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The impact of e-commerce on supply chain relationships

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Abstract *E-commerce is such a new phenomenon that little research has addressed the effects it has on relationships in supply chains. A qualitative study was conducted with eight e-commerce companies in order to construct theoretical relationships with which to develop a grounded theory of the impact of e-commerce on managing supply chain relationships. The e-commerce environment was perceived as highly uncertain, stemming from increased information visibility and dynamic market structures. A stronger emphasis on relationship management as part of business strategy enables managers to manage uncertainty better. Interestingly, increased information does not decrease the perception of uncertainty, but creates more uncertainty. As logistics is the function often involved with both information and relationship management within the supply chain, it may prove to be invaluable in helping firms succeed in this dynamic environment. Our research also found support for the application of transaction cost analysis and the resource dependence theory in explaining interorganizational relationship formation in e-commerce.*

Introduction

A supply chain can be defined as three or more organizations directly linked by one or more of the flows of products, services, finances, and information from a source to a customer (Mentzer *et al.*, 2001). Management of the supply chain is essentially management of the relationships and activities among the member organizations. These relationships range from single transactions to complex interdependent relationships. As the business environment becomes more complex, organizations recognize that many benefits can be obtained from closer, long-term relationships (Ganesan, 1994). Day (2000) ventures to say that committed relationships are among the most durable of advantages because of their inherent barriers to competition. The goal of supply chain management is for member organizations to work together in close, long-term relationships to increase the competitive advantage of the supply chain as a whole (Mentzer *et al.*, 2001).

The phenomenon referred to as "the next business revolution" – the nexus of computers, networks, people, and business goals for purposes of selling goods, services, and information – is an innovative way to cut costs, grow markets and profitability, and improve shareholder return relative to traditional business methods (Palmisano, 1998). This combination is the business phenomenon

referred to as e-commerce: the trade of goods and services that takes place electronically such as over the Internet (Dolber *et al.*, 1998). Projections in the business-to-business (B2B) e-commerce arena are staggering, ranging from $1.3 trillion by 2003 (Dolber *et al.*, 1998) to over $8 trillion by 2005 (Pastore, 2001). The ratio of online business trade to traditional channels is projected to vary greatly by industry, from a high of over 20 percent for computing to just over 1 percent for industrial equipment (Goldman-Sachs & Company, 1999). While the downturn in e-commerce stock valuations in 2000 resulted in the failure of many e-commerce ventures, the growth in B2B e-commerce is still on track. In 2000, the value of worldwide B2B Internet commerce sales transactions surpassed $433 billion, a 189 percent increase over 1999 sales transactions (Pastore, 2001). The emergence of business on the Internet brings a new set of challenges to coordinating supply chain activities. Firms conducting business electronically face several differences in the e-commerce business environment that may have a significant impact on managing relationships in the supply chain. Challenges that are frequently mentioned in both the popular press and academic literature are the speed of business and the level of connectivity among supply chain organizations. These differences can lead to higher levels of uncertainty and changes in the traditional structures of supply chains, which can influence the success of supply chain relationship management.

Because this phenomenon is so new, little research has addressed the impact of e-commerce on relationship management. As companies attempt to achieve success in managing relationships within their supply chains, the e-commerce environment presents organizations with new dynamics to manage. We conducted a qualitative research study to determine how e-commerce companies perceive the new environment and to explore how they are managing relationships in their supply chains under these new conditions. The purpose of this paper is to build a grounded theory of the impact of e-commerce on relationship management in the supply chain using the study findings, supported by existing research in e-commerce and relationship management.

The following section describes the methodology used for the grounded theory study. We then present findings on the e-commerce environment that emerged from analysis of data collected from informant companies and from existing literature. In the fourth section, we discuss the impact of this environment on relationship management as reported by the companies studied and supported with transaction cost economics and resource dependence theories. We then offer implications of this research for both practitioners and researchers based on the findings. Finally, limitations and opportunities for future research are presented.

Research methodology
An exploratory research study was conducted to examine the impact of the dimensions of e-commerce on managing relationships in the supply chain.

