypotheses were fully supported, three partially supported, and five were not supported. Overall, results indicate the importance role of WEC use as both direct and mediator effect on OBE. Furthermore, the important direct role of EIF, and STF on OBE was empirically validated. In addition, the importance of TPT, and TMM, when moderated by WEC was also validated in this study.

Hypothesis	IV	DV	Result
1a	Trading Partner Trust (TPT)	OBE	No
1b	Tech. Trust Mechanisms (TTM)	OBE	No
1c	Trading Partner Power (TPP)	OBE	Partially
1d	E-Infrastructure (EIF)	OBE	Yes
1e	Strategic Flexibility (STF)	OBE	Yes
1f	Supply Chain Integration (SCI)	OBE	Partially
2	Web-Based EC Use (WEC)	OBE	Yes
3a	TPT x WEC	OBE	Yes
3b	TTM x WEC	OBE	Yes
3c	TPP x WEC	OBE	No
3d	EIF x WEC	OBE	No
3e	STF x WEC	OBE	No
3f	SCI x WEC	OBE	Partially

Table 5.5.1. Hypotheses and Results Summary

Chapter 6

Dimension Level Analysis

In Chapter 5 , the hypotheses proposed in this research were tested. As indicated by the results, five of them were fully supported and three partially supported, indicating a direct relationship between E-Infrastructure, Strategic Flexibility, and Web-Based EC and Organizational Benefits. Additionally the moderating effect of Web-Based EC on the relationship between Trading Partner Trust and Technology Trust Mechanisms and Organizational Benefits were fully supported. Also, the relationships between Trading Partner Power and Supply Chain Integration on Organizational Benefits were partially supported. Finally the moderating effect of Web-Based EC on the relation between Supply Chain Integration and Organizational Benefits was also partially supported.

Despite the validation of the previous hypotheses, there are important theoretical and practical implications that remain unexplored that happen when multiple dimensions are grouped into a single construct. For example, what specific factors lead to higher levels of higher levels of organizational benefits in terms of information quality, business efficiency, and competitive advantage?; are there differences between successful and not-so-successful firms when it comes to the levels of Trading Partner Trust (TPT), Technology Trust Mechanisms (TMM),

Trading Partner Power (TPP), E-Infrastructure (EIF), Strategic Flexibility (STF), Supply Chain Integration (SCI), and Web-Based EC use (WEC)?; Are there differences between Heavy and Light users of Web-Based EC with regards to the factors previously mentioned? Are there differences between Strategic and Transactional Web-Based EC use? This chapter attempts to answer these questions using additional statistical analysis, namely, multiple regression, cluster analysis, and multivariate analysis of variance methods.

First, a description of Cluster Analysis and Multivariate Analysis of Variance (MANOVA) is presented, followed by the results obtained, along with discussions and implications.

6.1. Cluster Analysis

Cluster analysis is a statistical technique that can be applied to data that exhibits "natural" groupings. Cluster analysis sorts through the raw data and groups them into clusters, which is a group of relatively homogeneous cases or observations. The objective of cluster analysis is to classify a sample into a small number of mutually exclusive groups based on the similarities among the entities (Hair, Anderson et al., 1995). Those groups can later be used for description and explanation of taxonomies, for simplification of the data, and for identification of relationships (Hair, Anderson et al., 1995). There are several criteria to form the groups, i.e. maximization of the distance among the groups' centers, variance maximization among the groups, variance minimization within members of the same group, etc. One of the procedures most commonly used is the k-means grouping, which attempts to identify relatively homogeneous groups of cases

based on selected characteristics, using an algorithm that can handle large numbers of cases. The k-means primary objective is to minimize the within-group variability while maximizing the between-group differences.

6.2. Multivariate Analysis of Variance (MANOVA)

Multivariate Analysis of Variance (MANOVA) is a statistical technique that can be used to simultaneously investigate the relationship between several categorical independent variables and two or more metric dependent variables (Hair, Anderson et al., 1995). Its primary objective is to assess the significance of group differences (Mertler and Vannatta, 2002). The main advantage of MANOVA is that allows examining several dependent measures simultaneously, along with the interactions. The most common multivariate statistic that evaluates an effect on a single dependent variable is known as Wilks' lambda, although others can be used, especially when some of the assumptions are not met (e.g. Pillai's Trace can be used when there is unequal variance among groups). MANOVA requires a set of assumptions to be met including (Mertler and Vannatta, 2002): 1) randomness of the sample, 2) normality of the dependent variables, 3) homoscedasticity of the dependent variables, and 4) relationships must exist between dependent variables.

Since groups in MANOVA are created by two or more factors, it is important to determine if factors are interacting (working together) to affect the dependent variables. If lines overlap and crisscross, factor interaction is present. The interaction effects (joint effect of two treatments) should be analyzed before examining each treatment individually. Although a line plot may reveal some

factor interaction, the MANOVA results may show that the interaction is not statistically significant. Therefore, it is important to determine the interaction significance. If factors significantly interact, e.g. they are working together to affect the dependent variable, the researcher cannot determine the effect that each separate factor has on the dependent variable by looking at the main effects for each factor. Although individual factor main effects may be significant even while factor interaction is significant, caution should be use when drawing inferences about factor effects (Mertler and Vannatta, 2002). Interaction can occur in two different ways, ordinal (differences in magnitude) or disordinal (differences in magnitude and direction). If the significant interaction is ordinal, there might be plausible interpretations to ensure the acceptance of the results. However, if the interaction is disordinal, the main effects of the treatments cannot be interpreted and the study must be redesigned (Hair, Anderson et al., 1995).

Once the significance for the multivariate model has been established, individual univariate analyzes, normally regular one way ANOVAs, can be conducted to assess the impact of each DVs by the IV(s). This will result in multiple tests, which in turn will affect directly error Type I. To overcome this problem, it is necessary to adjust the significance level for the test of each DV so that the alpha level for the group of DVs does not exceed some pre-established critical value (Pedhazur and Schmelkin, 1991; Fowler, 2002). Therefore it is a common practice to set the overall alpha level to a low value (e.g. 0.01) to counteract this issue.

In summary, when evaluating the results of MANOVA, one must follow the

following steps (Mertler and Vannatta, 2002):

1. Examine the overall multivariate test of significance. If results are significant, proceed to step 2; if not stop.
2. Examine the univariate tests of individual DVs. If there are significant differences, proceed to step 3; if not stop.
3. Examine post – hoc tests for individual DVs.

6.3. Dimension Level Hierarchical Regression Analysis

In Chapter 5 , all the hypotheses posted in this research were tested and the results confirmed several hypotheses while some others were not supported (see Table 5.3.1). An important aspect of the study not addressed by previous analysis is the exploration of the factors affecting the Organizational Benefits (OBE) dimensions independently, namely Information Quality (INQ), Business Efficiency (BUE), and Competitive Advantage (COA). To this end, this section explores this issue by considering three multiple regression models, one for each of the OBE dimensions. Recall from Model 4 presented in Table 5.3.1 that some of the factors turned out to directly affect OBE. These factors are Trading Partner Power (TPP), E-Infrastructure (EIF), Strategic Flexibility (STF), and Web-Based EC use (WEC). Additionally, three interaction effects came out to be significant (TPTxWEC, TMMxWEC, and SCIxWEC). Based on these significant factors, three multiple hierarchical regression models were developed following a similar approach as the one used in the previous chapter. In the following models, we entered the variables in two blocks, one accounting for the direct effects of the significant factors (TPP, EIF, STF, and WEC), and a second block

for the significant interaction effects (TPTxWEC, TTMxWEC, and SCIxWEC).

6.3.1 Information Quality (INQ)

Table 6.3.1 presents the results of the multiple hierarchical regression models when Information Quality (INQ) is considered as the DV. The overall model (Model 2) has adequate predictive power (R^2=0.572), meaning that approximately more than half of the total variance in INQ is explained by the model. As indicated by the changes in R^2 and F values (0.035 and 4.696 respectively; p = 0.004) the moderating effect of WEC is also validated when considering INQ as the DV.

Block	Independent Variable(s) (IVs)	DV: Information Quality (INQ)	
		Model 1	**Model 2**
1	Trading Partner Power (TPP)	0.058	0.075
	E-Infrastructure (EIF)	0.326**	0.324**
	Strategic Flexibility (STF)	0.252**	0.206**
	Web-Based EC Use (WEC)	0.327**	0.292**
2	TPT x WEC		0.113*
	TTM x WEC		0.123*
	SCI x WEC		0.172*
	R^2	0.537	0.572
	F – value	50.830	32.855
	d. f.	(4,175)	(7,172)
	p-value	0.000	0.000
	Change in R^2	–	0.035
	Change in F-value	–	4.649
	d.f.	–	(3,172)
	p-value (change)	–	0.004

* : p < 0.05; **: p < 0.001; +: p< 0.1

Table 6.3.1. Multiple Hierarchical Regression Results (INQ Dimension)

The results are consistent with the findings in the previous chapter in that most of the IVs in the model turned out to be significant. The only exception is the direct effect of TPP on INQ. From a practical standpoint, this result indicates that improvements INQ (e.g. management of information, accuracy of information, etc.) will not be affected by the trading partner with the most power in a dyadic

buyer-supplier relationship. Also, it is evident that when firms do use of Web-Based EC, this leads to INQ gains no matter whether they control the power in the relationship.

As expected, important factors that lead to improvements in INQ include EIF (β=0.361; p<0.001), Strategic Flexibility (β=0.214; p<0.001), and Web-Based EC use (β=0.331; p<0.001). When a firm makes use of EIF and WEC, this will translate into INQ gains. Also, as the firm becomes more flexible to react to environmental changes, results indicate this flexibility will also be reflected in the INQ gains. Considering WEC as a moderating variable, results also indicate the importance of the interaction of WEC with TPT (β=0.213; p<0.05), TTM (β=0.184; p<0.05), and SCI (β=0.206; p<0.05). The implication of these results indicate that for obtaining INQ benefits, the interaction effects between WEC use and Trust, and Supply Chain Integration are important.

6.3.2 Business Efficiency (BUE)

Considering Business Efficiency as the DV in the multiple hierarchical regression model provides different results from the model presented in the previous section (see Table 6.3.2). Overall, Model 2 has a good predictive power (R^2=0.558), thus almost 56% of the variance in BUE is explained by the regression model. Changes in R^2 and F values (0.020 and 2.704 respectively) specify a somewhat weak significance (p= 0.047) of the moderating effect WEC use with regards to TPT, TMM, and SCI when BUE is the DV.

Block	Independent Variable(s) (IVs)	DV: Business Efficiency (BUE)	
		Model 1	**Model 2**
1	Trading Partner Power (TPP)	0.090^{+}	0.099^{+}
	E-Infrastructure (EIF)	0.279**	0.280**
	Strategic Flexibility (STF)	0.223**	0.192*
	Web-Based EC Use (WEC)	0.370**	0.375**
2	TPT x WEC		0.117*
	TTM x WEC		0.083
	SCI x WEC		0.109^{+}
	R^2	0.545	0.558
	F – value	54.655	33.302
	d. f.	(4,175)	(7,172)
	p-value	0.000	0.000
	Change in R^2	–	0.020
	Change in F-value	–	2.704
	d.f.	–	(3,172)
	p-value (change)	–	0.047

* : $p < 0.05$; **: $p < 0.001$; +: $p < 0.1$

Table 6.3.2. Multiple Hierarchical Regression Results (BUE Dimension)

There are some interesting findings that can be inferred from the results. First, the effect Trading Partner Power (TPP) turned out to be significant at the 0.1 level. Even though the significance is low, the practical implication could mean that for obtaining gains in BUE (e.g. reducing costs, reduce inventory, increase transparency of business transactions, etc), TPP plays an important role. Second, the interaction effect between TMM and WEC was found to be non-significant. This implies that Technology Trust Mechanisms along with use do not impact significantly BUE. This result is interesting from a practical perspective because even though TMM does not translate into BUE directly, it does have an effect on other benefits aspects, namely INQ, as described in the previous section, which reinforces the need to have these types of trust building mechanisms when interacting with trading partners.

Third, as expected, EIF (β=0.295; $p<0.001$), STF (β=0.188; $p<0.05$), WEC

(β=0.403; p<0.001) are all highly significant predictors of BUE. Proper infrastructure (both technical and human) along with adequate flexibility to adapt to changes and use of WEC do translate in business efficiency gains as indicated by the results.

6.3.3 Competitive Advantage (COA)

Both Information Quality (INQ) and Business Efficiency (BUE) are dimensions that are by nature more short term, whereas Competitive Advantage (COA) represents a dimension that indicates long-term benefits (e.g. enhance competitiveness, improve relationships, improve coordination of the supply chain, etc.). Taking this into consideration, Table 6.3.3 indicates that the model is quite good, with a predictive power of almost 60% of the total variance for the COA dimension (R^2=0.577). Further, the importance of the interaction effects between WEC and TPT, TTM, and SCI is established by the significance in the changes in R^2 (ΔR^2=0.027, p<0.01) and in the F-value (ΔF = 3.866, p<0.01).

Block	Independent Variable(s) (IVs)	DV: Competitive Advantage (COA)	
		Model 1	**Model 2**
1	Trading Partner Power (TPP)	0.058	0.069
	E-Infrastructure (EIF)	0.253**	0.254**
	Strategic Flexibility (STF)	0.195**	0.160*
	Web-Based EC Use (WEC)	0.431**	0.439**
2	TPT x WEC		0.132*
	TTM x WEC		0.107*
	SCI x WEC		0.119*
	R^2	0.557	0.577
	F – value	57.153	35.920
	d. f.	(4,175)	(7,172)
	p-value	0.000	0.000
	Change in R^2	–	0.027
	Change in F-value	–	3.866
	d.f.	–	(3,172)
	p-value (change)	–	0.010

* : p < 0.05; **: p < 0.001; +: p< 0.1

Table 6.3.3. Multiple Hierarchical Regression Results (COA Dimension)

The results of the hierarchical regression model considering COA as the DV indicate that all but one of the factors under consideration did not turn out to be significant (TPP). There are two possible explanations for this result. First, as indicated in Chapter 5 , the nature of trading partner relationships might be different than other contexts where Power played an important role (e.g., Gaski, 1984; Hart and Saunders, 1997; Hayward and Boeker, 1998). Second, the majority of the respondents perceived themselves as the dominant player in their respective supply chains, which might have a diminishing effect in the predictive power of TPP on COA.

Important practical implications from the results presented in Table 6.3.3 can be summarized as follows. First, in order to gain long term benefits, it is critical to have a mix of technological, human, and strategic capabilities, that accompanied by use of Web-Based EC will translate in improvements. This mix of factors include E-Infrastructure (β=0.289; $p<0.001$), Strategic Flexibility (β=0.169; $p<0.05$), and Web-Based EC use (β=0.506; $p<0.001$). Second, in dyadic relationships, it is imperative to both integrate processes along the supply chain , and build trust with trading partners to improve the competitive advantage of the firm. This is indicated by the significant results of the interaction effects between WEC and TPT (β=0.252; $p<0.05$), and between WEC and SCI (β=0.146; $p<0.05$).

6.4. Cluster Analysis Results

An important aspect not considered up to this point in the study is determining if differences exist between companies that have attained higher organizational benefits than those which have not. Therefore it is imperative to classify these

groups based on the organizational benefits dimensions considered in the study. To this end, Cluster Analysis was used to categorize firms that have been more successful than others using the K-means method. This approach has been used in previous business research to identify successful and not-so-successful companies (Co, Patuwo et al., 1998; Boyer, 1999) with regards to benefits.

To conduct the cluster analysis, the composite mean of the organizational benefits factor (OBE) was used, as it indicates the perceived benefits gains obtained by the firm. Convergence was achieved after four iterations and the results are presented in Table 6.4.1. To account for possible effects of demographic variables in the results, chi-square tabulations between the clusters were conducted with regards to firm size (number of employees), and industry type, which are considered to be related to organizational benefits. For the sample used in this study, no clear evidence was found relating organizational benefits (OBE) and any of the abovementioned demographic factors. The chi-square statistics in cross-tabulations between successful and not-so-successful groups and both firm size (χ^2=9.628, df= 5, p= 0.086) and industry type (χ^2=11.676, df= 7, p=0.112) do not show any significance.

Cluster	Label	Frequency	Center
1	Not-so-Successful	53	2.42
2	Successful	127	4.05

Table 6.4.1. Cluster Analysis results

6.5. Successful vs. Not-so-Successful Comparison

An interesting question left unanswered in previous analysis is what determinants differentiate successful firms (SUC) from not-so-successful ones (NSS). To

answer this question, a MANOVA analysis was conducted to determine if differences are present between these two groups considering the dimensions analyzed in this research, namely, Trading Partner Trust (TPT), Technology Trust Mechanisms (TMM), Trading Partner Power (TPP), E-Infrastructure (EIF), Strategic Flexibility (STF), Supply Chain Integration (SCI), and Web-Based EC use (WEC).

The steps described in section 6.2. were followed while conducting this analysis. First the assumption of equality of covariance matrices was assessed by examining the Box's Test (M =50.151, F = 1.695, p = 0.012). This indicates the Wilk's Lambda statistic can be used to interpret the MANOVA results. Second, the overall model with seven dependent variables (TPT, TMM, TPP, EIF, STF, SCI, and WEC) is statistically significant at p<0.01 with Wilks' Lambda = 0.551 ($F_{(7,172)} = 19.998, p = 0.000, \eta^2 = 0.449$). Third, individual ANOVA results on the DVs (see Table 6.5.1) indicate that significant differences exist between SUC and NSS groups with regards to TPP (F= 12.39, p = 0.00), EIF (F= 102.67, p= 0.00), STF(F= 56.86, p= 0.00), SCI(F= 77.43, p= 0.00), and WEC(F= 77.36, p= 0.00). The previous results suggest that SUC firms do pay more attention to critical factors such as TPT, EIF, STF, SCI, and WEC, and thus, the ripped the benefits. Furthermore, firms who intend to strategically use Web-Based EC as a source of competitive advantage must take into account the factors previously mentioned as results show.