Because the purpose of this research project was to develop an understanding of this new phenomenon, we adopted a theory-building, qualitative research design. Qualitative methods are ideally suited to research substantive areas about which little is known (Stern, 1980). Strengths of qualitative research include realism, significance, richness, high face validity, and potentially a more precise way to assess causality (Miles, 1979). Such strengths are attributed to the fact that the data come directly from the participants involved in the phenomenon. The findings are, therefore, not anecdotes, but rich verbal descriptions reported in the words of the informants, often incorporating direct quotes. Verbal descriptions offered in the findings are illustrative of repeated patterns along with their contextual variations that emerge from the data. These descriptions are systematically analyzed to develop theoretical relationships among the themes and provide important implications for practice and research. Weaknesses to qualitative research that need to be considered during the research include an overabundance of variables due to the amount of data, and a lack of control (Miles, 1979).

Specifically, the qualitative method of grounded theory is helpful in understanding processes people use to cope with, respond to, or alter their environment. "Social phenomena are complex: Thus, they require complex grounded theory. This means conceptually dense theory that accounts for a great deal of variation in the phenomenon studied" (Strauss, 1987). Thus, it is the appropriate methodology for a new and previously unresearched phenomenon such as e-commerce. Grounded theory is the process by which theory is derived from data, systematically gathered and analyzed through the research process (Strauss and Corbin, 1998). It was chosen for this research project because it enables interpretive analyses and facilitates theory construction – the two objectives of this research project. The rest of this section describes the general methodology of grounded theory followed for this project, the sampling procedures and details of the data collection process, the data analysis procedures, and the steps taken to ensure quality of the interpretations. Appendix 1 contains a diagram (Figure A1) summarizing the grounded theory research activities (adapted from Flint, 1997).

Grounded theory

Grounded theory starts with choosing the phenomenon to study; in this case, the phenomenon is the impact of e-commerce on relationship management in the supply chain. The next step is to choose a setting likely to contain the phenomenon in varying states. The setting for the present research is described in more detail in the sample section. Interviews are the primary data collection method used for grounded theory, along with document examination, review of relevant literature, and informal observations (Strauss and Corbin, 1998). Using multiple data sources allows for triangulation in data analysis, which provides more evidence to support the developing theory. For this study, interviews

were conducted, company documents were reviewed where they existed, and literature on e-commerce and supply chain management was examined.

The design of this research remained flexible throughout the study, as grounded theory intends. As Patton (1990) states, inquiry must adapt to the emergent findings. The researcher must avoid being locked into an inflexible design that eliminates the ability to respond to situations that would lead to new paths of discovery. Grounded theory methodology does not follow a sequential process of conceptualization, data collection, and data analysis. The grounded theory methodology requires analysis of data immediately on collection, and subsequent return to sampling for further data collection based on analytical findings. Data analysis is repeated at each stage of data collection, and the emergent findings are organized into themes, which are then integrated into theory (Swan, 1985). Moving back and forth between data collection and analysis moves the research in the direction that the developing theory leads. Detailed descriptions of the procedures applied to the present research are discussed further in the following sections.

Sample
The unit of analysis for this study was the firm, and the sample was purposive; targeted companies were chosen based on an attempt to locate the phenomenon of interest. Eight B2B companies conducting business electronically agreed to participate. Two to four employees responsible for activities related to management of the supply chain and its relationships at each company were interviewed for a total of 22 on-site, in-depth interviews. McCracken (1988) states that eight respondents is sufficient for many research questions; therefore, the number of participants for this research were more than enough to tap the domain of the impact of e-commerce on supply chain relationships. The companies represented both brick-and-click (traditional businesses now conducting transactions over the Internet) and pure-play firms (only conducting business via the Internet). They also represented various industries, sizes, and lengths of time in e-commerce. These companies were chosen based on the likelihood that the phenomenon would manifest itself in different ways, i.e. both similar and contrasting cases might be found. This was done to meet the grounded theory requirements of specifically and systematically exploring instances of variation for each variable which allows the constructed theory to incorporate as much of the complexity of reality as possible (Strauss and Corbin, 1998).

Data collection
In-depth interviews are the primary method used for grounded theory data collection; the interview helps thoroughly exhaust concepts (Strauss and Corbin, 1998). A protocol was developed by the research team to guide the interviews and was reviewed by colleagues familiar with the phenomenon of interest. Initially, interview questions were purposefully broad to keep them

flexible. As the research study progressed, they became more focused, eventually leading to theoretical sampling. During theoretical sampling, interviews are driven by concepts derived from the evolving theory and based on the intention of making comparisons in order to maximize opportunities to discover variations and to densify categories (Strauss and Corbin, 1998). All interviews were conducted by two members of the research team and were audiotaped for subsequent transcription to minimize researcher bias and support data quality and reliability.