Construct	Successful mean (std. dev.) (n=127)	Not-so-Successful mean (std. dev.) (n=53)	F-statistic	p-value	Partial Eta Squared
Trading Partner Trust (TPT)	4.07 (0.52)	3.75 (0.65)	12.39	0.00	0.07
Technology Trust Mechanisms (TMM)	4.68 (0.60)	4.56 (0.74)	1.32	0.25	0.01
Trading Partner Power (TPP)	2.69 (1.07)	2.47 (1.08)	1.56	0.21	0.01
E-Infrastructure (EIF)	3.68 (0.66)	2.53 (0.78)	102.67	0.00	0.37
Strategic Flexibility (STF)	3.85 (0.73)	2.84 (1.00)	56.86	0.00	0.24
Supply Chain Integration (SCI)	3.85 (0.58)	2.94 (0.74)	77.43	0.00	0.30
Web-Based EC use (WEC)	3.71 (0.68)	2.67 (0.80)	77.36	0.00	0.30

Table 6.5.1. MANOVA Results (Successful vs. Not-so-Successful)

Additionally, Table 6.5.1 shows that there are room for improvement for both SUC and NSS firms as reflected by the mean values in all of the DVs, where most of the values have a mean less than 4 on a 5 point scale. This implies that as firms give more importance to factors such as Trading Partner Trust, E-Infrastructure, Strategic Flexibility, Supply Chain Integration, and Web-Based EC use, they will become more competitive and attain higher Organizational Benefits.

6.6. Heavy Adopters vs. Light Adopters Comparison

Even though the importance of Web-Based EC use has been established throughout this study, there is yet no indication of the differences between firms who use WEC more heavily than those who do not. Therefore, there are important theoretical and practical implications to learn from such a comparison. In order to differentiate “Heavy Adopters” from “Light Adopters” of WEC, a demographic question asked the respondent to indicate the percentage of

monthly transactions conducted through Web-Based EC. This question had a five point scale ranging from 0-20% to 81-100%. A score of 3 and above, indicating 41% or more of monthly transactions conducted through WEC, was treated as being “Heavy Adopters”, and a score of less than 3, indicating 40% of less of the monthly transactions conducted by WEC means, was treated as “Light Adopters”. To account for possible effects of firm size and industry type, a series of cross-tabulations between Heavy and Light Adopters were performed and the results do not indicate any significance (firm size: χ^2=6.977, df=5, p=0.222; industry type: χ^2=5.728, df = 7, p=0.572). As in the previous section, the following steps were followed while conducting the MANOVA analysis. First, the assumption of equality of covariance matrices was assessed by examining the Box’s Test (M =55.982, F =1.479, p = 0.032), which confirms that Wilk’s Lambda can be used to infer the MANOVA results. Second, the model with all the dimensions analyzed in this study (TPT, TMM, TPP, EIF, STF, SCI, WEC, and OBE), is analyzed. Results indicate that the model is significant at the 0.01 level with a Wilk’s Lambda score of 0.828 ($F_{(8,171)} = 4.425, p = 0.000, \eta^2 = 0.172$). Once the significance of the model has been established, individual ANOVAs for each of the DVs can be studied (see Table 6.6.1).

Construct	Heavy Adopters mean (std. dev.) (n=78)	Light Adopters mean (std. dev.) (n=102)	F-statistic	p-value	Partial Eta Squared
Trading Partner Trust (TPT)	4.08 (0.55)	3.90 (0.59)	4.09	0.04	0.02
Technology Trust Mechanisms (TMM)	4.71 (0.54)	4.59 (0.72)	1.54	0.22	0.01
Trading Partner Power (TPP)	2.62 (1.09)	2.62 (1.07)	0.00	0.99	0.00
E-Infrastructure (EIF)	3.66 (0.75)	3.09 (0.88)	21.07	0.00	0.11
Strategic Flexibility (STF)	3.85 (0.89)	3.32 (0.91)	15.45	0.00	0.08
Supply Chain Integration (SCI)	3.87 (0.67)	3.37 (0.74)	21.86	0.00	0.11
Web-Based EC use (WEC)	3.78 (0.71)	3.11 (0.85)	31.08	0.00	0.15
Organizational Benefits (OBE)	3.92 (0.70)	3.30 (0.93)	23.44	0.00	0.12

Table 6.6.1. MANOVA Results (Heavy Adopters vs. Light Adopters)

Results indicate that significant differences exist between Heavy and Light Adopters in the following factors: EIF (F= 21.07, p= 0.00), STF (F= 15.45, p= 0.00), SCI (F= 21.86, p= 0.00), WEC (F= 31.08, p= 0.00), and OBE (F= 23.4, p= 0.00). Several conclusions can be drawn from these results. First, it is clear that heavy adopters do obtain greater benefits than light adopters, which reinforce the need for firms to adopt WEC as an integral part of their businesses. Second, results indicate that heavy adopters have an edge on Supply Chain Integration activities, thus confirming the notion that in order to successfully implement WEC in a supply chain, the operations and activities that take place between trading partners must be integrated. Third, Heavy adopters appear to be more strategically flexible than Light adopters, probably due to the fact that by integrating their business processes using WEC, they are able to respond and adapt to change more quickly.

6.7. Impact of Strategic and Transactional Web-Based EC Use on Organizational Benefits

So far results have shown the critical impact of Web-Based EC use on Organizational Benefits and also as moderator of several contextual factors, including Trading Partner Trust, Technology Trust Mechanisms, and Supply Chain Integration. However, so far we have not analyzed the individual impact of the two dimensions that form this construct, namely Transactional Web-Based EC and Strategic Web-Based EC. To this extent, this section explored the impact of the two dimensions on Organizational Benefits.

The analysis followed a number of steps. First, groupings were created to differentiate between "Heavy Adopters" from "Light Adopters" of Transactional and Strategic WEC. We followed a similar procedure as the one described in section 6.6. , where a similar analysis was performed. To account for possible effects of firm size and industry type, cross-tabulations were done and, with the exception of the firm size for the strategic WEC grouping, results did not show significant differences (Transactional Group: firm size: χ^2=7.805, df=5, p=0.167; industry type: χ^2=15.519, df = 7, p=0.03; Strategic Group: firm size: χ^2=15.241, df=5, p=0.009; industry type: χ^2=6.066, df = 7, p=0.532). Second, MANOVA was done using a general linear model (GLM). GLM-MANOVA is similar to the MANOVA used in previous sections, but it has the additional advantage of allowing comparison among groups with unequal number of cases. Pillai's criterion and Wilks' λ statistics were used to determine if significant differences among the groups on the Organizational Benefits dimensions simultaneously.

The results showed that there is a there is a statistically significant difference between heavy and light users of Transactional WEC (Pillai's criterion = 0.110 , P = 0.000; Wilk's λ = 0.890, P = 0.000) when considering the three dimensions of Organizational Benefits. Additionally, the difference between heavy and light users of Strategic WEC turned out to be statistically significant (Pillai's criterion = 0.145 , P = 0.000; Wilk's λ = 0.855, P = 0.000). Because overall differences among the groups were detected, further analyses were done to identify the univariate differences at the individual variable level and the results are shown in Table 6.7.1. The results showed that all the dimensions of Organizational Benefits (Information Quality - INQ, Business Efficiency – BUE, Competitive Advantage – COA) were all statistically significant among the Transactional and Strategic WEC groups. As expected, the magnitude of the difference for the INQ and BUE dimensions in the case of Transactional WEC turned out to be greater than for the Strategic WEC group. Conversely, the magnitude of the difference for the COA dimension turned out to be greater for the Strategic WEC group.

Source	Dependent Variable	Sum of Squares	df	Mean Square	F	P value
Transactional WEC use (Light vs. Heavy)	INQ	10.89	1	10.89	15.19	0.00
	BUE	10.04	1	10.04	17.41	0.00
	COA	3.28	1	3.28	5.06	0.03
Strategic WEC use (Light vs. Heavy)	INQ	4.07	1	4.07	5.67	0.02
	BUE	6.13	1	6.13	10.62	0.00
	COA	17.66	1	17.66	27.20	0.00

Table 6.7.1. MANOVA Results (Transactional and Strategic WEC use)

6.8. Chapter Summary

Chapter 6 described and explored additional analyses not answered by the

hypotheses proposed and tested in this study. Important findings were derived from these analyses and significant differences were found between Successful and Not-so-Successful firms and between Heavy Adopters and Light Adopters of WEC. Also, differences were found with regards to Strategic and Transactional WEC use. The following chapter (Chapter 7) summarizes the findings of this study, indicates the implications from both theoretical and practical views, discusses the limitations of the study, and points out some recommendation for future research.

Chapter 7

Summary and Future Research Directions

This chapter provides a summary of the major research findings and contributions of this study, discusses the practical implications of the findings, presents some of the limitations of the study, and sets the ground for future research with a set of recommendations ,

7.1. Summary of findings

Undoubtedly, electronic commerce is dramatically changing the way firms are conducting business. For this reason, firms of all sizes must realize the importance of electronic commerce in their strategies and operations in order to maximize profits. Companies must understand how to leverage emerging technologies to move toward the goal of achieving more benefits within the confinements of the firm, as well as in the context of their supply chain. The present study is a step forward in this direction by systematically investigating Web-Based Electronic Commerce Use utilizing sound empirical research methods. This study aimed at exploring the relationships between various factors and their impact on organizational benefits and the moderating effect of Web-Based EC use.

The proposed model considered various factors mentioned in the literature that correlated with Web-Based EC use. Those relationships and their impact on Organizational Benefits were tested with data collected from 180 firms in different industries. The study contributes to the body of knowledge in Electronic Commerce in a number of ways.

First, this study provided a theoretical framework that identified various factors that are correlated with Web-Based EC use including Trading Partner Trust, Technology Trust Mechanisms, Strategic Flexibility, and E-Infrastructure. Also, the model explored the impact of these factors on Organizational Benefits as means to assert the significant factors to achieve performance gains within an organization.

Second, the research developed and validated reliable measures for the following constructs: 1) Web-Based EC use, 2) Organizational Benefits, and 3) E-Infrastructure. Also, other measures were validated in the electronic commerce context (Trading Partner Trust, Trading Partner Power, Technology Trust Mechanisms, and Supply Chain Integration). This research also adequately developed measures for Web-Based EC use, which have not been tackled properly in previous literature. All scales developed meet the reliability and validity requirements of rigorous empirical research, and thus, are suitable for use in future research. This in turn will facilitate theory development in the field.

Third, empirical evidence from the study demonstrated the current state of the extent of use of Web-Based EC. Despite anecdotal evidence in trade journals about the increasing number of organizations that interact with the supply chain

partners, the results of this study indicate that those interactions are somewhat limited. In fact, nearly 60% of the respondents conduct a merely 0-40% of their transactions through Web-Based EC. Also, about half of the respondents have limited interactions with customers and suppliers through electronic means.

Fourth, this study provided evidence to the literature about previously untested statements regarding the moderating effect of Web-Based EC use. The results demonstrated this construct has a moderating effect on the relationship between Trading Partner Trust and Organizational Benefits, and between Technology Trust Mechanisms and Organizational Benefits.

Fifth, results indicated that the following factors are associated with organizational benefits: Trading Partner Power, E-Infrastructure and Strategic Flexibility. Of special importance is the finding regarding Trading Partner Power. The results indicated an opposite yet significant effect to what we originally hypothesized. The relationship between Trading Partner Power and Organizational Benefits was found to be positive and significant. As described earlier, arguments can be made to explain this result. First, over 50% of the respondents perceived themselves as the dominant player in the supply chain. Moreover, over 30% believed their firm had the most power in the supply chain. This in turn could had led to the perception that the higher the Power, the higher the Organizational Benefits.

Equally important, the results indicated the critical role of E-Infrastructure and Strategic Flexibility on Organizational Benefits. Even though there has been a long debate on the positive impact of IT on benefits for an organization, our

results indicated that E-Infrastructure does in fact positively impacts Organizational Benefits at both the operational and tactical levels, as evidenced by the fact E-Infrastructure is positively and significantly related to the three sub-dimensions of Organizational Benefits (Information Quality – INQ, Business Efficiency – BUE, Competitive Advantage – COA). Furthermore, in today's turbulent and highly competitive environments, companies need to adapt rapidly to adapt to environment changes and the importance of this adaptation was captured in the significant impact of Strategic Flexibility on Organizational Benefits. This implies that companies who are able to adapt to customer demands and whose strategies are flexible enough to adapt to market changes along the value chain will see greater gains and stay more competitive.

Sixth, significant differences between Successful and Not-so-Successful firms were found with regards to Trading Partner Power, E-Infrastructure, Strategic Flexibility, and Web-Based EC use indicating that those firms who obtain more organizational benefits do pay more attention to the factors mentioned.

Seventh, differences between Heavy Adopters vs. Low Adopters of Web-Based EC turned out to be significant for the following factors: E-Infrastructure, Strategic Flexibility, Supply Chain Integration, Web-Based EC use, and Organizational Benefits. This implies heavy adopters do appear to obtain greater benefits than light adopters, which reinforce the need for firms to adopt WEC as an integral part of their businesses. Also, heavy adopters have an edge on Supply Chain Integration activities, thus confirming the notion that in order to successfully implement WEC in a supply chain, the operations and activities that take place

between trading partners must be integrated.

Eight, Heavy adopters appear to be more strategically flexible than Light adopters, probably due to the fact that by integrating their business processes using WEC, they are able to respond and adapt to change more quickly.

Ninth,

7.2. Practical Implications

One of the goals of any business related theoretical research is to find and highlight the practical implications for managers. Being an applied study on the effects of Web-Based EC use, this study also has several important contributions in this aspect that are worth mentioning.

First, the study provided a better understanding of the current state of Web-Based EC use in different types of industries, which indicated relative low percentages of use. This should not discourage organizations from implementing Web-Based EC because it is clear from this study that there are benefits to be obtained from it. In fact, as indicated by the results in Chapter 6 , those companies who reported to conduct a higher percentage of their transactions using Web-Based EC consistently showed higher levels of Strategic Flexibility, Supply Chain Integration, and ultimately, Organizational Benefits.

Second, the research indicated the role of Trading Partner Trust in the context of Web-Based EC use. The mediating effect of Trust and Web-Based EC use implies that as an organization establishes relations with the trading partners, trust must be embedded in these relationships in order to attain organizational benefits. Similarly, it provided technology managers a clear indication as to the

relevant technology trust mechanisms that must be in place in order to create a trustworthy environment in which business transactions can take place.

Third, in light of the results, successful companies in the sample do experience higher levels of Web-Based EC use. This implies that companies are obtaining the benefits frequently mentioned in trade journals about efficiencies gained by it.

Fourth, this study did not provide empirical support to the statement that holds that future competition will be between supply chains instead of individual companies. Our results indicated that, as suggested by Riche and Hoppe (2001), competitive players will be those that build unique capabilities across the supply chain, including having adequate infrastructure (E-Infrastructure) and being able adapt to market needs (Strategic Flexibility).

Fifth, this study provided several indicators that can be used to measure the extent of organizational benefits that span a number of dimensions, including information quality, business efficiency, and competitive advantage. These indicators can serve as benchmarks to evaluate the current state of a firm and help in setting future organizational goals.

7.3. Limitations

Despite the important contributions made by this study and discussed in the previous sections, it also has some limitations inherent to empirical research. It is important to highlight these limitations so generalizations are made considering the limitations.

First, there might be some bias by having the same respondent reporting on both predictor and outcome variables. Also, we requested a single respondent to

evaluate the perceptions of an entire firm. Future research should attempt to collect data from different respondents within the organization to assess communal measures.

Second, this research examined only a small set of possible relationships between Web-Based EC use and organizational factors. Since the factors studied have been shown to be associated with favorable outcomes, future research could propose and examine its antecedents and consequences.

Third, it is important to note that because of the innovative nature of Web-Based EC and its likely developments in the future, it is important to note that the current operationalization describes the current state of practice.

Fourth, because of time limitation and to keep the model at a manageable size, this research did not consider other factors in the model such as: organizational, cultural, and external factors. These are important issues to be addressed in a comprehensive research model that can give researchers and practitioners some deep insights about buyers who use Web-Based EC.

Finally, the results and implications of this research are somewhat limited by the research methodology used method employed and the proposed causal relationships are limited by the cross-sectional nature of the methodological design.

7.4. Future Research Directions

In empirical research, there are always new opportunities to be addressed in future research. Therefore, based on the current study, a number of directions are possible to explore in future research.

First, future research should revalidate measurement scales developed in this study. This validation will confirm the instrument proposed in this research and create generalizability for those instruments.

Second, future research might consider longitudinal research and alternative statistical methods that could complement the empirical findings of this study.

Third, because of the subject studied in this research, It is possible that there are confounding effects, interactions effects, and other complex relationships among the variables. This needs to be addressed in future work through the use of more sophisticated statistical tools such as structural equation modeling.

Fourth, this study was limited to the United States. Since Web-Based EC is a worldwide phenomenon, it is recommended to conduct cross-country research to determine if differences exist. To this end, factorial invariance across countries can also be tested.

References

A.T. Kearney. (2003, August 7). "E-Business Spending now exceeds 20 percent of all I.T. expenditure." Retrieved January 13, 2004, from http://www.atkearney.com/main.taf?p=1,5,1,135.

Abdi, H. (2003). Factor Rotations in Factor Analyses. Encyclopedia for research methods for the social sciences. M. Lewis-Beck, A. Bryman and T. Futing. Thousand Oaks, CA, SAGE**:** 978-982.

Aberdeen Group Inc. (2000). "The e-Business Supply Chain: Meeting Customer Requirements in the Internet Economy." Retrieved 10/5, 2001, from http://www.aberdeen.com.

Adobor, H. and R. S. McMullen (2002). "Strategic partnering in e-commerce: Guidelines for managing alliances." Business Horizons **45**(2): 67-76.

Ahuja, V. (2000). "Building trust in electronic commerce." IT Professional **2**(3): 61-63.

Aiken, L. S. and S. G. West (1991). Multiple Regression : Testing and Interpreting Interactions. Newbury Park, CA, Sage Publications.

Alt, R., E. Fleisch, et al. (2000). "Electronic Commerce and Supply Chain Management at ETA Fabriques D'Ebauches SA." Journal of Electronic Commerce Research **1**(2): 67-78.

Anand, G. and P. T. Ward (2004). "Fit, Flexibility and Performance in Manufacturing: Coping with Dynamic Environments." Production & Operations Management **13**(4): 369-385.

Andersen, P. H. and R. Kumar (2003). Emotions, trust and relationship development in Business relationships: A conceptual model for buyer-seller dyads. Proceedings of the 32nd EMAC Conference, Glasgow, Scotland.

Anderson, J. (2001). Tools for Improved Performance in the Supply Chain - Experiences from a Software Development Project. Lund, Sweden, Lund University**:** 189.

Angeles, R., R. Nath, et al. (2001). Testing the Moderator Variable Status of Level of Electronic Data Interchange (EDI) Implementation and Level of Business Application Complexity. Proceedings of the Decision Sciences Institute Annual Meeting, San Francisco, CA.

Armstrong, J. S. and T. S. Overton (1977). "Estimating Non-response Bias in Mail Surveys." Journal of Marketing Research **14**: 396-402.

Astley, W. G. and E. J. Zajac (1991). "Intraorganizational Power and Organizational Design: Reconciling Rational and Coalitional Models of Organization." Organization Science: A Journal of the Institute of Management Sciences **2**(4): 399-411.

Auger, P., A. Barnir, et al. (2003). "Strategic Orientation, Competition, and Internet-Based Electronic Commerce." Information Technology and Management **4**(2-3): 139-164.

Ba, S. and P. A. Pavlou (2002). "Evidence of the Effect of Trust Building Technology in Electronic Markets: Price Premiums and Buyer Behavior." MIS Quarterly **26**(3): 243-268.

Bailey, J. P. and Y. Bakos (1997). "An Exploratory Study of the Emerging Role of Electronic Intermediaries." International Journal of Electronic Commerce **1**(3): 7-

20.

Bakos, J. Y. (1991). "Information Links and Electronic Marketplaces: The Role of Interorganizational Information Systems in Vertical Markets." Journal of Management Information Systems **8**(2): 31-52.

Bakos, J. Y. and E. Brynjolfsson (1993). "From Vendors to Partners: Information Technology and Incomplete Contracts in Buyer-Supplier Relationships." Journal of Organizational Computing & Electronic Commerce **3**(3): 301-328.

Barney, J. (1991). "Firm Resources and Sustained Competitive Advantage." Journal of Management **17**(1): 99-120.

Barney, J. B. and M. H. Hansen (1994). "Trustworthiness as a Source of Competitive Advantage." Strategic Management Journal **15**(8): 175-190.

Baron, J. P., M. J. Shaw, et al. (2000). "Web-based e-catalog systems in B2B procurement." Communications of the ACM **43**(5): 93-100.

Barua, A., P. Konana, et al. (2000). "The Role of Trust and Expertise in the Adoption of Electronic Commerce Intermediaries." CREC Working paper, McCombs School of Business, The University of Texas: 44.

Barua, A., S. Ravindran, et al. (1997). "Efficient Selection of Suppliers over the Internet." Journal of Management Information Systems **13**(4).

Batagelj, Z. and V. Vehovar (1998). Technical and Methodological Issues In WWW Surveys. Proceedings of the 53rd Annual Conference of the American Association for Public Opinion Research (AAPOR), St. Louis, MO.

Beamon, B. M. (1999). "Measuring supply chain performance." International

Journal of Operations & Production Management **19**(3): 275-292.

Becerra, M. and A. K. Gupta (2003). "Perceived Trustworthiness Within the Organization: The Moderating Impact of Communication Frequency on Trustor and Trustee Effects." Organization Science: A Journal of the Institute of Management Sciences **14**(1): 32-44.

Bensaou, M. (1997). "Interorganizational Cooperation: The Role of Information Technology. An Empirical Comparison of U.S. and Japanese Supplier Relations." Information Systems Research **8**(2): 107-124.

Bergeron, F. and L. Raymond (1997). "Managing EDI for corporate advantage: A longitudinal study." Information & Management **31**(6): 319-333.

Beth, S., D. N. Burt, et al. (2003). "Supply Chain Challenges: Building Relationships." Harvard Business Review **81**(7): 64-73.

Bharadwaj, A. S. (2000). "A resource-based perspective on information technology capability and firm performance: An empirical investigation." MIS Quarterly **24**(1): 169-196.

Bhatt, G. D. (2001). "Business process improvement through electronic data interchange (EDI) systems: an empirical study." Supply Chain Management: An International Journal **6**(2): 60-74.

Bhattacherjee, A. (2002). "Individual Trust in Online Firms: Scale Development and Initial Test." Journal of Management Information Systems **19**(1): 211-241.

Bowker, D. and D. A. Dillman (2000). An Experimental Evaluation of Left and Right Oriented Screens for Web Questionnaires. Proceedings of the 55th Annual Conference of the American Association for Public Opinion Research (AAPOR),

Portland, OR.

Boyer, K. K. (1999). "Evolutionary Patters of Flexible Automation and Performance: A Longitudinal Study." Management Science **45**(6): 824-842.

Broadbent, M. and P. Weill (1997). "Management by Maxim: How Business and IT Managers Can Create IT Infrastructures." Sloan Management Review **38**(3): 77-92.

Broadbent, M. and P. Weill (1999). "The Implications of Information Technology Infrastructure for Business Process Redesign." MIS Quarterly **23**(2): 159-182.

Bryant, A. (2002). "Trust in Electronic Commerce Business Relationships." Journal of Electronic Commerce Research **3**(2): 32-39.

Brynjolfsson, E. (1993). "The productivity paradox of information technology." Communications of the ACM **36**(12): 66-77.

Bunn, M. D. (1993). "Taxonomy of Buying Decision Approaches." Journal of Marketing **57**(1): 38-56.

Cagliano, R., F. Caniato, et al. (2006). "The linkage between supply chain integration and manufacturing improvement programmes." International Journal of Operations & Production Management **26**(3): 282-299.

Chan, Y. E. (2000). "IT Value: The Great Divide Between Qualitative and Quantitative and Individual and Organizational Measures." Journal of Management Information Systems **16**(4): 225-261.

Chau, P. Y. K. (1996). "An empirical assessment of a modified technology acceptance model." Journal of Management Information Systems **13**(2): 185-

204.

Chau, P. Y. K., K. Y. Tam, et al. (2000). "Impact of Information Presentation Modes on Online Shopping: An Empirical Evaluation of a broadband interactive shopping service." Journal of Organizational Computing & Electronic Commerce **10**(1): 1-21.

Chen, S. C. and G. S. Dhillon (2003). "Interpreting Dimensions of Consumer Trust in E-Commerce." Information Technology and Management **4**(2-3): 303-318.

Chircu, A. M., G. B. Davis, et al. (2000). "The Role of Trust and Expertise in the Adoption of Electronic Commerce Intermediaries." MISRC Working paper, Carlson School of Management, University of Minnesota: 8.

Chircu, A. M. and R. J. Kauffman (2000). "Limits to Value in Electronic Commerce-Related IT Investments." Journal of Management Information Systems **17**(2): 59-80.

Choi, T. Y. and J. L. Hartley (1996). "An exploration of supplier selection practices across the supply chain." Journal of Operations Management **14**(4): 333-343.

Choudhury, V. (1997). "Strategic choices in the development of interorganizational information systems." Information Systems Research **8**(1): 1-23.

Chulikavit, K. and P. Tansuhaj (2001). "Electronic commerce: an SME's tool for developing trust within international network alliances." International Journal of E-Business Strategy Management **3**(2): 107-120.

Chung, S. H., R. K. Rainer Jr., et al. (2003). "The Impact of Information Technology Infrastructure Flexibility on Strategic Alignment and Applications Implementation." Communications of the AIS **11**: 191-203.

Churchill, G. A. (1979). "A Paradigm for Developing Better Measures of Marketing Constructs." Journal of Marketing Research **16**(1): 64-73.

Chwelos, P., I. Benbasat, et al. (2001). "Research Report: Empirical Test of an EDI Adoption Model." Information Systems Research **12**(3): 304-321.

Clark, T. H. and H. G. Lee (2000). "Performance, interdependence and coordination in business-to-business electronic commerce and supply chain management." Information Technology And Management **1**(1/2): 85-105.

Clemons, E. K. and M. C. Row (1993). "Limits to Interfirm Coordination through Information Technology: Results of a Field Study in Consumer Packaged Goods Distribution." Journal of Management Information Systems **10**(1): 73-95.

Closs, D. J., M. Swink, et al. (2005). "The role of information connectivity in making flexible logistics programs successful." International Journal of Physical Distribution & Logistics Management **35**(4): 258-277.

Co, H. C., B. E. Patuwo, et al. (1998). "The human factor in advanced manufacturing technology adoption: An empirical analysis." International Journal of Operations & Production Management **18**(1): 87-106.

Cohen, J. (1960). "A coefficient of agreement for nominal scales." Educational and Psychological Measurement **20**: 37-46.

Cohen, J. and P. Cohen (1983). Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences. Hillsdale, N.J., Lawrence Erlbaum Associates.

Compeau, D. R. and C. A. Higgins (1995). "Computer self-efficacy: Development of a measure and initial test." MIS Quarterly **19**(2): 189 -211.

Cook, T. D. and D. T. Campbell (1979). Quasi-Experimentation : Design & Analysis Issues for Field Settings. Chicago, Rand McNally College Pub. Co.

Cool, K. and J. Henderson (1998). "Power and firm profitability in supply chains: french manufacturing industry in 1993." Strategic Management Journal **19**(10): 909 - 926.

Cooper, R. B. and R. W. Zmud (1990). "Information Technology Implementation Research: A Technological Diffusion Approach." Management Science **36**(2): 123.

Cronbach, L. J. and P. E. Meehl (1955). "Construct validity in psychological tests." Psychological Bulletin **52**: 281-302.

Croom, S., P. Romano, et al. (2000). "Supply chain management: an analytical framework for critical literature review." European Journal of Purchasing & Supply Management **6**(1): 67-83.

Cureton, E. E., L. J. Cronbach, et al. (1996). Validity. Educational measurement: Origins, theories, and explications. A. W. Ward, H. W. Stoker and M. Murray-Ward. Lanham, MD, England, University Press of America. **1:** 125-243.

D'Aveni, R. A. and I. F. Kesner (1993). "Top Managerial Prestige, Power and Tender Offer Response: A Study of Elite Social Networks and Target Firms Cooperation During Takeovers." Organization Science: A Journal of the Institute of Management Sciences **4**(Issue 2): 123-151.

Dai, Q. and R. J. Kauffman (2002). "B2B E-Commerce Revisited: Leading Perspectives on the Key Issues and Research Directions." Electronic Markets **12**(2): 67-83.

Davis, F. D. (1989). "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology." MIS Quarterly **13**(3): 318-340.

Davis, F. D., R. P. Bagozzi, et al. (1989). "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models." Management Science **35**(8): 982-1003.

Deans, P. C. and J. W. W. Strachan (2002). Electronic B2B Commerce: Reasons Adoption Was Slower Than Forecast. Proceedings of the 17th Annual Conference of the International Academy for Information Management, Barcelona, Spain.

DeLone, W. H. and E. R. McLean (1992). "Information Systems Success: The Quest for the Dependent Variable." Information Systems Research **3**(1): 60-95.

DeLone, W. H. and E. R. McLean (2003). "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update." Journal of Management Information Systems **19**(4): 9-30.

DeMaio, H. B. (2001). B2B and Beyond: New Business Models Built on Trust. New York, NY, Wiley.

Dillman, D. A. and D. K. Bowker (2001). The Web Questionnaire Challenge to Survey Methodologists. Dimensions of Internet Science. U.-D. Reips and M. Bosnjak. Lengerich, Germany, Pabst Science Publishers.

Dillman, D. A., R. D. Tortora, et al. (1999). Principles for Constructing Web

Surveys, SESRC Technical Report 98-50**:** 16.

Dillman, D. A., R. D. Tortora, et al. (1998). Influence of Plain vs. Fancy Design on Response Rates for Web Surveys. Proceedings of the Annual Joint Statistical Meeting (JSM), Dallas, TX.

Dirks, K. T. and D. L. Ferrin (2001). "The Role of Trust in Organizational Settings." Organization Science: A Journal of the Institute of Management Sciences **12**(4): 450-467.

Doney, P. M. and J. P. Cannon (1997). "An examination of the nature of trust in buyer-seller relationships." Journal of Marketing **61**(2): 35-51.

Dreyer, B. and K. Gronhaug (2004). "Uncertainty, flexibility, and sustained competitive advantage." Journal of Business Research **57**(5): 484-494.

Dubosson-Torbay, M., A. Osterwalder, et al. (2002). "E-business Model Design, Classification, and Measurements." Thunderbird International Business Review **44**(1): 5 - 23.

Duncan, N. B. (1995). "Capturing flexibility of information technology infrastructure: A study of resource characteristics and their measure." Journal of Management Information Systems **12**(2): 37-57.

Dyer, J. H. and W. Chu (2003). "The Role of Trustworthiness in Reducing Transaction Costs and Improving Performance: Empirical Evidence from the United States, Japan, and Korea." Organization Science: A Journal of the Institute of Management Sciences **14**(1): 57-68.

Eardley, A., D. Avison, et al. (1997). "Developing Information Systems to Support Flexible Strategy." Journal of Organizational Computing & Electronic Commerce

7(1): 57-77.

Earl, M. J. (1989). Management strategies for information technology. New York, NY, Prentice Hall.

Eid, R., M. Trueman, et al. (2002). "A cross-industry review of B2B critical success factors." Internet Research: Electronic Networking Applications and Policy **12**(2): 110-123.

El Sawy, O. A. and A. Malhotra (1999). "IT-Intensive Value Innovation in the Electronic Economy: Insights from Marshall Industries." MIS Quarterly **23**(3): 305 -335.

Ellram, L. M. (2002). Strategic Cost Management in the Supply Chain: A Purchasing and Supply Management Perspective. Tempe, AZ, CAPS Research**:** 144.

Evans, J. S. (1991). "Strategic Flexibility for High Technology Manouevres: A Conceptual Framework." Journal of Management Studies **28**(1): 69-89.

Fawcett, S. E. and G. M. Magnan (2001). Achieving World-Class Supply Chain Alignment: Benefits, Barriers, and Bridges. Tempe, AZ, CAPS Research**:** 159.

Forrester, J. W. (1958). "Industrial Dynamics: A Major Breakthrough for Decision Makers." Harvard Business Review **36**(4): 37.

Forrester, J. W. (1961). Industrial dynamics. Cambridge, MA, M.I.T. Press.

Fowler, F. J. (2002). Survey Research Methods. London, Sage Publications.

Friedman, B., P. H. Khan, et al. (2000). "Trust online." Communications of the

ACM **43**(12): 34-40.

Frohlich, M. T. (2002). "E-Integration in the Supply Chain: Barriers and Performance." Decision Sciences **33**(4): 537 -556.

Frohlich, M. T. and R. Westbrook (2001). "Arcs of integration: an international study of supply chain strategies." Journal of Operations Management **19**(2): 185-200.

Gallivan, M. J. and G. Depledge (2003). "Trust, control and the role of interorganizational systems in electronic partnerships." Information Systems Journal **13**(2): 159-190.

Ganesan, S. (1994). "Determinants of long-term orientation in buyer-seller relationships." Journal of Marketing **58**(2): 1-19.

Gaski, J. F. (1984). "The Theory of Power and Conflict in Channels of Distribution." Journal of Marketing **48**(3): 9-29.

Gaski, J. F. (1986). "Interrelations Among a Channel Entity's Power Sources: Impact of the Exercise of Reward and Coercion on Expert, Referent, and Legitimate Power Sources." Journal of Marketing Research **23**(1): 62-77.

Gaski, J. F. and J. R. Nevin (1985). "The Differential Effects of Exercised and Unexercised Power Sources in a Marketing Channel." Journal of Marketing Research **22**(2): 130-142.

Gay, L. R. and P. Airasian (2003). Educational Research : Competencies for Analysis and Applications. Upper Saddle River, N.J., Merrill/Prentice Hall.

Gefen, D. (2000). "E-commerce: the role of familiarity and trust." Omega **28**(6):

725-737.

Gefen, D., E. Karahanna, et al. (2003). "Trust and TAM in Online Shopping: An Integrated Model." MIS Quarterly **27**(1): 51-90.

Giaglis, G. M., R. J. Paul, et al. (1999). "Assessing the Impact of Electronic Commerce on Business Performance." Electronic Markets **9**(1/2): 25-31.

Grabner-Krauter, S. and E. A. Kaluscha (2003). "Empirical research in on-line trust: a review and critical assessment." International Journal of Human-Computer Studies **58**(6): 783-812.

Grant, R. M. (1991). "The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation." California Management Review **33**(3): 114-135.

Greenspan, R. (2002). "EU B2B Expected to Explode." Retrieved January 13, 2004, from http://www.clickz.com/stats/markets/b2b/article.php/1453831.

Grewal, R. and P. Tansuhaj (2001). "Building Organizational Capabilities for Managing Economic Crisis: The Role of Market Orientation and Strategic Flexibility." Journal of Marketing **65**(2): 67-80.

Grover, V. and M. K. Malhotra (2003). "Transaction cost framework in operations and supply chain management research: theory and measurement." Journal of Operations Management **21**(4): 457-473.

Grover, V. and P. Ramanlal (1999). "Six Myths of Information and Markets: Information Technology Networks, Electronic Commerce, and the Battle for Consumer Surplus." MIS Quarterly **23**(4): 465 -495.