Each interview began with an introduction and questions to ascertain demographic data. This established a rapport between the interviewers and the participants and helped create an understanding of the purpose of the study (Strauss and Corbin, 1998). All respondents were assured of confidentiality. The general question, "how does your company operate in e-commerce" was asked to begin the qualitative portion of the interview. This was followed by prompts as necessary to tap the domain of supply chain relationship management practices in the e-commerce environment. The prompts included questions such as how information was collected, what it was used for, what factors influenced supply chain relationship management, what processes or systems were used, and how success was defined, as well as others that emerged from the interview content. Researchers recorded field notes and memos to capture thoughts, feelings, observations, or insights following the interviews. Interviews were conducted until theoretical saturation was reached; that is, when the concepts were exhausted, and no new information came from interviews. In addition to interviews and field notes, company documents were reviewed, and literature on supply chain management and the e-commerce environment were examined to triangulate the findings.

During data collection, even though the aim is to get close to the situation being explored, the researchers must periodically step back in order to maintain skepticism so as not to introduce bias (Strauss and Corbin, 1998). This is also referred to as "manufacturing distance" from the research (McCracken, 1988). The researchers involved in this study have studied e-commerce, interorganizational relationships, and supply chain management. Bringing knowledge and experience to the study is important in order to provide theoretical sensitivity (Strauss and Corbin, 1998). However, there must be a balance between what has been explored prior to data collection and restraining that knowledge to ensure that the theory comes from and is grounded in the data.

Data analysis

Grounded theory methodology was chosen due to its appropriateness for the research question (determining "how") and the phase in the scientific process (exploratory research of a new phenomenon). Data analysis began immediately following the first interview and continued throughout the data collection process, allowing the developing theory to direct the research. Specific

techniques prescribed by grounded theory methodology were used to analyze the data collected (see Strauss and Corbin, 1998). Transcribed interviews, memos, field notes, and company documents were all coded in order to categorize, name, and identify properties and dimensions of the research. The basic process of analysis involved continually questioning the information obtained and making comparisons among coded sets of data. These techniques allowed the theoretical concepts to emerge from the data.

Over 700 pages of interview transcripts and company documents were systematically organized and coded independently by two members of the research team, which resulted in 95 categories of meaning. The two researchers then reconciled their codes, and any initial discrepancies were resolved by consensus. A third member of the research team then reviewed the transcripts to verify reliability of the codes. Three members of the research team met on three occasions during the data collection and analysis to discuss emergent themes, their definitions, and relationships. As a result, the categories of meaning were linked into 17 major themes. The fourth member of the research team reviewed the themes and samples of text coded within the themes. Coding was facilitated with the latest QSR qualitative research software, NVivo (QSR International Pty Ltd, 2000), which is specifically designed for performing indexing, searching, and theorizing on qualitative data. All three types of coding – open, axial, and selective – recommended by Strauss and Corbin (1998) for grounded theory were conducted. Memos, field notes, and company documents were used to integrate and refine the theory and enabled a comprehensive understanding of the phenomenon.

Quality of results

The imperative to illustrate that results obtained from qualitative research methods are of the highest quality parallels the importance of measuring validity and reliability in quantitative research. The grounded theory researcher must have empathetic insight for data collection and analysis and neutrality toward the emergent themes and findings. Complete objectivity is not possible, and complete subjectivity is not credible (Patton, 1990, p. 40). Quality is therefore supported through the rigor of the research process and trustworthiness of the data.

Five methods for supporting the rigor of the findings were used for this research. First, to minimize researcher bias and improve the reliability of the subsequent interpretations, two researchers conducted each interview. Each interview was transcribed verbatim from audiotapes by a professional transcriber who was unfamiliar with the research objectives. Second, the researchers who conducted the interviews independently coded and then reconciled the transcribed interviews to demonstrate agreement in the constructs that emerged. A third researcher then reviewed the coding for additional inter-coder reliability (Potter and Levine-Donnerstein, 1999). Third, member checks (having interview participants review the interpretations of

their interviews) were done with each interview participant to ensure the data analysis was both complete and credible (Hirschman, 1986). Fourth, triangulation of data from different sources was used to provide additional evidence to support the theory developed. Finally, colleagues familiar with the constructs reviewed results to ensure they were understandable and confirmable (Hirschman, 1986).