Grover, V., J. Teng, et al. (1998). "The influence of information technology diffusion and business process change on perceived productivity: The IS executive's perspective." Information & Management **34**(3): 141-159.

Guimaraes, T., Y. Yoon, et al. (1996). "Factors important to expert systems success." Information & Management **30**(3): 119-130.

Hair, J. F., R. E. Anderson, et al. (1995). Multivariate Data Analysis. Upper Saddle River, New Jersey, Prentice Hall.

Hardy, C. and N. Phillips (1998). "Strategies of Engagement: Lessons from the Critical Examination of Collaboration and Conflict in an Interorganizational Domain." Organization Science: A Journal of the Institute of Management Sciences **9**(2): 217-229.

Hart, P. and C. Saunders (1997). "Power and Trust: Critical Factors in the Adoption and Use of Electronic Data Interchange." Organization Science: A Journal of the Institute of Management Sciences **8**(1): 23-42.

Hart, P. J. and C. S. Saunders (1998). "Emerging electronic partnerships: Antecedents and dimensions of EDI use from the supplier's." Journal of Management Information Systems **14**(4): 87-111.

Hayward, M. L. A. and W. Boeker (1998). "Power and conflicts of interest in professional firms: Evidence from investment banking." Administrative Science Quarterly **43**(1): 1-22.

Head, M. M. and K. Hassanein (2002). "Trust in E-Commerce." Quarterly Journal of Electronic Commerce **3**(3): 307-325.

Hill, C. A. and G. D. Scudder (2002). "The use of electronic data interchange for

supply chain coordination in the food industry." Journal of Operations Management **20**(4): 375-387.

Holsapple, C. W. and W. Luo (1995). "Dependent Variables for Organizational Computing Research: An Empirical Study." Journal of Organizational Computing & Electronic Commerce **5**(1): 31-51.

Holsapple, C. W. and M. Singh (2000). "Electronic Commerce: From a Definitional Taxonomy Toward a Knowledge-Management View." Journal of Organizational Computing & Electronic Commerce **10**(3): 149-170.

Hsiung, H., S. Scheurich, et al. (2001). "Bridging e-business and added trust: keys to e-business growth." IT Professional **3**(2): 41-45.

Huff, L. and L. Kelley (2003). "Levels of Organizational Trust in Individualist Versus Collectivist Societies: A Seven-Nation Study." Organization Science: A Journal of the Institute of Management Sciences **14**(1): 81-90.

Humphreys, P. K., M. K. Lai, et al. (2001). "An inter-organizational information system for supply chain management." International Journal of Production Economics **70**(3): 245-255.

Iacovou, C. L., I. Benbasat, et al. (1995). "Electronic data interchange and small organizations: Adoption and impact of technology." MIS Quarterly **19**(4): 465-485.

International Data Corporation. (2004). "U.S. Online Strategic Sourcing 2004-2008 Forecast." Retrieved July 13, 2004, from http://www.idc.com/getdoc.jsp?containerId=31114.

Irani, Z. and P. E. D. Love (2000). "The Propagation of Technology Management

Taxonomies for Evaluating Investments in Information Systems." Journal of Management Information Systems **17**(3): 161-177.

Jackson, J., K.-c. Chang, et al. (2002). E-Commerce Strategy and Corporate Performance. Proceedings of the Eighth Americas Conference on Information Systems, Dallas, TX, Association for Information Systems.

Jap, S. D. (1999). "Pie-Expansion Efforts: Collaboration Processes in Buyer-Supplier Relationships." Journal of Marketing Research **36**(4): 461-475.

Jap, S. D. and J. J. Mohr (2002). "Leveraging Internet Technologies in B2B Relationships." California Management Review **44**(4): 24-38.

Jarvenpaa, S. L. (1989). "The Effect of Task Demands and Graphical Format on Information Processing Strategies." Management Science **35**(3): 285-303.

Jarvenpaa, S. L., K. Knoll, et al. (1998). "Is anybody out there? Antecedents of trust in global virtual teams." Journal of Management Information Systems **14**(4): 29-64.

Jarvenpaa, S. L. and D. E. Leidner (1999). "Communication and Trust in Global Virtual Teams." Organization Science: A Journal of the Institute of Management Sciences **10**(6): 791-815.

Jelassi, T. and O. Figon (1994). "Competing through EDI at Brun Passot: Achievements in France and ambitions for the Single." MIS Quarterly **18**(4): 337 -352.

Johnston, R. B. and H. C. Mak (2000). "An Emerging Vision of Internet-Enabled Supply Chain Electronic Commerce." International Journal of Electronic Commerce **4**(4): 43-60.

Jones, S., M. Wilikens, et al. (2000). "Trust requirements in e-business." Communications of the ACM **43**(12): 81-87.

Kaiser, H. F. (1958). "The varimax criterion for analytic rotation in factor analysis." Psychometrika 23: 187-200.

Kaufman, A., C. H. Wood, et al. (2000). "Collaboration and technology linkages: a strategic supplier typology." Strategic Management Journal **21**(6): 649 - 663.

Kaufmann, L. and C. R. Carter (2000). International Purchasing and Supply Management: A Comparison of U.S. and German Practices. Tempe, AZ, CAPS Research**:** 74.

Keller, S. B., K. Savitskie, et al. (2002). "A Summary and Analysis of Multi-Item Scales Used in Logistics Research." Journal of Business Logistics **23**(2): 83-181.

Keng, S. and J. Messersmith (2002). "Enabling Technologies for E-Commerce and ERP Integration." Quarterly Journal of Electronic Commerce **3**(1): 43-52.

Kent, J. L. and J. T. Mentzer (2003). "The Effect of Investment in Interorganizational Information Technology in a Retail Supply Chain." Journal of Business Logistics **24**(2): 155-175.

Kerlinger, F. N. (1986). Foundations of Behavioral Research. New York, Holt, Rinehart and Winston.

Keskinocak, P., R. Goodwin, et al. (2001). "Decision Support for Managing an Electronic Supply Chain." Electronic Commerce Research **1**(1/2): 15-31.

Khazanchi, D. and S. G. Sutton (2001). "Assurance Services for Business-to-

Business Electronic Commerce: A Framework and Implications." Journal of the AIS **1**: 53.

Kheng, C. B. and S. Al-Hawamdeh (2002). "The Adoption of Electronic Procurement in Singapore." Electronic Commerce Research **2**(1/2): 61-73.

Kim, S. W. and R. Narasimhan (2002). "Information system utilization in supply chain integration efforts." International Journal of Production Research **40**(18): 4585-4609.

King, W. R. and T. S. H. Teo (1996). "Key dimensions of facilitators and inhibitors for the strategic use of information technology." Journal of Management Information Systems **12**(4): 35-53.

Kivijärvi, H. and T. Saarinen (1995). "Investment in information systems and the financial performance of the firm." Information & Management **28**(2): 143-163.

Klassen, R. D. and J. Jacobs (2001). "Experimental comparison of Web, electronic and mail survey technologies in operations management." Journal of Operations Management **19**(6): 713-728.

Kohli, R. and S. Devaraj (2003). "Measuring Information Technology Payoff: A Meta-Analysis of Structural Variables in Firm-Level Empirical Research." Information Systems Research **14**(2): 127-145.

Korsgaard, M. A. and D. M. Schweiger (1995). "Building commitment, attachment, and trust in strategic decision-making teams: The role of." Academy of Management Journal **38**(1): 60-84.

Koushik, S. (2000). "Understanding B2B e-business Solutions. An Executive's Guide to Business-To- Business e-business." Retrieved May, 2001, from

http://www-1.ibm.com/industries/telecom/doc/content/bin/26560.pdf.

Krause, D. R. and R. B. Handfield (2001). Trust and its Role in Buyer-Supplier Relationships. Proceedings of the Decision Sciences Institute Annual Meeting, San Francisco, CA.

Krause, D. R., R. B. Handfield, et al. (1998). "An empirical investigation of supplier development: reactive and strategic processes." Journal of Operations Management **17**(1): 39-58.

Krause, D. R. and T. V. Scannell (2000). "A structural analysis of the effectiveness of buying firms' strategies to improve supplier." Decision Sciences **31**(1): 33 -55.

Kumar, K. (2001). "Technology for supporting supply chain management: introduction." Communications of the ACM **44**(6): 58-61.

Lai, V. S. and R. K. Mahapatra (2004). "Correlating business process re-engineering with the information systems department." International Journal of Production Research **42**(12): 2357-2382.

Lambert, D. M. and M. C. Cooper (2000). "Issues in Supply Chain Management." Industrial Marketing Management **29**(1): 65-83.

Landis, J. R. and C. G. Koch (1977). "The measurement of observer agreement for categorical data." Biometrics **33**: 159-174.

Landwehr, C. E. (2001). "Computer security." International Journal of Information Security **1**(1): 3 -13.

Le, T. T. (2002). "Pathways to Leadership for Business-to-Business Electronic

Marketplaces." Electronic Markets **12**(2): 112-119.

Le, T. T., S. S. Rao, et al. (2004). "Industry-Sponsored Marketplaces: a Platform for Supply Chain Integration or a Vehicle for Market Aggregation?" Electronic Markets **14**(4): 295-308.

Lederer, A. L., D. A. Mirchandani, et al. (2001). "The Search for Strategic Advantage from the World Wide Web." International Journal of Electronic Commerce **5**(4): 117-133.

Lee, H. L. (2002). "Aligning Supply Chain Strategies with Product Uncertainties." California Management Review **44**(3): 105 -119.

Lee, H. L., K. C. So, et al. (1997). "The Value of Information Sharing in a Two-Level Supply Chain." Management Science **43**(4): 546-559.

Lee, H. L., K. C. So, et al. (2000). "The Value of Information Sharing in a Two-Level Supply Chain." Management Science **46**(5): 626-644.

Lee, J.-N. and Y.-G. Kim (1999). "Effect of Partnership Quality on IS Outsourcing Success: Conceptual Framework and Empirical Validation." Journal of Management Information Systems **15**(4): 29-61.

Lee, S. (1991). "The Impact of Office Information Systems on Potential Power and Influence." Journal of Management Information Systems **8**(2): 135-151.

Leonard, L. N. K. and T. P. Cronan (2000). Electronic Versus Manual Replenishment in Supply Chains: Does it Make a Diffrence in the Sucess of the Firm? Proceedings of the Decision Sciences Institute Annual Meeting, Orlando, FL.

Leonard, L. N. K. and T. P. Cronan (2002). "A Study of the Value and Impact of Electronic Commerce: Electronic Versus Traditional Replenishment in Supply Chains." Journal of Organizational Computing & Electronic Commerce **12**(4): 307-327.

Lewis, B. R. and C. A. Snyder (1995). "An empirical assessment of the information resource management construct." Journal of Management Information Systems **12**(1): 199-223.

Li, E. Y. (1997). "Perceived importance of information system success factors: A meta analysis of group differences." Information & Management **32**(1): 15-28.

Li, S. (2002). An integrated model for supply chain management practice, performance and competitive advantage. Doctoral Dissertation, University of Toledo, Toledo, OH.

Li, S., B. Ragu-Nathan, et al. (2006). "The impact of supply chain management practices on competitive advantage and organizational performance." Omega **34**(2): 107-124.

Li, S., S. S. Rao, et al. (2005). "Development and validation of a measurement instrument for studying supply chain management practices." Journal of Operations Management **23**(6): 618-641.

Love, P. E. D., Z. Irani, et al. (2002). "A model for supporting inter-organizational relations in the supply chain." Engineering Construction & Architectural Management **9**(1): 2-15.

Mabert, V. A. and M. A. Venkataramanan (1998). "Special research focus on supply chain linkages: Challenges for design and management in the 21st." Decision Sciences **29**(3): 537 -552.

Mackay, D. R., G. L. Altmann, et al. (2003). "How intimate are Australian e-business retail supply chains?" Logistics Information Management **16**(1): 48-55.

Madie, D. (1999). "The basic strategic challenge of e-commerce." International Journal of E-Business Strategy Management **1**(1): 27-32.

Magnan, G. M. and S. E. Fawcett (2002). Supply Chain Barriers, Bridges And Benefits: Perspectives From The Literature. Proceedings of the Decision Sciences Institute Annual Meeting, San Diego, CA.

Mahmood, M. A. and G. J. Mann (1993). "Measuring the Organizational Impact of Information Technology Investment: An Exploratory Study." Journal of Management Information Systems **10**(1): 97-122.

Malhotra, D. and J. K. Murnighan (2002). "The Effects of Contracts on Interpersonal Trust." Administrative Science Quarterly **47**(3): 534-559.

Malone, T., J. Yates, et al. (1987). "Electronic Markets and Electronic Hierarchies." Communications of the ACM **30**(6): 484-497.

Malone, T. W., J. Yates, et al. (1989). "The Logic of Electronic Markets." Harvard Business Review **67**(3): 166-169.

Massetti, B. and R. W. Zmud (1996). "Measuring the extent of EDI usage in complex organizations: Strategies and illustrative examples." MIS Quarterly **20**(3): 331-345.

Mata, F. J., W. L. Fuerst, et al. (1995). "Information technology and sustained competitive advantage: A resource-based analysis." MIS Quarterly **19**(4): 487-505.

Mayer, R. C. and J. H. Davis (1995). "An integrative model of organizational trust." Academy of Management Review **20**(3): 709-734.

McAllister, D. J. (1995). "Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations." Academy of Management Journal **38**(1): 24-59.

McEvily, B., V. Perrone, et al. (2003). "Trust as an Organizing Principle." Organization Science: A Journal of the Institute of Management Sciences **14**(1): 91-103.

McGee, A. R., S. R. Vasireddy, et al. (2003). "A Framework for Ensuring Network Security." Bell Labs Technical Journal **8**(4): 7.

McKeown, B. and D. Thomas (1988). Q methodology. Newbury Park, CA, Sage Publications.

McKnight, D. H. and N. L. Chervany (1996). "The Meanings of Trust." MISRC Working paper , Carlson School of Management, University of Minnesota: 86.

McKnight, D. H. and N. L. Chervany (2001). "What Trust Means in E-Commerce Customer Relationships: An Interdisciplinary Conceptual Typology." International Journal of Electronic Commerce **6**(2): 35-59.

McKnight, D. H., V. Choudhury, et al. (2002). "Developing and Validating Trust Measures for e-Commerce: An Integrative Typology." Information Systems Research **13**(3): 334-359.

McKnight, D. H., L. Cummings, et al. (1996). "Trust Formation in New Organizational Relationships." MISRC Working paper , Carlson School of

Management, University of Minnesota: 46.

McKnight, D. H., L. L. Cummings, et al. (1998). "Initial trust formation in new organizational relationships." Academy of Management Review **23**(3): 473-490.

McLaren, T., M. Head, et al. (2002). "Supply chain collaboration alternatives: understanding the expected costs and benefits." Internet Research: Electronic Networking Applications and Policy **12**(4): 348-364.

Mentzer, J. T. (2001). Managing Supply Chain Collaboration. IFPMM 2001 World Congress, Sun City, South Africa.

Mentzer, J. T., W. DeWitt, et al. (2001). "Defining Supply Chain Management." Journal of Business Logistics **22**(2): 1-25.

Mertler, C. A. and R. A. Vannatta (2002). Advanced and Multivariate Statistical Methods. Los Angeles, CA, Pyrczak Publishing.

Microsoft Corporation (2002). "Empowering Suppliers for Integrated Business-to-Business E-Commerce." White Paper: 28.

Mieczkowska, S. M., D. L. Barnes, et al. (2002). "Finding the Fit: Applications of B2B e-Business in Three UK Insurance Companies." Electronic Markets **12**(3): 184-191.

Min, H. and W. P. Galle (1999). "Electronic commerce usage in business-to-business purchasing." International Journal of Operations & Production Management **19**(9): 909-921.

Min, S. and J. T. Mentzer (2004). "Developing and Measuring Supply Chain Management Concepts." Journal of Business Logistics **25**(1): 63-99.

Mirani, R. and A. L. Lederer (1998). "An instrument for assessing the organizational benefits of IS projects." Decision Sciences **29**(4): 803 -838.

Misiolek, N., N. Zakaria, et al. (2002). Trust in Organizational Acceptance of Information Technology: A Conceptual Model and Preliminary Evidence. Proceedings of the Decision Sciences Institute Annual Meeting, San Diego, CA.

Mohr, J. and R. Spekman (1994). "Characteristics of Partnership Success: Partnership Attributes, Communication Behavior, and Conflict Resolution Techniques." Strategic Management Journal **15**(2): 135-152.

Monczka, R. M. and K. J. Petersen (1998). "Success factors in strategic supplier alliances: The buying company perspective." Decision Sciences **29**(3): 553 -577.

Moore, G. C. and I. Benbasat (1991). "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation." Information Systems Research **2**(3): 192-222.

Mukhopadhyay, T. and S. Kekre (1995). "Business value of information technology: A study of electronic data interchange." MIS Quarterly **19**(2): 137 -156.

Mukhopadhyay, T. and S. Kekre (2002). "Strategic and Operational Benefits of Electronic Integration in B2B Procurement Processes." Management Science **48**(10): 1301-1313.

Murphy, K. E. and S. J. Simon (2002). "Intangible benefits valuation in ERP projects." Information Systems Journal **12**(4): 301-320.

Nahm, A. Y., L. E. Solis-Galvan, et al. (2002). "The Q-Sort Method: Assessing

Reliability and Construct Validity of Questionnaire Items at a Pre-Testing Stage." Journal of Modern Applied Statistical Methods **1**(1): 114-125.

Nakayama, M. (2000). "E-commerce and firm bargaining power shift in grocery marketing channels: A case of wholesalers' structured document exchanges." Journal of Information Technology **15**(3): 195-210.

Nakayama, M. (2000). Evaluation of IT Effectiveness for Business-to-Business E-Commerce: Roles of Strategic Stakes in Interfirm Relationships and Top Management Communication. Proceedings of the Sixth Americas Conference on Information Systems, Long Beach, CA, Association for Information Systems.