Evaluating the quality of grounded theory research involves assessing the trustworthiness of the data, theory, research process, and empirical grounding of the research (Strauss and Corbin, 1998). Miles and Huberman (1994) provide several questions grouped into five standards that can be used to address the quality issue. These standards correspond to the notions of validity and reliability used in quantitative research and are presented in Appendix 2, Table AI, along with specific actions taken in this research to address each standard.

The nature of the e-commerce environment

The in-depth interviews produced numerous themes surrounding e-commerce and supply chain relationship management. These themes were examined in light of the context in which they were collected in the interviews and were compared to information in the literature to determine relationships among them. Emergent themes specific to the nature of conducting business electronically were speed, connectivity, information visibility, market structure, and uncertainty. Each of these is discussed in detail.

Speed

When interview respondents spoke of the speed of e-commerce, they focused on two components, the increasing rate of change and the pace of decision-making. In discussing how rapidly business takes place in the e-commerce environment, respondents talked about "Internet time" and that one year in e-commerce is equivalent to four years in the traditional business cycle. Regardless of the industry or type of company, they agreed that electronic business evolves very quickly. One respondent from a brick and click company said, "this thing is moving at 150 miles an hour. Business models are morphing at incredible speed," while their traditional side is "moving 20 miles an hour." Another respondent summed up the rate of change in the following quote:

> You are pulled in all these different directions and have a lot of responsibility put on you where [you] probably would have to go through a good five or ten years in another corporation before you get that type of responsibility. Things transpire here, inside an Internet company, more quickly than they would elsewhere.

The executives interviewed also stressed the pace at which they needed to make decisions in order to stay ahead of competition. One respondent said, "In this business, laggards lose, and they lose because somebody else innovates a solution that captures the customer." Another stated, "We want to maintain our lead position because our lead is really just about a city block. We've got to

keep up real fast here." Because e-commerce represents an emerging market, companies are fighting for market share, so they are trying to get to market with their offerings faster than companies competing in the traditional business environment. Respondents felt their companies have had "to grow basically twice as fast to ever make any kind of headway." One quote from a respondent epitomized how e-commerce companies view decision-making in this environment:

> It's just very dynamic. You don't sleep. You make decisions much faster. You may take less data points to make a decision. You take higher risks. From a traditional business side, we've been analyzing something five, six times . . . we looked at so many different aspects. I think in the Internet world, you just do it.

The literature echoed these two components of speed. Stalk (1988) posits that a strategic shift toward time-based competitive advantage began in the late 1970s with the flexible manufacturing concept. Faster execution of processes allowed companies to reduce costs, improve quality, and attract the most profitable customers. The speed at which business operates electronically is an attractive aspect of e-commerce. It is business in real time where quick decision-making is key. CEOs of e-commerce companies speak of "doing a deal a minute" and being forced to "be on your toes every minute, every second" (Colvin, 1999). Today, the e-commerce environment has intensified the strategic emphasis on speed, enabling further reduction of product cycle time, increased rate of new product introductions, and increased speed of customer transactions (Greenstein and Feinman, 2000).

Connectivity

Interaction and market access emerged as the two components of connectivity in the interviews. Nearly all respondents spoke of the network effect – being interconnected to their suppliers and customers via the Internet. Companies have begun to rely on the "system-to-system connection with strategic suppliers and customers." They view e-commerce as a way to open and remove technology barriers among supply chain members and to bring everyone in the network closer. The Internet allows companies to communicate and share information across the supply chain. One respondent stated, "Now we have Web-hosted technology which allows me to share information on one common data platform and provide different views or uses for folks up and down the supply chain." This connectivity helps companies manage the shared information – as one respondent said, "when you have big volume flows of data, it (the Internet) has proven to be more reliable and efficient for that integration – systems-to-systems integration."

The second aspect of connectivity – market access – illustrates the ability of companies to access customers they could not reach prior to e-commerce. One respondent said that connectivity allowed them "to understand what customers need." Another company talked about how the Internet would give them a "cost-effective way to reach out and touch" smaller customers. Some companies

spoke of gaining "critical mass" through connectivity. Critical mass is the threshold of network members (suppliers and customers) needed to make their business model successful. A respondent summarized this idea in the following quote:

> As the size of the network grows, the benefits grow exponentially. So the answer is we use [our business model] to bring other companies in that grow the network fast, and let us achieve critical mass quickly.