Nakayama, M. (2003). "An assessment of EDI use and other channel communications on trading behavior and trading partner knowledge." Information and Management **40**(6): 563-580.

Nambisan, S. (2000). "EC and Supply Chain Management: Towards Cross-Industry Supply Chains." Electronic Markets **10**(3): 197-202.

Narasimhan, R. and A. Das (1999). "An empirical investigation of the contribution of strategic sourcing to manufacturing." Decision Sciences **30**(3): 683 -718.

Narasimhan, R. and A. Das (2001). "The impact of purchasing integration and practices on manufacturing performance." Journal of Operations Management **19**(5): 593-609.

Narasimhan, R. and J. Jayaram (1998). "Causal linkages in supply chain management: An exploratory study of North American manufacturing." Decision Sciences **29**(3): 579 -605.

Narasimhan, R. and S. W. Kim (2001). "Information System Utilization Strategy

for Supply Chain Integration." Journal of Business Logistics **22**(2): 51-75.

Narasimhan, R. and S. W. Kim (2002). "Effect of supply chain integration on the relationship between diversification and performance: evidence from Japanese and Korean firms." Journal of Operations Management **20**(3): 303-323.

Narasimhan, R., S. Talluri, et al. (2003). Evaluating E-Procurement Solutions. Tempe, AZ, CAPS Research**:** 36.

Neter, J., M. H. Kutner, et al. (1996). Applied Linear Regression Models. Homewood, Ill., Irwin.

Nidumolu, S. R. and G. W. Knotts (1998). "The effects of customizability and reusability on perceived process and competitive performance." MIS Quarterly **22**(2): 105 -137.

Nooteboom, B. and H. Berger (1997). "Effects of trust and governance on relational risk." Academy of Management Journal **40**(2): 308-338.

Nunnally, J. C. and I. H. Bernstein (1994). Psychometric Theory. New York, N.Y., McGraw Hill.

Oliver, K., A. Chung, et al. (2003). "Beyond Utopia. The Realist's Guide to Internet-Enabled Supply Chain Management." Strategy and Business(23): 1-10.

Olson, J. S. and G. M. Olson (2000). "i2i trust in e-commerce." Communications of the ACM **43**(12): 41-44.

Pabrai, U. O. A. (2000). "E-Security and e-Business: disruption of the enterprise." International Journal of E-Business Strategy Management **1**(4): 299-302.

Pant, S., R. Sethi, et al. (2003). "Making sense of the e-supply chain landscape: an implementation framework." International Journal of Information Management **23**(3): 201-221.

Papadopoulou, P., P. Kanellis, et al. (2001). Investigating Trust in E-Commerce: A Literature Review and a Model For its Formation in Customer Relationships. Proceedings of the Seventh Americas Conference on Information Systems, Boston, MA, Association for Information Systems.

Pavlou, P. A. (2001). Integrating Trust in Electronic Commerce with the Technology Acceptance Model: Model Development and Validation. Proceedings of the Seventh Americas Conference on Information Systems, Boston, MA, Association for Information Systems.

Pavlou, P. A. (2002). Coordination of Task Interdependencies in Collaborative Supply Chains: Interorganizational It-Enabled Coordination Capabilities. Proceedings of the Eighth Americas Conference on Information Systems, Dallas, TX, Association for Information Systems.

Pavlou, P. A. (2002). "Institution-based trust in interorganizational exchange relationships: the role of online B2B marketplaces on trust formation." Journal of Strategic Information Systems **11**(3-4): 215-243.

Pavlou, P. A. and L. Chai (2002). "What Drives Electronic Commerce Across Cultures? A Cross-Cultural Empirical Investigation of the Theory of Planned Behavior." Journal of Electronic Commerce Research **3**(4): 240-253.

Pavlou, P. A. and D. Gefen (2002). Building Effective Online Marketplaces with Institution-Based Trust. Proceedings of the Twenty-Third International Conference on Information Systems, Barcelona, Spain.

Pedhazur, E. J. and L. Schmelkin (1991). Measurement, Design, and analysis: An Integrated Approach. Hillsdale, N.J., Lawrence Erlbaum Associates.

Porter, M. E. (1980). Competitive Strategy: Techniques for Analyzing Industries and Competitors. New York, NY, Free Press.

Powell, T. C. and A. Dent-Micallef (1997). "Information technology as competitive advantage: the role of human, business, and technology resources." Strategic Management Journal **18**(5): 375 - 405.

Power, D. (2002). "Application of established and emerging B2B e-commerce technologies: Australian empirical evidence." Integrated Manufacturing Systems **13**(8): 573-585.

Prasad, S. and J. Tata (2000). "Information investment in supply chain management." Logistics Information Management **13**(1): 33-38.

Premkumar, G. and W. R. King (1992). "An Empirical Assessment of Information Systems Planning and the Role of Information Systems in Organizations." Journal of Management Information Systems **9**(2): 99-125.

Premkumar, G. and W. R. King (1994). "Organizational Characteristics and Information Systems Planning: An Empirical Study." Information Systems Research **5**(2): 75-109.

Premkumar, G. and K. Ramamurthy (1995). "The role of interorganizational and organizational factors on the decision mode for adoption of Interorganizational Systems." Decision Sciences **26**(3): 303 -336.

Premkumar, G. P. (2000). "Interorganization Systems and Supply Chain Management: An Information Processing Perspective." Information Systems

Management **17**(3): 56 -69.

Quesada, G. (2004). A Study of eProcurement Technologies, Procurement Practices, Procurement Performance and their Relationship. Doctoral Dissertation, University of Toledo, Toledo, OH.

Raghunathan, B. and T. S. Raghunathan (1988). "Impact of Top Management Support on IS Planning." Journal of Information Systems **2**(2): 15.

Ragu-Nathan, B., C. H. Apigian, et al. (2004). "A path analytic study of the effect of top management support for information systems performance." Omega **32**(6): 459-471.

Rai, A. and D. S. Bajwa (1997). "An empirical investigation into factors relating to the adoption of executive information systems: An analysis of EIS for collaboration and decision support." Decision Sciences **28**(4): 939-974.

Rajkumar, T. M. (2001). "E-Procurement: Business and Technical Issues." Information Systems Management **18**(4): 52 -60.

Ramamurthy, K., G. Premkumar, et al. (1999). "Organizational and Interorganizational Determinants of EDI Diffusion and Organizational Performance: A Causal Model." Journal of Organizational Computing & Electronic Commerce **9**(4): 253-285.

Ranganathan, C., J. S. Dhaliwal, et al. (2004). "Assimilation and Diffusion of Web Technologies in Supply-Chain Management: An Examination of Key Drivers and Performance Impacts." International Journal of Electronic Commerce **9**(1): 127-161.

Rao, S. S., M. Glenn, et al. (2003). "Electronic commerce development in small

and medium sized enterprises: A stage model and its implications." Business Process Management Journal **9**(1): 11-32.

Ratnasingam, P. (2000). Developing Inter-Organizational Trust in Business-to-Business e-Commerce Participation - Case Studies in the Automotive Industry. Hershey, PA, Idea Group Pub.

Ratnasingam, P. (2000). "The influence of power on trading partner trust in electronic commerce." Internet Research: Electronic Networking Applications and Policy **10**(1): 56-63.

Ratnasingam, P. (2001). "Inter-organizational trust in EDI adoption: the case of Ford Motor Company and PBR Limited in Australia." Internet Research: Electronic Networking Applications and Policy **11**(3): 261-269.

Ratnasingam, P. and S. Klein (2001). Perceived Benefits of Inter-Organizational Trust in E-Commerce Participation: A Case Study in the Telecommunication Industry. Proceedings of the Seventh Americas Conference on Information Systems, Boston, MA, Association for Information Systems.

Ratnasingam, P. and P. A. Pavlou (2003). "Technology Trust in Internet-Based Interorganizational Electronic Commerce." Journal of Electronic Commerce in Organizations **1**(1): 17-41.

Ratnasingam, P. and D. D. Phan (2003). "Trading Partner Trust in B2B E-Commerce: A Case Study." Information Systems Management **20**(3): 39 -50.

Raymond, L. and F. Bergeron (1996). "EDI Success in Small and Medium-Sized Enterprises: A Field Study." Journal of Organizational Computing & Electronic Commerce **6**(2): 161-172.

Rice, J. J. B. and R. M. Hoppe (2001). "Supply Chain vs. Supply Chain." Supply Chain Management Review **5**(5): 47-54.

Roberts, B. and M. Mackay (1998). "IT supporting supplier relationships: The role of electronic commerce." European Journal of Purchasing & Supply Management **4**(2-3): 175-184.

Rogers, E. M. (1983). Diffusion of Innovations. New York, NY, Free Press.

Rollins, J. D., D. A. Marchand, et al. (2000). "Information Capabilities: The Key to Winning in the New Economy." Outlook Journal **12**(2): 6-32.

Rosenbloom, A. (2000). "Trusting Technology." Communications of the ACM **43**(12): 30-32.

Rosenbloom, B. (2002). "The ten deadly myths of e-commerce." Business Horizons **45**(2): 61-66.

Rosenzweig, E. D., A. V. Roth, et al. (2003). "The influence of an integration strategy on competitive capabilities and business performance: An exploratory study of consumer products manufacturers." Journal of Operations Management **21**(4): 437-456.

Rudberg, M., N. Klingenberg, et al. (2002). "Collaborative supply chain planning using electronic marketplaces." Integrated Manufacturing Systems **13**(8): 596-610.

Ryssel, R., T. Ritter, et al. (2004). "The impact of information technology deployment on trust, commitment and value creation in business relationships." Journal of Business & Industrial Marketing **19**(3): 197-207.

Sabath, R. E. and J. Fontanella (2002). "The Unfulfilled Promise of Supply Chain Collaboration." Supply Chain Management Review **6**(4): 24-29.

Sahin, F. and E. P. Robinson (2002). "Flow Coordination and Information Sharing in Supply Chains: Review, Implications, and Directions for Future Research." Decision Sciences **33**(4): 505-536.

Sakaguchi, T., C. C. Dibrell, et al. (2002). Development of an Integrated Supply Chain Model. Proceedings of the Eighth Americas Conference on Information Systems, Dallas, TX, Association for Information Systems.

Sawhney, M. S. and J. Zabin (2001). The Seven Steps to Nirvana. Strategic Insights into E-business Transformation. New York, NY, McGraw-Hill.

Schneider, F. B. and National Research Council (U.S.), Eds. (1999). Trust in Cyberspace. Washington, D.C., National Academy Press.

Schoenfeldt, L. F. (1984). Psychometric Properties of Organizational Research Instruments. Method and Analysis in Organizational Research. T. S. Bateman and G. R. Ferris. Reston, Va., Reston Pub. Co.**:** xi, 415 p. :.

Schonlau, M., R. D. Fricker, et al. (2002). Conducting research surveys via E-mail and the Web. Santa Monica, CA, RAND.

Schroeder, R. G., K. A. Bates, et al. (2002). "A resource-based view of manufacturing strategy and the relationship to manufacturing performance." Strategic Management Journal **23**(2): 105 - 117.

Segars, A. H. and V. Grover (1993). "Re-examining perceived ease of use and usefulness: A confirmatory factor analysis." MIS Quarterly **17**(4): 517 -525.

Sethi, V. and W. R. King (1994). "Development of measures to assess the extent to which an information technology application provides competitive advantage." Management Science **40**(12): 1601-1627.

Setzekorn, K., A. Rai, et al. (2002). Manufacturing IT infrastructure and supply Chain coordination strategy's impact on Strategic performance. Proceedings of the Eighth Americas Conference on Information Systems, Dallas, TX, Association for Information Systems.

Shapiro, S. P. (1987). "The Social Control of Impersonal Trust." The American Journal of Sociology **93**(3): 623-658.

Shin, H., D. A. Collier, et al. (2000). "Supply management orientation and supplier/buyer performance." Journal of Operations Management **18**(3): 317-333.

Shon, T.-H. and P. M. C. Swatman (1998). "Identifying effectiveness criteria for Internet payment systems." Internet Research: Electronic Networking Applications and Policy **8**(3): 202-218.

Singh, J. (1996). "The importance of information flow within the supply chain." Logistics Information Management **9**(4): 28-30.

Sitkin, S. B. and N. L. Roth (1993). "Explaining the Limited Effectiveness of Legalistic "Remedies" for Trust/Distrust." Organization Science: A Journal of the Institute of Management Sciences **4**(3): 367-392.

Smart Chemicals Forum (2001). eCollaboration in Speciality Chemicals. London, UK, Netmarkets Europe Limited**:** 27.

Soliman, K. S. (2003). "Internet-Based Business-to-Business Electronic Commerce: A CIO's Perspective." Information Systems Management **20**(1): 35 -

41.

Srinivasan, K., S. Kekre, et al. (1994). "Impact of electronic data interchange technology on JIT shipments." Management Science **40**(10): 1291-1304.

Sriram, V., R. L. Stump, et al. (1997). "Information technology investments in purchasing: An empirical study of dimensions and antecedents." Information & Management **33**(2): 59-72.

Stafford, T. (2002). Trust, Transactions, and Relational Exchange: Virtual Integration and Agile Supply Chain Management. Proceedings of the Eighth Americas Conference on Information Systems, Dallas, TX, Association for Information Systems.

Stewart, G. (1997). "Supply-chain operations reference model (SCOR): the first cross-industry framework for integrated supply-chain management." Logistics Information Management **10**(2): 62-67.

Stewart, K. J. (2003). "Trust Transfer on the World Wide Web." Organization Science: A Journal of the Institute of Management Sciences **14**(1): 5-17.

Stock, G. N., N. P. Greis, et al. (2000). "Enterprise logistics and supply chain structure: the role of fit." Journal of Operations Management **18**(5): 531-547.

Stratman, J. K. and A. V. Roth (2002). "Enterprise Resource Planning (ERP) Competence Constructs: Two-Stage Multi-Item Scale Development and Validation." Decision Sciences **33**(4): 601 -628.

Straub, D. W. and R. T. Watson (2001). "Research Commentary: Transformational Issues in Researching IS and Net-Enabled Organizations." Information Systems Research **12**(4): 337.

Stroeken, J. H. M. (2000). "Information technology, innovation and supply chain structure." International Journal of Technology Management **20**(1/2): 156-175.

Subramani, M. R. (2002). "How Do Suppliers Benefit From IT Use in Supply Chain Relationships?" MISRC Working paper , Carlson School of Management, University of Minnesota: 43.

Subramaniam, C. and M. J. Shaw (2002). "A Study of the Value and Impact of B2B E-Commerce: The Case of Web-Based Procurement." International Journal of Electronic Commerce **6**(4): 19-40.

Swafford, P. M. (2003). Theoretical Development and Empirical Investigation of Supply Chain Agility. Doctoral Dissertation, Georgia Institute of Technology, Atlanta, GA.

Takeishi, A. (2001). "Bridging inter and intra-firm boundaries: management of supplier involvement in automobile product development." Strategic Management Journal **22**(5): 403 - 433.

Tan, K. C. (2001). "A framework of supply chain management literature." European Journal of Purchasing and Supply Management **7**(1): 39-48.

Tan, Y.-H. and W. Thoen (2000). "A Logical Model of Trust in Electronic Commerce." Electronic Markets **10**(4): 258-263.

Tan, Y.-H. and W. Thoen (2000). "Toward a Generic Model of Trust for Electronic Commerce." International Journal of Electronic Commerce **5**(2): 61-74.

Tan, Y.-H., T. Yao-Hua, et al. (2000). "An Outline of a Trust Model for Electronic Commerce." Applied Artificial Intelligence **14**(8): 849-862.

Tatikonda, M. V. and M. M. Montoya-Weiss (2001). "Integrating Operations and Marketing Perspectives of Product Innovation: The Influence of Organizational Process Factors and Capabilities on Development Performance." Management Science **47**(1): 151-172.

Teo, H. H., B. C. Y. Tan, et al. (1997). "Organizational transformation using electronic data interchange: The case of TradeNet in Singapore." Journal of Management Information Systems **13**(4): 139-165.

Teo, H. H., K. K. Wei, et al. (2003). "Predicting Intention to Adopt Interorganizational Linkages: An Institutional Perspective." MIS Quarterly **27**(1): 19 -49.

Teo, T. S. H. and W. Y. Choo (2001). "Assessing the impact of using the Internet for competitive intelligence." Information & Management **39**(1): 67-83.

Thatcher, M. E. and J. R. Oliver (2001). "The Impact of Technology Investments on a Firm's Production Efficiency, Product Quality, and Productivity." Journal of Management Information Systems **18**(2): 17-45.

Thatcher, S. M. B. (2002). Business-to-Business E-Commerce: A Study of Greater Chinese and U.S. Electronics and Apparel/Textile Firms. Tempe, AZ, CAPS Research**:** 146.

Thomson, M. (2006). "Human Brands: Investigating Antecedents to Consumers' Strong Attachments to Celebrities." Journal of Marketing **70**(3): 104-119.

Thong, J. Y. L., Y. Chee-Sing, et al. (1997). "Environments for Information Systems Implementation in Small Businesses." Journal of Organizational Computing & Electronic Commerce **7**(4): 253-278.

Timmers, P. (1999). Electronic commerce: Strategies and Models for Business-to-Business Trading. Chichester, NY, Wiley,.

Todd, P. and I. Benbasat (1993). "An Experimental Investigation of the Relationship between Decision Makers, Decision Aids and Decision Making Effort." Information Systems Research **31**(2): 80-100.

Tomak, K. and M. Xia (2002). "Evolution of B2B Marketplaces." Electronic Markets **12**(2): 84-91.

Truong, D. (2004). A Study of Business-to-Business Marketplace Usage from the Buyer Perspective. Doctoral Dissertation, University of Toledo, OH, Toledo.

Tumolo, M. (2001). "Business-to-Business Exchanges." Information Systems Management **18**(2): 54-62.

Urbaczewski, A., L. M. Jessup, et al. (2002). "Electronic Commerce Research: A Taxonomy and Synthesis." Journal of Organizational Computing & Electronic Commerce **12**(4): 263-305.

Urban, G. L. (2003). "The Trust Imperative." CISR Working paper , Sloan School of Management, MIT: 18.

Vakharia, A. J. (2002). "E-Business and Supply Chain Management." Decision Sciences **33**(4): 495-504.

Venkatraman, N. (1994). "IT-enabled business transformation: From automation to business scope redefinition." Sloan Management Review **35**(2): 73-87.

Viega, J., T. Kohno, et al. (2001). "Trust (and mistrust) in secure applications."

Communications of the ACM **44**(2): 31-36.

Vijayasarathy, L. R. and D. Robey (1997). "The effect of EDI on market channel relationships in retailing." Information & Management **33**(2): 73-86.

Warkentin, M., Ed. (2002). Business to Business Electronic Commerce : Challenges and Solutions. Hershey, PA, Idea Group Publishing.

Warkentin, M., R. Bapna, et al. (2000). "The Information Dimension of Emerging Supply Chain Relationships in E-Commerce Markets." Journal of Electronic Commerce Research **1**(2): 45-59.

Warkentin, M., R. Bapna, et al. (2001). "E-knowledge networks for inter-organizational collaborative e-business." Logistics Information Management **14**(1-2): 149-163.

Weill, P. (1992). "The Relationship Between Investment in Information Technology and Firm Performance: A Study of the Valve Manufacturing Sector." Information Systems Research **3**(4): 307-333.

Weill, P., M. R. Subramani, et al. (2002). "IT Infrastructure for Strategic Agility." CISR Working paper , Sloan School of Management, MIT: 32.

Weill, P. and M. Vitale (2002). "What IT Infrastructure Capabilities are Needed to Implement E-Business Models?" MIS Quarterly Executive **1**(1): 17-34.

Weiss, A. M. and N. Kurland (1997). "Holding Distribution Channel Relationships Together: The Role of Transaction-Specific Assets and Length of Prior Relationship." Organization Science: A Journal of the Institute of Management Sciences **8**(6): 612-623.

Wells, J. D., A. Urbaczewski, et al. (2001). Electronic Partnerships: When Power Takes the Form of a Barrier to Adoption. Proceedings of the Seventh Americas Conference on Information Systems, Boston, MA, Association for Information Systems.

Welty, B. and I. Becerra-Fernandez (2001). "Managing trust and commitment in collaborative supply chain relationships." Communications of the ACM **44**(6): 67-73.

Wernerfelt, B. (1984). "A Resource-based View of the Firm." Strategic Management Journal **5**(2): 171-180.

Wheelwright, S. C. and R. H. Hayes (1985). "Competing Through Manufacturing." Harvard Business Review **63**(1): 99-109.

Wigand, R. (1997). "Electronic Commerce: Definition, Theory, and Context." Information Society **13**(1): 1-16.

Williamson, O. E. (1975). Markets and Hierarchies, Analysis and Antitrust implications : A Study in the Economics of Internal Organization. New York, Free Press.

Williamson, O. E. (1993). "Calculativeness, trust, and economic organization." Journal of Law and Economics **34**: 453-502.

Wilson, D. T. and R. P. Vlosky (1998). "Interorganizational information system technology and buyer-seller relationships." Journal of Business & Industrial Marketing **13**(3): 215-234.

Wixom, B. H. and H. J. Watson (2001). "An Empirical Investigation of the Factors Affecting Data Warehousing Success." MIS Quarterly **25**(1): 17 -38.

Wondergem, J. (2001). Supply Chain Operations Reference-model Includes all Elements of Demand Satisfaction. IFPMM 2001 World Congress, Sun City, South Africa.

Xia, W. and R. K. William (2002). "Determinants of Organizational IT Infrastructure Capabilities: An Empirical Study." MISRC Working paper , Carlson School of Management, University of Minnesota: 52.

Yan, A. and B. Gray (1994). "Bargaining power, management control and performance in United States-China joint ventures: A comparative case study." Academy of Management Journal **37**(6): 1478-1517.

Yau, O. B. (2003). "Adoption of Business-to-Business electronic commerce: A case study of a Hong Kong jewelry manufacturer." International Journal of E-Business Strategy Management **4**(3): 229-245.

Yen, B. P. C. and E. O. S. Ng (2002). "Migrating Procurement onto the Internet." Electronic Commerce Research **2**(1/2): 113-134.

Young-Ybarra, C. and M. Wiersema (1999). "Strategic Flexibility in Information Technology Alliances: The Influence of Transaction Cost Economics and Social Exchange Theory." Organization Science: A Journal of the Institute of Management Sciences **10**(4): 439-459.

Young, D., H. H. Carr, et al. (1999). "Strategic implications of electronic linkages." Information Systems Management **16**(1): 32 -39.

Zaheer, A., B. McEvily, et al. (1998). "Does Trust Matter? Exploring the Effects of Interorganizational and Interpersonal Trust on Performance." Organization Science: A Journal of the Institute of Management Sciences **9**(2): 123-141.

Zaheer, A. and N. Venkatraman (1994). "Determinants of Electronic Integration in the Insurance Industry: An Empirical Test." Management Science **40**(5): 549-566.

Zhang, Q. (2001). Technology infusion enabled value chain flexibility : a learning and capability-based perspective. Doctoral Dissertation, University of Toledo, Toledo, OH.

Zhu, K. and K. L. Kraemer (2002). "e-Commerce Metrics for Net-Enhanced Organizations: Assessing the Value of e-Commerce to Firm Performance in the Manufacturing Sector." Information Systems Research **13**(3): 275-295.

Zhu, Q. and J. Sarkis (2004). "Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises." Journal of Operations Management **22**(3): 265-289.

Zhuang, Y. and A. L. Lederer (2001). Electronic Commerce and a Resource-Based View of the Firm. Proceedings of the Seventh Americas Conference on Information Systems, Boston, MA, Association for Information Systems.

Zucker, L. G. (1987). "Institutional Theories of Organization." Annual Review of Sociology **13**: 443-464.

Appendix A. List of items included in the Q-Sort Analysis

Trading Partner Trust

Competence

- Our trading partners are competent in our business relationships
- Our trading partners perform their role very well
- Our trading partners are capable in our business relationships
- Our trading partners are very knowledgeable about their business

Benevolence

- I believe our trading partners would act in our best interest
- If we require help, our trading partners would do their best to help us
- Our trading partners are interested in our well-being, not just their own
- Our trading partners are likely to care for our welfare
- If there is a problem, our trading partners are likely to go out on a limb for us
- Our trading partners are likely to make sacrifices for us if needed

Integrity

- Our trading partners are truthful in their dealings with us
- Our trading partners are honest
- Our trading partners would keep their commitments
- Our trading partners are likely to be honest in dealing with us
- Promises made by our trading partners are likely to be reliable
- Our trading partners are likely to be open with us if problems occur

Technology Trust Mechanisms

- Firewall mechanisms
- Encryption mechanisms
- Logon procedures (IDs and Passwords)
- Network access controls
- Mechanisms to control the quality and integrity of the data
- Accounting controls
- Seal assurances
- Digital signatures
- Recovery mechanisms
- Backup mechanisms

Trading Partner Power

- Our Trading Partners played a major role in our decision whether or not to adopt Web-Based EC
- Our Trading Partners imposed their rules and regulations for using Web-Based EC
- Our Trading Partners imposed the format and standards in Web-Based EC
- When implementing Web-Based EC, we normally don't have much influence in the negotiations with our trading partners
- Our trading partners were the force behind the implementation of Web-Based EC

E-Infrastructure

IT Use

- Electronic Data Interchange (EDI)
- Groupware
- Electronic Fund Transfer (EFT)
- Intranet
- Extranet
- Transaction Processing Systems (TPS)
- Data Warehousing (DW)
- Customer Relationship Management (CRM)
- Supplier Relationship Management (SRM)
- Vendor Managed Inventory (VMI)
- Transportation Management System (TMS)
- Forecasting System
- Inventory and Warehouse Management
- Distribution Requirement Planning (DRP)
- Automatic Ordering System
- Resource Management System (ERP, MRP, MRPII)

Top Management Support

- Top management willingly assigns resources to Web-Based EC initiatives as they are needed
- The need for long-term Web-Based EC support resources is recognized by top management
- Top management is enthusiastic about the possibilities of Web-Based EC
- Top management has invested the time needed to understand how Web-Based EC will benefit the firm
- Top Management provides a work environment that is supportive of Web-Based EC
- Top Management provides a clear vision for achieving excellence in Web-Based EC

Training

- Specific user training needs have been identified early in the implementation
- A formal training program has been developed to meet the requirements of Web-Based EC users
- Training materials have been customized for each specific job
- We seldom update training materials to reflect system changes
- Training materials target the entire business task, not just the screens and reports
- Employees are tracked to ensure that they have received the appropriate Web-Based EC

system training
- All users have been trained in basic Web-Based EC skills
- Web-Based EC system training review sessions are scheduled

Strategic Flexibility

- Our strategy can be continuously renewed to meet changing customers needs
- Our strategy emphasizes exploiting opportunities arising due to variability in the environment.
- Our strategy reflects high level of flexibility in managing risks.
- We can take actions quickly based on all the information continuously collected along the supply chain
- We can quickly develop strategies based on the coordination and integration of information along the value chain
- When an unexpected situation arises, our strategy allows us to quickly adapt to the new situation
- Our strategy allows us to react efficiently to new product or service launches by competitors.

Supply Chain Integration

Internal Integration

- Data integration among internal functions through information networks
- System-wide information system integration among internal functions
- Data integration in production process
- Integrative inventory management
- A system-wide interaction system between production and sales
- The utilization of periodic interdepartmental meetings among internal functions
- Cross-functional teams for process design and improvement
- Systems for continuous monitoring of order status at various stages in the process

Supplier Integration

- The level of strategic partnership with suppliers
- The participation level of suppliers in the design stage
- The participation level of suppliers in the process of procurement and production
- Stable procurement through networks
- Upstream processes and systems automatically reflect order changes
- Systems can transmit, integrate, and process data from suppliers

Customer Integration

- Follow-up with customers for feedback
- The level of organic linkage with customers through information networks
- The level of sharing on market information
- The agility level of the ordering process
- The level of communication with customers
- Downstream processes and systems automatically reflect order changes
- Systems can transmit, integrate, and process data from customers

Web-Based EC Use

Transactional Use

- Supplier selection (getting quotes, bids, etc.)
- Purchase-order processing
- Procurement from suppliers (warehouse, logistics, etc.)
- Fulfillment to customers (distribution, logistics, etc).
- Invoicing and payment processing

Strategic Use

- Information Gathering/Market Research
- Product Development
- Demand management
- Sales Support
- After-Sales Service and Support

Organizational Benefits

Information Quality

- Improve management of information for strategic planning
- Improve accuracy or reliability of information
- Improve information for operational control
- Improve accessibility of information
- Improve timeliness of information
- Improve completeness of information
- Improve the retrieval or delivery of information or reports
- Improve the access to information
- Present information in more concise manner or better format
- Increase the flexibility of information requests

Communications Efficiency

- Save money by reducing communication costs
- Save money by reducing search costs
- Improve the search of information about product availability
- Improve communication with suppliers
- Improve communication with customers

Business Efficiency

- Save money by reducing operation costs
- Speed up transactions or shorten product cycles
- Reduce inventory levels
- Improved return on assets and sales
- Increase product sales
- Reach to a larger number of suppliers and customers
- Increased transparency of business processes

- Improve logistics management

Competitive Advantage

- Enhance competitiveness or create strategic advantage
- Enable organization to catch up with competitors
- Align well with stated organizational goals
- Help establish useful linkages with other firms
- Enable organization to respond more quickly to change
- Improve relationships with suppliers and customers
- Provide better products or services to customers
- Improve the overall coordination of the supply chain

Appendix B. Measurement items after Q-Sort Analysis

Trading Partner Trust

Competence

- Our trading partners are competent in our business relationships
- Our trading partners perform their role very well
- Our trading partners are capable in our business relationships
- Our trading partners are very knowledgeable about their business

Benevolence

- I believe our trading partners would act in our best interest
- If we require help, our trading partners would do their best to help us
- Our trading partners are interested in our well-being, not just their own
- Our trading partners are likely to care for our welfare
- If there is a problem, our trading partners are likely to go out on a limb for us
- Our trading partners are likely to make sacrifices for us if needed

Integrity

- Our trading partners are truthful in their dealings with us
- Our trading partners are honest
- Our trading partners would keep their commitments
- Our trading partners are likely to be honest in dealing with us
- Promises made by our trading partners are likely to be reliable
- Our trading partners are likely to be open with us if problems occur

Technology Trust Mechanisms

- Firewall mechanisms
- Encryption mechanisms
- Logon procedures (IDs and Passwords)
- Network access controls
- Seal assurances
- Digital signatures
- Recovery mechanisms
- Backup mechanisms

Trading Partner Power

- Our Trading Partners played a major role in our decision whether or not to adopt Web-Based EC
- Our Trading Partners imposed their rules and regulations for using Web-Based EC
- Our Trading Partners imposed the format and standards in Web-Based EC
- When implementing Web-Based EC, we normally don't have much influence in the negotiations with our trading partners
- Our trading partners were the force behind the implementation of Web-Based EC

E-Infrastructure

IT Use

- Electronic Data Interchange (EDI)
- Groupware
- Electronic Fund Transfer (EFT)
- Intranet
- Extranet
- Data Warehousing (DW)
- Customer Relationship Management System (CRM)
- Supplier Relationship Management System (SRM)
- Vendor Managed Inventory System (VMI)
- Transportation Management System (TMS)
- Forecasting System
- Inventory Management System
- Automatic Ordering System
- Resource Management System (ERP, MRP, MRPII)

Top Management Support

- Top management willingly assigns resources to Web-Based EC initiatives as they are needed
- The need for long-term Web-Based EC support resources is recognized by top management
- Top management is enthusiastic about the possibilities of Web-Based EC
- Top management has invested the time needed to understand how Web-Based EC will benefit the firm
- Top Management provides a work environment that is supportive of Web-Based EC
- Top Management provides a clear vision for achieving excellence in Web-Based EC

Training

- Specific user training needs have been identified early in the implementation
- A formal training program has been developed to meet the requirements of Web-Based EC users
- Training materials have been customized for each specific job
- We seldom update training materials to reflect system changes
- Training materials target the entire business task, not just the screens and reports
- Employees are tracked to ensure that they have received the appropriate Web-Based EC system training
- All users have been trained in basic Web-Based EC skills

- Web-Based EC system training review sessions are scheduled

Strategic Flexibility

- Our strategy can be continuously renewed to meet changing customers needs
- Our strategy emphasizes exploiting opportunities arising due to variability in the environment.
- Our strategy reflects high level of flexibility in managing risks.
- We can take actions quickly based on all the information continuously collected along the supply chain
- We can quickly develop strategies based on the coordination and integration of information along the value chain
- When an unexpected situation arises, our strategy allows us to quickly adapt to the new situation
- Our strategy allows us to react efficiently to new product or service launches by competitors.

Supply Chain Integration

Internal Integration

- Data integration among internal functions through information networks
- Data integration in production process
- The utilization of periodic interdepartmental meetings among internal functions
- Cross-functional teams for process design and improvement

Supplier Integration

- The level of strategic partnership with suppliers
- The participation level of suppliers in the design stage
- The participation level of suppliers in the process of procurement and production
- Stable procurement through networks
- Upstream processes and systems automatically reflect order changes

Customer Integration

- Follow-up with customers for feedback
- The level of sharing on market information
- The agility level of the ordering process
- The level of communication with customers
- Downstream processes and systems automatically reflect order changes

Web-Based EC Use

Transactional Use

- Supplier selection (getting quotes, bids, etc.)
- Purchase-order processing
- Procurement from suppliers (warehouse, logistics, etc.)
- Fulfillment to customers (distribution, logistics, etc).
- Invoicing and payment processing

Strategic Use

- Information Gathering/Market Research
- Product Development
- Demand management
- Sales Support
- After-Sales Service and Support

Organizational Benefits

Information Quality

- Improve management of information for strategic planning
- Improve accuracy or reliability of information
- Improve information for operational control
- Improve timeliness of information
- Improve completeness of information
- Improve the retrieval or delivery of information or reports
- Improve the access to information
- Increase the flexibility of information requests

Communications Efficiency

- Save money by reducing communication costs
- Save money by reducing search costs
- Improve the search of information about product availability
- Improve communication with suppliers
- Improve communication with customers

Business Efficiency

- Save money by reducing operation costs
- Speed up transactions or shorten product cycles
- Reduce inventory levels
- Improved return on assets and sales
- Increase product sales
- Reach to a larger number of suppliers and customers
- Increased transparency of business processes
- Improve logistics management

Competitive Advantage

- Enhance competitiveness or create strategic advantage
- Enable organization to catch up with competitors
- Help establish useful linkages with other firms
- Improve relationships with suppliers and customers
- Provide better products or services to customers
- Improve the overall coordination of the supply chain

Appendix C. Large Scale Instrument

A Survey of

Web-Based Electronic Commerce

Usage

Member Database Provided by

The **College of Business Administration at The University of Toledo** and **The College of Business at New Mexico State University** with support of the **Institute for Supply Management**

General Instructions and Information

- The study addresses the issue of Web-Based Electronic Commerce usage in a Supply Chain context. We expect to determine the antecedents and outcomes of Web-Based e-commerce usage in American firms.
- **Web-Based Electronic Commerce** (Web-Based EC) is viewed as the full spectrum of activities that can take place between two firms that lead to an exchange of value, **where parties interact electronically.**
- **Trading partner** refers to any external firm/organization that plays an integral and critical in your company's Supply Chain. This includes customers, suppliers, distribution centers, wholesalers, retailers, carriers, freight forwarding services, etc.
- Data collected in this research will be treated with the **utmost confidentiality**, and will be only used in this research and in related reports. Information on the reports will be given in an aggregated manner only.
- This research is being conducted by Carlo A. Mora Monge, a Ph.D. candidate and Dr. Subba Rao, professor of Management at the University of Toledo.
- Please answer **all** questions. If you feel there is someone else in your firm/organization that might be better qualified to answer the questions in this survey, please ask them to complete the questionnaire. If you are not sure of an answer to a question, please provide your best estimate.
- We will be pleased to provide you with a copy of the results. Simply provide the information requested on the last page of the questionnaire.
- If you have any questions, please contact Carlo by email at cmora@nmsu.edu, by phone at (505)646-5044, or by fax at (707) 371-0851.