The two components of connectivity – interaction and market access – were supported by the e-commerce literature as well. Hamill (1997) asserts that the key to effective use of the Internet is understanding the concept of connectivity. On the Internet, information flows are multidirectional. Compared to the unidirectional, one-to-many communication of traditional business, communication on the Internet has been described as many-to-many (Hoffman et al., 1995). Connectivity provides for a level of interaction that is not as efficiently achieved in the traditional business environment. In addition to providing the opportunity for firms to strengthen relationships with individual customers, the electronic environment also expands the reach of companies as they seek to develop their customer bases. Firms are no longer restricted to markets by their geographic locations. The fastest growth rates for the electronic environment are outside the USA (Cairncross, 1997). As global access grows, new markets are opening. Thus, the connectivity of e-commerce facilitates the extension of electronic storefronts to any location with online access.

Information visibility
E-commerce technology provides information visibility throughout the supply chain. Respondents spoke of being more responsive to supply chain members' needs due to the visibility of real time data via the Internet. One respondent specifically said, "there's a tremendous amount of value for somebody who can deploy those solutions effectively, link someone to their trading partners, and allow them total visibility to the supply chain in ways that they haven't had before." One company talked about their customers being able to access and "check everything where they want," and that they "also have visibility to ask what's the status of a particular move or transaction." Supply chains can achieve a great deal of efficiency due to visibility as stated in the following respondent's quote:

> If you can integrate in your system the components on production planning and scheduling and inventory control, and do that through the supply chain, then you can really get into just-in-time. The procurement officer and the customer enter their requirements, and that gets messaged directly into our system that's working on all of our production and inventory scheduling. That goes directly in, and then we can feed that back around to the customer so we complete the loop.

The literature also discusses the value of information visibility in supply chains. Information helps managers plan, execute, and evaluate results with

greater precision and speed (Rayport and Sviokla, 1995). Technology that permits complete visibility to this information enables businesses to manage their operations more effectively. Visibility of information across the supply chain as opposed to information from one supplier or customer provides for better management of the supply chain as a whole rather than as a set of discrete parts. Companies have transformed this kind of information visibility into competitive advantage (Rayport and Sviokla, 1995), not just for themselves, but also for their supply chains. However, visibility can also lead to information overload as companies have access to more information than they are accustomed to managing, potentially resulting in confusion and additional uncertainty in the connected environment.

Market structures
The fast pace needed to operate in the e-commerce environment and access to new markets has impacted traditional market structures. Continuously adapting to the rapid rate of change, respondents commented on the difficulty encountered in managing supply chain relationships in dynamic market structures. As companies expand into new markets, they begin to work with traditional competitors and compete with suppliers and customers. One respondent said, "One of the biggest changes that I've seen is when I start to talk about who I compete with versus who I work with." Companies have to learn to manage the conflict that is created when this occurs. New competitors are materializing – from new intermediaries entering the market to existing supply chain members taking advantage of new opportunities to reach customers. One respondent told of having to work harder to stay in contact with customers because they "risk losing the direct contact with the end customer due to (a new intermediary). And once you get in that position, then we become even more commoditized and we lose all pricing power." Another respondent gave an example of how one of their large customers is now competing directly with them and clouding the traditional distinction among supply chain members:

> On the one hand they are a huge customer of ours, but they've made huge investments into the technology side of the business, into logistics. So now suddenly, we are finding that they are trying to interject themselves in our business relationships between us and some of our very largest customers. So while they're a huge customer, we're also wondering just what are they doing. For example they're taking over (logistics for a) huge customer of ours. More than a hundred million dollars a year we do business for and suddenly, here is somebody that's trying to get between us and them.

According to the literature, the differences in e-commerce have driven a shift in market structures across industries. The emergence of the electronic marketspace provides the opportunity for manufacturers to market directly to customers, eliminating the need for traditional channel intermediaries. At the same time, new "cybermediaries" are stepping between trading partners. As e-commerce opens new opportunities for channels to consumers, the potential

for channel conflict is magnified (Aldridge *et al.*, 1997). In this new
environment, functions and a relative power shift among all members of the
value chain – suppliers, manufacturers, retailers, and consumers – blurs the
boundaries among players in traditional industry structures (Davis and Meyer,
1998; Glazer, 1991; Weiber and Kollmann, 1998).