Carlo A. Mora Monge
Department of Accounting and Information Systems
College of Business Administration
New Mexico State University
MSC 3DH / P.O. Box 30001
Las Cruces, New Mexico 88003

Thank you for your participation!!

Unless otherwise specified, please use the following scale to answer each item:

Not at All	To a small extent	To a moderate extent	To a considerable extent	To a great extent	Don't Know
1	2	3	4	5	6

Section A. About the Trust with your Trading Partners…

It is felt that creating and maintaining trust is very important in conducting Web-Based EC. Please indicate **the number that accurately reflects your firm's relationship with your trading partners**.

	1	2	3	4	5	6
Our trading partners are competent in our business relationships	○	○	○	○	○	○
Our trading partners perform their role very well	○	○	○	○	○	○
Our trading partners are capable in our business relationships	○	○	○	○	○	○
Our trading partners are very knowledgeable about their business	○	○	○	○	○	○
I believe our trading partners would act in our best interest	○	○	○	○	○	○
If we require help, our trading partners would do their best to help us	○	○	○	○	○	○
Our trading partners are interested in our well-being, not just their own	○	○	○	○	○	○
Our trading partners are likely to care for our welfare	○	○	○	○	○	○
If there is a problem, our trading partners are likely to go out on a limb for us	○	○	○	○	○	○
Our trading partners are likely to make sacrifices for us if needed	○	○	○	○	○	○
Our trading partners are truthful in their dealings with us	○	○	○	○	○	○
Our trading partners are honest	○	○	○	○	○	○
Our trading partners would keep their commitments	○	○	○	○	○	○
Our trading partners are likely to be honest in dealing with us	○	○	○	○	○	○
Promises made by our trading partners are likely to be reliable	○	○	○	○	○	○
Our trading partners are likely to be open with us if problems occur	○	○	○	○	○	○

Section B. About Trust-Building Mechanisms…

To promote and build trust among partners in Web-Based EC, a number of technological and procedural mechanisms exist. The following is such a list. Please indicate the **extent to which the following mechanisms are used in your firm**.

	1	2	3	4	5	6
Firewall mechanisms	○	○	○	○	○	○
Encryption mechanisms	○	○	○	○	○	○
Logon procedures (IDs and Passwords)	○	○	○	○	○	○
Network access controls	○	○	○	○	○	○
Seal assurances	○	○	○	○	○	○
Digital signatures	○	○	○	○	○	○
Recovery mechanisms	○	○	○	○	○	○
Backup mechanisms	○	○	○	○	○	○

Section C. About your Trading Partner Power…

Your decisions and actions in Web-Based EC may be influenced by your trading partners. In the following statements, we would like to asses the **extent to which your trading partners influenced your decisions regarding the adoption of Web-Based EC**.

	1	2	3	4	5	6
Our Trading Partners played a major role in our decision whether or not to adopt Web-Based EC	○	○	○	○	○	○
Our Trading Partners imposed their rules and regulations for using Web-Based EC	○	○	○	○	○	○
Our Trading Partners imposed the format and standards in Web-Based EC	○	○	○	○	○	○
When implementing Web-Based EC, we normally don't have much influence in the negotiations with our trading partners	○	○	○	○	○	○
Our trading partners were the force behind the implementation of Web-Based EC	○	○	○	○	○	○

Unless otherwise specified, please use the following scale to answer each item:

Not at All	To a small extent	To a moderate extent	To a considerable extent	To a great extent	Don't Know
1	2	3	4	5	6

Section D. About Information Technology (IT) Use in your firm…

A number of IT tools/applications are needed to facilitate Web-Based EC. The following is such a list. Please **indicate the extent to which the following IT applications/tools/processes are used in your firm.**

	1	2	3	4	5	6
Electronic Data Interchange (EDI)	○	○	○	○	○	○
Groupware	○	○	○	○	○	○
Electronic Fund Transfer (EFT)	○	○	○	○	○	○
Intranet	○	○	○	○	○	○
Extranet	○	○	○	○	○	○
Data Warehousing System (DW)	○	○	○	○	○	○
Customer Relationship Management System (CRM)	○	○	○	○	○	○
Supplier Relationship Management System (SRM)	○	○	○	○	○	○
Vendor Managed Inventory System (VMI)	○	○	○	○	○	○
Transportation Management System (TMS)	○	○	○	○	○	○
Forecasting System	○	○	○	○	○	○
Inventory Management System	○	○	○	○	○	○
Automatic Ordering System	○	○	○	○	○	○
Resource Management System (ERP, MRP, MRPII)	○	○	○	○	○	○

Section E. About Top Management Support to Web-Based EC…

We would like to assess the support that your firm's Top Management has given to Web-Based EC efforts. Please indicate the **number that accurately reflects your firm's situation with regards to the following statements.**

	1	2	3	4	5	6
Top management willingly assigns resources to Web-Based EC initiatives as they are needed	○	○	○	○	○	○
The need for long-term Web-Based EC support resources is recognized by top management	○	○	○	○	○	○
Top management is enthusiastic about the possibilities of Web-Based EC	○	○	○	○	○	○
Top management have invested the time needed to understand how Web-Based EC will benefit the firm	○	○	○	○	○	○
Top Management provides a work environment that is supportive of Web-Based EC	○	○	○	○	○	○
Top Management provides a clear vision for achieving excellence in Web-Based EC	○	○	○	○	○	○

Section F. About Training for Web-Based EC…

In this section we would like to know if training activities have been undertaken to support users of Web-Based EC in your firm. Please indicate the **extent to which the following training activities have been undertaken by your firm.**

	1	2	3	4	5	6
Specific user training needs have been identified early in the implementation	○	○	○	○	○	○
A formal training program has been developed to meet the requirements of Web-Based EC users	○	○	○	○	○	○
Training materials have been customized for each specific job	○	○	○	○	○	○
We seldom update training materials to reflect system changes	○	○	○	○	○	○
Training materials target the entire business task, not just the screens and reports	○	○	○	○	○	○
Employees are tracked to ensure that they have received the appropriate Web-Based EC system training	○	○	○	○	○	○
All users have been trained in basic Web-Based EC skills	○	○	○	○	○	○
Web-Based EC system training review sessions are scheduled	○	○	○	○	○	○

Section G. About the Strategic Flexibility of your Firm…

To cope with ever-changing environments, firms must have strategies in place that allow them to react efficiently to those changes. Please indicate the **extent to which each of the following statements reflects your firm's strategic flexibility.**

	1	2	3	4	5	6
Our strategy can be continuously renewed to meet changing customers needs	○	○	○	○	○	○
Our strategy emphasizes exploiting opportunities arising due to variability in the environment.	○	○	○	○	○	○
Our strategy reflects high level of flexibility in managing risks.	○	○	○	○	○	○
We can take actions quickly based on all the information continuously collected along the supply chain	○	○	○	○	○	○
We can quickly develop strategies based on the coordination and integration of information along the value chain	○	○	○	○	○	○
When an unexpected situation arises, our strategy allows us to quickly adapt to the new situation	○	○	○	○	○	○
Our strategy allows us to react efficiently to new product or service launches by competitors.	○	○	○	○	○	○

Unless otherwise specified, please use the following scale to answer each item:

Not at All	To a small extent	To a moderate extent	To a considerable extent	To a great extent	Don't Know
1	2	3	4	5	6

Section H. About the Internal Integration of your firm's Supply Chain…

The following statements describe various internal integration activities/efforts carried out within a firm. Please indicate the **number that accurately reflects your firm's situation with regards to the following statements.**

	1	2	3	4	5	6
Data integration among internal functions through information networks	○	○	○	○	○	○
Data integration in production process	○	○	○	○	○	○
The utilization of periodic interdepartmental meetings among internal functions	○	○	○	○	○	○
Cross-functional teams for process design and improvement	○	○	○	○	○	○

Section I. About the Integration of your firm's Supply Chain with Suppliers…

The following statements describe various integration activities/efforts carried out between a firm and its suppliers. Please indicate the **number that accurately reflects your firm's situation with regards to the following statements.**

	1	2	3	4	5	6
The level of strategic partnership with suppliers	○	○	○	○	○	○
The participation level of suppliers in the design stage	○	○	○	○	○	○
The participation level of suppliers in the process of procurement and production	○	○	○	○	○	○
Stable procurement through networks	○	○	○	○	○	○
Upstream processes and systems automatically reflect order changes	○	○	○	○	○	○

Section J. About the Integration of your firm's Supply Chain with Customers…

The following statements describe various integration activities/efforts carried out between a firm and its customers. Please indicate the **number that accurately reflects your firm's situation with regards to the following statements.**

	1	2	3	4	5	6
Follow-up with customers for feedback	○	○	○	○	○	○
The level of sharing on market information	○	○	○	○	○	○
The agility level of the ordering process	○	○	○	○	○	○
The level of communication with customers	○	○	○	○	○	○
Downstream processes and systems automatically reflect order changes	○	○	○	○	○	○

Section K. About the Use of Web-Based Technologies in your Firm's Supply Chain Processes …

In this section, we would like to assess the extent of use of Web-Based Technologies in different Supply Chain practices. Please indicate the **extent to which Web-Based EC is used in the following processes in your direct (immediate) supply chain**

	1	2	3	4	5	6
Information Gathering/Market Research	○	○	○	○	○	○
Product Development	○	○	○	○	○	○
Supplier selection (getting quotes, bids, etc.)	○	○	○	○	○	○
Purchase-order processing	○	○	○	○	○	○
Procurement from suppliers (warehouse, logistics, etc.)	○	○	○	○	○	○
Fulfillment to customers (distribution, logistics, etc).	○	○	○	○	○	○
Invoicing and payment processing	○	○	○	○	○	○
Demand management	○	○	○	○	○	○
Sales Support	○	○	○	○	○	○
After-Sales Service and Support	○	○	○	○	○	○

Unless otherwise specified, please use the following scale to answer each item:

Not at All	To a small extent	To a moderate extent	To a considerable extent	To a great extent	Don't Know
1	2	3	4	5	6

About the Benefits of Web-Based EC…

The following statements describe how Web-Based Electronic Commerce has affected your firm. **Please answer based on the perceptions of your firm's benefits.**

***Information Quality** – Web-Based EC has helped our firm to*

	1	2	3	4	5	6
Improve management of information for strategic planning	○	○	○	○	○	○
Improve accuracy or reliability of information	○	○	○	○	○	○
Improve information for operational control	○	○	○	○	○	○
Improve timeliness of information	○	○	○	○	○	○
Improve completeness of information	○	○	○	○	○	○
Improve the retrieval or delivery of information or reports	○	○	○	○	○	○
Improve the access to information	○	○	○	○	○	○
Increase the flexibility of information requests	○	○	○	○	○	○

***Communications Efficiency** – Web-Based EC has helped our firm to*

	1	2	3	4	5	6
Save money by reducing communication costs	○	○	○	○	○	○
Save money by reducing search costs	○	○	○	○	○	○
Improve the search of information about product availability	○	○	○	○	○	○
Improve communication with suppliers	○	○	○	○	○	○
Improve communication with customers	○	○	○	○	○	○

***Business Efficiency** – Web-Based EC has helped our firm to*

	1	2	3	4	5	6
Save money by reducing operation costs	○	○	○	○	○	○
Speed up transactions or shorten product cycles	○	○	○	○	○	○
Reduce inventory levels	○	○	○	○	○	○
Improve return on assets and sales	○	○	○	○	○	○
Increase product sales	○	○	○	○	○	○
Reach a larger number of suppliers and customers	○	○	○	○	○	○
Increase transparency of business processes	○	○	○	○	○	○
Improve logistics management	○	○	○	○	○	○

***Competitive Advantage** – Web-Based EC has helped our firm to*

	1	2	3	4	5	6
Enhance competitiveness or create strategic advantage	○	○	○	○	○	○
Catch up with competitors	○	○	○	○	○	○
Help establish useful linkages with other firms	○	○	○	○	○	○
Improve relationships with suppliers and customers	○	○	○	○	○	○
Provide better products or services to customers	○	○	○	○	○	○
Improve the overall coordination of the supply chain	○	○	○	○	○	○

Section L. About the use of Web-Based Technologies in your firm …

In this section, we would like to assess the extent of use of Web-Based Technologies. Please indicate the **extent to which Web-Based Technologies are used in your firm**

	1	2	3	4	5	6
e-shop	○	○	○	○	○	○
e-procurement	○	○	○	○	○	○
e-mail	○	○	○	○	○	○
e-auctions	○	○	○	○	○	○
e-marketplaces	○	○	○	○	○	○
Web-Based EDI	○	○	○	○	○	○
e-banking	○	○	○	○	○	○

Note: click on the technology for a definition.

Section M. General Information …

Please provide the following information for statistical purpose.

1. Please indicate the **percentage of suppliers** who interact with your firm through Web-Based EC

☐ 0 - 20 ☐ 21 - 40 ☐ 41 – 60 ☐ 61 - 80 ☐ 81 - 100

2. Please indicate the **percentage of customers** who interact with your firm through Web-Based EC

☐ 0 - 20 ☐ 21 - 40 ☐ 41 – 60 ☐ 61 - 80 ☐ 81 - 100

3. What is the **percentage of your firm's overall total monthly business transactions** do you estimate are conducted through Web-Based EC?

☐ 0 - 20 ☐ 21 - 40 ☐ 41 - 60 ☐ 61 - 80 ☐ 81 - 100

4. The average annual sales (in U.S. $ millions) of your firm in the last year was

☐ Less than 10
☐ 10 – 49
☐ 50 – 99
☐ 100 – 249
☐ 250 – 499
☐ 500 – 999
☐ 1000 and above

5. The number of employees in your firm is

☐ Less than 50
☐ 51 – 100
☐ 101 – 250
☐ 251 – 500
☐ 501 – 1000
☐ Over 1000

6. The type of industry that best describes your firm is

☐ Chemicals & Allied Products **(SIC Code 28)**
☐ Primary Metal Industries **(SIC Code 33)**
☐ Fabricated Metal Products **(SIC Code 34)**
☐ Industrial, Commercial & Computer Equipment **(SIC Code 35)**
☐ Electronic, Electrical Equipment & Components **(SIC Code 36)**
☐ Transportation Equipment **(SIC Code 37)**
☐ Other (**Please specify SIC code**) _____

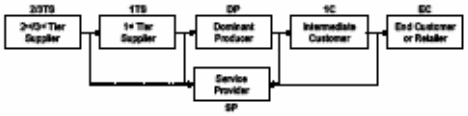
7. Please identify your position within your organization

☐ Top Level Management (e.g. CEO, President)
☐ Middle Level Management (e.g. Director, Manager)
☐ First Level Supervisor (e.g. Supervisor, Coordinator)
☐ Professional employee without supervisory role
☐ Other (**Please specify**) _____

8. Please indicate your job function (mark all that apply)

☐ Corporate Executive
☐ Purchasing
☐ Logistics and SCM
☐ Distribution
☐ Manufacturing/Production
☐ Sales
☐ Other (**Please specify**) _____

Referring to the following diagram, please answer the questions 9-11 by selecting the appropriate response.



	2/3TS	1TS	DP	1C	EC	SP
9. Where is your firm in the supply chain for your primary product?	○	○	○	○	○	○
10. Which firm possesses the most channel power or influence in the supply chain?	○	○	○	○	○	○
11. Which firm sets the technology standards in the supply chain?	○	○	○	○	○	○

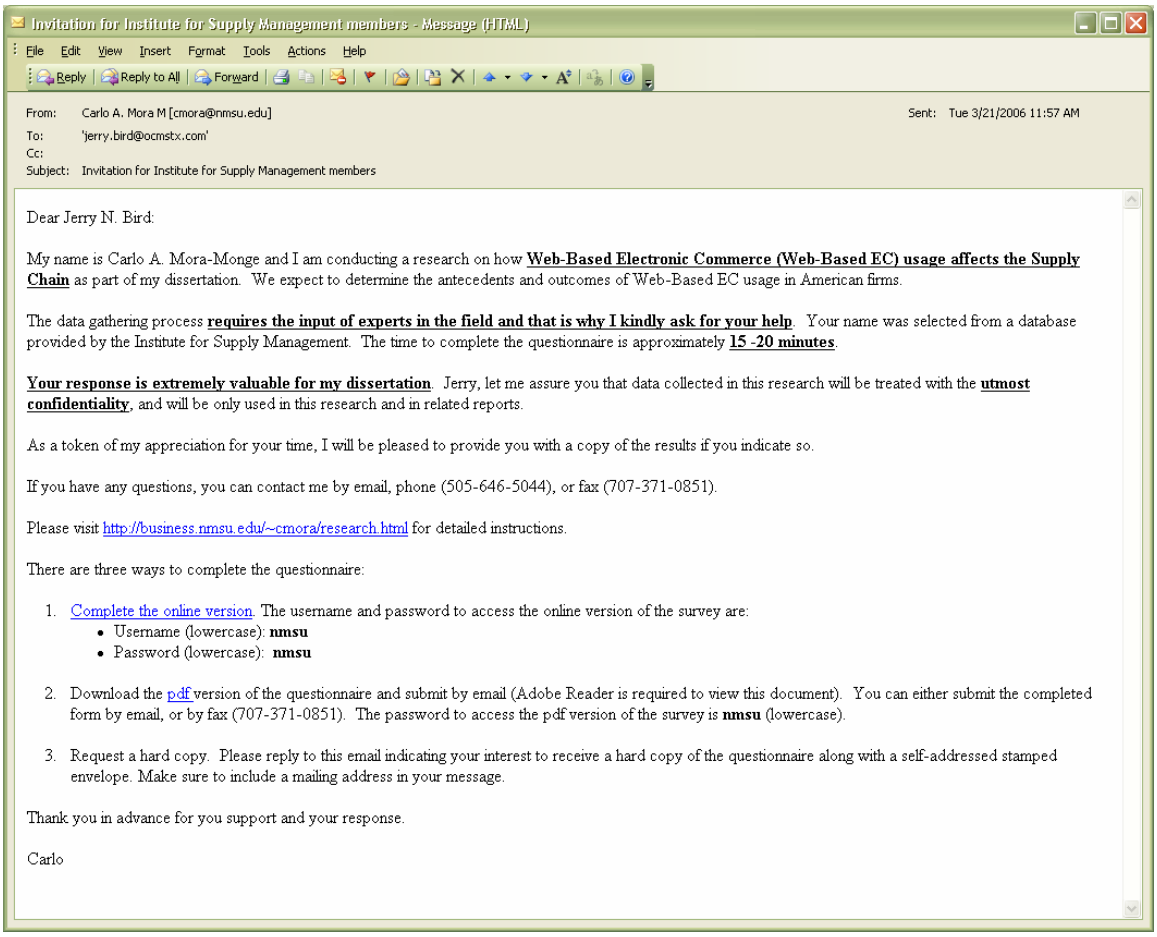
12. When (year) were Web-Based EC efforts initiated in your firm? (Use YYYY format) _____

13. Please indicate your email address if you would like to receive a summary report of the findings of this research:

_____ (email)

Click here to send by Email

Appendix D. Sample email for data collection. First email.