Uncertainty
The dynamism of markets and the increased information visibility facilitated
by the speed and connectivity of e-commerce present an uncertain
environment. One respondent described the environment in the following
quote:

> In the Internet space, it changes that we deal with the customers and then deal with the
> suppliers, and it's all very new to them and it's scary, right. No longer can I get up and go to
> work like I used to get up and go to work. I don't know what's coming down the path.

Another respondent compared e-commerce on the Internet to the renaissance,
"Everything's evolving, changing. You know, really the whole structure of the
world in some ways is being, you know, touched and modified, changed, and I
think that's true." Companies are making decisions without complete
information, making outcomes more uncertain. However, many respondents
view the uncertainty as exhilarating. One respondent stated, "a lot of it is being
able to work in the unknown. But you know, as a business person I think it's
very exciting."
    The literature discusses the characteristics of uncertainty as dynamism,
technological intensity, and change – all of these being characteristics of the
e-commerce environment. Achrol and Stern (1988) found support for their
hypothesis that dynamic or shifting environments create increased uncertainty
for decision makers. In discussing the outcomes of uncertainty, Osborn and
Baughn (1990) proposed technological intensity as likely to reflect high
uncertainty. In the following quote from his article on network organization,
Achrol (1997) describes how advances in technology have led to increased
external uncertainty faced by firms:

> Environments are being disturbed by an increasing pace of technological change, fueled by
> an explosion in the growth and availability of knowledge. The proliferation of technological
> and managerial know-how is dismantling economic and political boundaries and slowly but
> surely moving the world toward a borderless marketplace. The impact of technological
> change is intensified in global environments that are densely interconnected and
> interdependent.

E-commerce represents the kind of environment of which Achrol speaks.

Summary
Based on themes that emerged from our research, the nature of the e-commerce
environment can be described as shown in Figure 1. E-commerce has two
primary dimensions, that make e-commerce very different from the traditional
business environment.

These are:

(1) speed; and

(2) connectivity.

Most respondents discussed how rapidly business takes place in the e-commerce environment and how e-commerce allows them to be interconnected to all their suppliers and customers. The speed of e-commerce impacts the structure of the market by inducing companies to bypass intermediate steps in the supply chain in order to conduct business faster, thereby creating different market structures. The connectivity of e-commerce also contributes to new market structures through the access it provides to new customers. Information visibility is achieved through connectivity. Respondents said the Internet allows communication and the sharing of information providing visibility across the supply chain. Information visibility and dynamic market structures directly create a perception of uncertainty. As shown in Figure 1, the dimensions of speed and connectivity lead to dynamic market structures and information visibility, which then lead to uncertainty.

The impact of e-commerce on relationship management

The differences in the e-commerce environment impact supply chain relationship management for those companies that conduct business electronically. Because supply chain management is essentially managing the relationships among the companies in a supply chain, we propose that the impact of e-commerce on supply chain management occurs primarily through the management of relationships.

Relationship management was a prominent theme that emerged from the respondent interviews. As companies deal electronically with more suppliers and customers in a variety of supply chain structures, they found managing relationships to be very important. One respondent stated, "I would say more and more, it's going to become more of a relationship driven business for us." Even though many of the transactions can be accomplished via the Internet, some companies said they would never move away from providing face-to-face contact with their customers, as one respondent commented:

One of our market differentiators is that we use a personal account manager model even for our lowest value customers, meaning you'll have one person that does business with you. You will have a person with a name and an extension and an email address, and you'll probably know that person's schedule and you'll call them. They will do business with you and ideally create a relationship that is truly a consultative relationship – that in itself presents value.
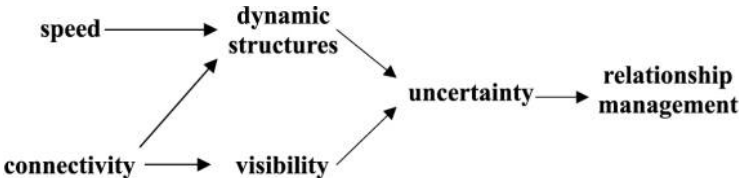

Figure 1.
Impact of e-commerce on relationship management

Whether it is a partnership or strategic alliance, companies operating in the e-commerce environment are stressing relationship management in order to combat uncertainty – by providing stability and obtaining needed resources. One respondent stated his company's goal "is to get into the relationships with customers where it's a collaborative, one to one, really so hard to be replaced. They know you and you know them and there's a fair amount of trust in there." Another respondent talked about how the Internet helps to build stronger relationships:

> You've got to find ways to involve yourself and get them involved in our meetings so that they understand so that we start earning credibility with them so that you can take them into that collaborative thing. They're not going to do anything unless they trust you. So the Internet can help us with accurate data. You know, if you have zero defect transactions, you start earning credibility with the customers and you're really not going to be able to establish that collaborative relationship until you do.