Invitation for Institute for Supply Management members - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

From: Carlo A. Mora M [cmora@nmsu.edu] Sent: Tue 3/21/2006 11:57 AM

To: 'jerry.bird@ocmstx.com'

Cc:

Subject: Invitation for Institute for Supply Management members

Dear Jerry N. Bird:

My name is Carlo A. Mora-Monge and I am conducting a research on how **Web-Based Electronic Commerce (Web-Based EC) usage affects the Supply Chain** as part of my dissertation. We expect to determine the antecedents and outcomes of Web-Based EC usage in American firms.

The data gathering process **requires the input of experts in the field and that is why I kindly ask for your help**. Your name was selected from a database provided by the Institute for Supply Management. The time to complete the questionnaire is approximately **15 -20 minutes**.

Your response is extremely valuable for my dissertation. Jerry, let me assure you that data collected in this research will be treated with the **utmost confidentiality**, and will be only used in this research and in related reports.

As a token of my appreciation for your time, I will be pleased to provide you with a copy of the results if you indicate so.

If you have any questions, you can contact me by email, phone (505-646-5044), or fax (707-371-0851).

Please visit http://business.nmsu.edu/~cmora/research.html for detailed instructions.

There are three ways to complete the questionnaire:

1. Complete the online version. The username and password to access the online version of the survey are:
   - Username (lowercase): **nmsu**
   - Password (lowercase): **nmsu**
2. Download the pdf version of the questionnaire and submit by email (Adobe Reader is required to view this document). You can either submit the completed form by email, or by fax (707-371-0851). The password to access the pdf version of the survey is **nmsu** (lowercase).
3. Request a hard copy. Please reply to this email indicating your interest to receive a hard copy of the questionnaire along with a self-addressed stamped envelope. Make sure to include a mailing address in your message.

Thank you in advance for you support and your response.

Carlo

Appendix E. Missing Data Analysis (Large Scale)

Before attempting to analyze the large scale results, it is imperative to address the issues related to missing data. Even though appropriate actions were taken to minimize missing data (e.g. web-based data collection, checking procedures for missing questions, etc) missing data is still present in this study. As suggested by Hair et al. (1995), the researcher must identify the patterns of the missing data to verify the data is missing at random and determine the best way to deal with it. This analysis was done in three stages: 1) elimination of obvious cases/variables 2) pattern(s) examination of missing data, 3) determining the approach to deal with missing data. For this analysis we considered one type of missing data: "**don't know**" responses. The reason for this is because the web-based survey was designed in such a way that required most of the questions (general questions were optional) to be answered, to prevent the existence of unanswered questions. Each of these stages is described next.

- **Elimination of Obvious cases/variables**. The first step in the analysis involves uncover obvious cases and or variables with significant missing data. With regards to cases, 6 of the 186 cases had more than 50% of missing data, thus these cases were eliminated. Additionally there are two variables, TTM_5 (Seal assurances) and EIF_ITC2 (Groupware) with 43% and 35% missing respectively. After carefully reviewing these variables, it was decided to drop them because in doing so it is not expected that these variables will cause major problems when performing the data analysis. After the first screening of the data, the number of

cases was reduced to 180 and the number of variables to 113. The summary statistics of the remaining data is shown in the following table. The extent of missing data for the remaining 113 variables ranges from a high 18.9% (OBE_BUE5) to a low 0% (several variables). Because the ranges are not excessive, it was decided to retain them for further analysis.

				Missing Data	
Variable	Number of Cases with Valid Data	Mean	Standard Deviation	Number	Percent
TPT_COMP1	179	4.15	0.73	1	0.6%
TPT_COMP2	179	4.14	0.71	1	0.6%
TPT_COMP3	178	4.19	0.67	2	1.1%
TPT_COMP4	177	4.56	0.62	3	1.7%
TPT_BENE1	178	3.72	0.94	2	1.1%
TPT_BENE2	178	4.20	0.87	2	1.1%
TPT_BENE3	176	3.84	0.80	4	2.2%
TPT_BENE4	174	3.61	0.91	6	3.3%
TPT_BENE5	177	3.57	0.96	3	1.7%
TPT_BENE6	175	3.31	0.91	5	2.8%
TPT_INTE1	177	4.00	0.81	3	1.7%
TPT_INTE2	178	4.07	0.77	2	1.1%
TPT_INTE3	180	4.11	0.75	0	0.0%
TPT_INTE4	178	4.07	0.78	2	1.1%
TPT_INTE5	177	4.08	0.79	3	1.7%
TPT_INTE6	177	3.97	0.81	3	1.7%
TTM_1	165	4.73	0.73	15	8.3%
TTM_2	153	4.08	1.16	27	15.0%
TTM_3	165	4.78	0.71	15	8.3%
TTM_4	162	4.71	0.75	18	10.0%
TTM_6	147	3.35	1.39	33	18.3%
TTM_7	149	4.45	0.92	31	17.2%
TTM_8	160	4.54	0.88	20	11.1%
TPP_1	171	2.80	1.27	9	5.0%
TPP_2	167	2.54	1.22	13	7.2%
TPP_3	167	2.67	1.47	13	7.2%
TPP_4	167	2.63	1.29	13	7.2%
TPP_5	168	2.43	1.28	12	6.7%
EIF_ITC1	172	3.61	1.36	8	4.4%
EIF_ITC3	166	3.80	1.22	14	7.8%
EIF_ITC4	167	4.44	1.03	13	7.2%

				Missing Data	
Variable	**Number of Cases with Valid Data**	**Mean**	**Standard Deviation**	**Number**	**Percent**
EIF_ITC5	155	4.33	1.07	25	13.9%
EIF_ITL1	156	3.67	1.45	24	13.3%
EIF_ITL2	151	3.16	1.49	29	16.1%
EIF_ITL3	164	3.11	1.55	16	8.9%
EIF_ITL4	171	2.94	1.45	9	5.0%
EIF_ITL5	151	2.88	1.49	29	16.1%
EIF_ITL6	172	3.61	1.41	8	4.4%
EIF_ITL7	173	3.95	1.23	7	3.9%
EIF_ITL8	173	3.24	1.47	7	3.9%
EIF_ITL9	172	3.93	1.45	8	4.4%
EIF_TMS1	165	3.58	1.17	15	8.3%
EIF_TMS2	172	3.78	1.16	8	4.4%
EIF_TMS3	169	3.68	1.14	11	6.1%
EIF_TMS4	170	3.46	1.29	10	5.6%
EIF_TMS5	170	3.63	1.18	10	5.6%
EIF_TMS6	169	3.24	1.31	11	6.1%
EIF_TRA1	168	3.48	1.31	12	6.7%
EIF_TRA2	169	3.29	1.36	11	6.1%
EIF_TRA3	166	3.04	1.29	14	7.8%
EIF_TRA4	164	2.85	1.28	16	8.9%
EIF_TRA5	163	3.12	1.27	17	9.4%
EIF_TRA6	162	2.75	1.31	18	10.0%
EIF_TRA7	166	2.84	1.31	14	7.8%
EIF_TRA8	167	2.60	1.27	13	7.2%
STF_1	172	3.90	1.00	8	4.4%
STF_2	170	3.63	1.09	10	5.6%
STF_3	171	3.61	1.04	9	5.0%
STF_4	174	3.51	1.12	6	3.3%
STF_5	172	3.42	1.15	8	4.4%
STF_6	175	3.41	1.16	5	2.8%
STF_7	171	3.36	1.11	9	5.0%
SCI_INT1	171	3.61	1.05	9	5.0%
SCI_INT2	171	3.56	1.12	9	5.0%
SCI_INT3	174	3.61	1.14	6	3.3%
SCI_INT4	174	3.70	1.15	6	3.3%
SCI_SUP1	176	3.73	1.04	4	2.2%
SCI_SUP2	171	3.18	1.13	9	5.0%
SCI_SUP3	175	3.47	1.07	5	2.8%
SCI_SUP4	168	3.45	1.13	12	6.7%
SCI_SUP5	166	3.29	1.23	14	7.8%
SCI_CUS1	155	3.91	1.02	25	13.9%
SCI_CUS2	153	3.51	1.12	27	15.0%
SCI_CUS3	159	3.66	1.04	21	11.7%
SCI_CUS4	156	4.00	0.91	24	13.3%
SCI_CUS5	156	3.45	1.14	24	13.3%

				Missing Data	
Variable	Number of Cases with Valid Data	Mean	Standard Deviation	Number	Percent
WEC_STR1	161	3.28	1.23	19	10.6%
WEC_STR2	153	2.95	1.20	27	15.0%
WEC_TRA1	180	3.64	1.14	0	0.0%
WEC_TRA2	177	3.81	1.23	3	1.7%
WEC_TRA3	174	3.59	1.22	6	3.3%
WEC_TRA4	163	3.52	1.24	17	9.4%
WEC_TRA5	177	3.61	1.29	3	1.7%
WEC_STR3	158	3.07	1.34	22	12.2%
WEC_STR4	149	3.21	1.20	31	17.2%
WEC_STR5	147	3.16	1.27	33	18.3%
OBE_INQ1	168	3.51	1.21	12	6.7%
OBE_INQ2	171	3.60	1.15	9	5.0%
OBE_INQ3	170	3.53	1.13	10	5.6%
OBE_INQ4	173	3.79	1.15	7	3.9%
OBE_INQ5	168	3.61	1.13	12	6.7%
OBE_INQ6	169	3.70	1.12	11	6.1%
OBE_INQ7	170	3.81	1.12	10	5.6%
OBE_INQ8	163	3.55	1.13	17	9.4%
OBE_COE1	161	3.53	1.18	19	10.6%
OBE_COE2	167	3.49	1.17	13	7.2%
OBE_COE3	167	3.74	1.04	13	7.2%
OBE_COE4	173	3.85	1.14	7	3.9%
OBE_COE5	150	3.78	1.22	30	16.7%
OBE_BUE1	169	3.57	1.19	11	6.1%
OBE_BUE2	172	3.74	1.14	8	4.4%
OBE_BUE3	166	3.22	1.28	14	7.8%
OBE_BUE4	155	3.32	1.19	25	13.9%
OBE_BUE5	146	3.33	1.23	34	18.9%
OBE_BUE6	162	3.62	1.23	18	10.0%
OBE_BUE7	167	3.39	1.25	13	7.2%
OBE_BUE8	165	3.42	1.19	15	8.3%
OBE_COA1	162	3.57	1.21	18	10.0%
OBE_COA2	153	3.23	1.32	27	15.0%
OBE_COA3	163	3.49	1.21	17	9.4%
OBE_COA4	169	3.73	1.15	11	6.1%
OBE_COA5	160	3.43	1.24	20	11.1%
OBE_COA6	169	3.69	1.23	11	6.1%

- **Missing data pattern(s)**. The primary objective of this stage is to determine if the data missing can be classified as random. Several tests are suggested by Hair et al. (1995) and are described next. We

concentrated on the variables with the highest percentage of missing data, namely: TTM_6, TTM_7, WEC_STR4, WEC_STR5, OBE_BUE5, and OBE_COE5. The missing data for these variables ranged from 16.7% and 18.9%.

1. Significant differences between missing values and valid data. In this step, we created groups with missing and without missing data and tested whether there was a significant difference between the groups considering the variables mentioned above. The results are shown in the following table. There are a few items of concern here that are worth mentioning. It appears to be a pattern in variable TTM_7, where three comparisons found significant differences. Further analysis should indicate the best remedy to solve this problem.

Groups Formed by Missing Data on:		TTM_6	TTM_7	WEC_STR4	WEC_STR5	OBE_COE5	OBE_BUE5
TTM_6	F		3.415	2.183	1.365	0.579	1.151
	Significance		0.067	0.142	0.245	0.448	0.285
	Number present	147	129	129	126	125	122
	Number missing		20	21	21	26	24
	Mean (present)	3.35	4.40	3.27	3.21	3.82	3.38
	Mean (missing)		4.80	2.86	2.86	3.62	3.08
TTM_7	F	8.069		0.908	0.006	0.341	1.061
	Significance	0.005**		0.342	0.936	0.560	0.305
	Number present	129	149	126	125	125	123
	Number missing	18		24	22	26	23
	Mean (present)	3.47	4.45	3.25	3.14	3.81	3.37
	Mean (missing)	2.50		3.00	3.16	3.65	3.09
WEC_STR4	F	0.013	1.325		0.493	0.454	1.015
	Significance	0.910	0.252		0.484	0.502	0.315
	Number present	129	126	150	144	138	132
	Number missing	18	23		3	13	14
	Mean (present)	3.35	4.41	3.21	3.15	3.76	3.30
	Mean (missing)	3.39	4.65		3.67	4.00	3.64
WEC_STR5	F	0.188	4.048	0.123		1.354	0.140
	Significance	0.665	0.046*	0.727		0.246	0.709
	Number present	126	125	144	147	137	130
	Number missing	21	24	5		14	16
	Mean (present)	3.35	4.38	3.21	3.16	3.74	3.32
	Mean (missing)	3.48	4.79	3.40		4.14	3.44
OBE_COE5	F	0.662	1.370	1.336	0.887		1.367
	Significance	0.417	0.244	0.250	0.348		0.244
	Number present	125	125	138	137	151	139
	Number missing	21	23	10	9		7
	Mean (present)	3.30	4.41	3.25	3.19	3.78	3.30
	Mean (missing)	3.57	4.65	2.80	2.78		3.86
OBE_BUE5	F	1.631	6.335	0.901	0.496	1.331	
	Significance	0.204	0.013*	0.344	0.482	0.251	
	Number present	122	123	132	130	139	146
	Number missing	23	24	15	15	11	
	Mean (present)	3.30	4.37	3.24	3.18	3.74	3.33
	Mean (missing)	3.70	4.88	2.93	2.93	4.18	

*: Significant at the 0.05 level
**: Significant at the 0.01 level

2. Correlation between dichotomous variables. The correlation between dichotomous variables indicates the extent to which missing data are related in pairs of variables. Low correlations indicate low association between the missing data for those variables. The results indicate that most of the pairs of variables are highly correlated, indicating that the assumption to the data might be missing at random (MAR).

	TTM_6	TTM_7	WEC_STR4	WEC_STR5	OBE_COE5	OBE_BUE5
TTM_6	1.000					
TTM_7	0.372**	1.000				
WEC_STR4	0.349**	0.199**	1.000			
WEC_STR5	0.319**	0.240**	0.851**	1.000		
OBE_COE5	0.191**	0.139	0.565**	0.597**	1.000	
OBE_BUE5	0.213**	0.198**	0.472**	0.470**	0.685**	1.000
**: Significant at the 0.01 level.						

Steps involved:

1. Find variable that highly correlates to the one that is missing. Do this for every variable.

Variable under investigation	**Highly correlated pair**
Digital signatures (TTM_6)	Encryption mechanisms (TTM_2)
Recovery mechanisms (TTM_7)	Backup mechanisms (TTM_8)
Sales Support (WEC_STR4)	Demand management (WEC_STR3)
After-Sales Service and Support (WEC_STR5)	Demand management (WEC_STR3)
Improve communication with customers (OBE_COE5)	Improve communication with suppliers (OBE_COE4)
Increase product sales (OBE_BUE5)	Reach a larger number of suppliers and customers (OBE_BUE6)

2. Compute means for variables using regression and replaced by means
3. Compare the difference between the means for the variables

Variable		Mean	N (std. Deviation)	t
TTM_6	Regression	3.35	186(1.24)	0.00
	Replaced with Means	3.35	186(0.81)	
TTM_7	Regression	4.45	186(0.71)	0.00
	Replaced with Means	4.45	186(0.82)	
WEC_STR4	Regression	3.21	186(0.83)	0.93
	Replaced with Means	3.21	186(1.07)	
WEC_STR5	Regression	3.21	186(0.83)	0.00
	Replaced with Means	3.16	186(1.13)	
OBE_COE5	Regression	3.78	186(0.92)	0.00
	Replaced with Means	3.78	186(1.1)	
OBE_BUE5	Regression	3.33	186(0.89)	0.00
	Replaced with Means	3.33	186(1.09)	