In order to maintain flexibility in this uncertain environment, e-commerce companies support basic operations with a minimal in-house staff and obtain additional resources through relationships with other companies. Many partner with information technology providers to acquire a technology infrastructure, while some partner with consulting firms to provide human resources to achieve scalability for growth. One respondent noted, "the biggest challenge for us is scalability … the group is going to reach capacity very quickly as we get a number of clients, so the critical part of our business was to build and partner with folks." Companies also realize the importance of partners for international business, as one respondent noted, "entering the South American market, and particularly the Asian market, we're going to have to have some strong strategic alliances, some strong partners who are doing business in those markets to be successful."

Successfully competing in dynamic product markets requires resources, capabilities, and strategies that are different from those likely to lead to competitive success in more stable markets (Sanchez, 1993). Higher uncertainty through dynamic market structures and increased information visibility in the e-commerce environment have caused respondents to place a stronger emphasis on relationship management in order to secure these resources, capabilities, and strategies. A great deal of research exists that supports a positive relationship between dynamic structures and environments and the formation of relationships such as partnerships (Lambe and Spekman, 1997; Mentzer *et al.*, 2000) and alliances (Adler and Scherer, 1999; Cravens *et al.*, 1996; Dahlstrom *et al.*, 1996; Lambe and Spekman, 1997). Achrol (1997) adds that closer relationships between firms offer higher levels of coordination, greater stability, and flexibility. Increased visibility can actually make it more difficult to manage the incredible amounts of information available. Companies therefore emphasize relationship management to overcome the uncertainty from information overload.

Firms internalize fewer resources and capabilities in highly uncertain environments with changing markets than in stable markets (Osborn and Baughn, 1990). Resource dependence theory views interfirm governance as a response to conditions of uncertainty where governance encompasses the initiation, termination, and ongoing relationship maintenance among supply chain parties (Heide, 1994). Firms therefore purposely structure their exchange relationships to reduce uncertainty. In this respect, transaction cost theory parallels resource dependence theory (Heide, 1994). It is based on the assumption that firms are motivated by uncertainty to craft efficient governance structures (Noordewier *et al.*, 1990). Uncertainty is often a determinant for companies deciding whether to obtain or use assets from other organizations or develop them in-house (Skjoett-Larsen, 1999). Since e-commerce is characterized by high uncertainty due to dynamic market structures and total information visibility, resource dependence theory and transaction cost theory support an emphasis on interorganizational relationship management.

Implications for relationship management

This research has implications for companies conducting business electronically, as well as for those that are not. For companies engaged in e-commerce, an emphasis needs to be placed on relationship management in order to deal with the uncertainty, dynamic market structures, and total information visibility that the environment brings. Alliances and partnerships with various providers allow companies to obtain needed resources while maintaining flexibility in the sometimes volatile environment. This may be even more important when the economy shifts; the viability of e-commerce businesses was tested in late 2000 and 2001 due to a downward turn in the economy. Not only did this create even higher levels of uncertainty for companies, but it also put pressure on them to justify their business models. Successful relationship management is thought to lead to competitive advantage in the traditional environment. In e-commerce, it aids companies in managing their supply chains, which has proven to be critically important not only for success in e-commerce, but also for survival. These companies, therefore, need to consider how managing interorganizational relationships is incorporated in their business models.

The infrastructures that e-commerce companies build around relationships could affect traditional firms. Relationships can create barriers to competition as suppliers and customers rely on those with whom they work on a continual basis. This may make it imperative that traditional businesses better manage their relationships so as not to lose suppliers or customers. Proactive relationship and supply chain management will enable companies to enter e-commerce and potentially gain an advantage much more easily than those that did earlier. It will also make it easier for these companies to cope with

uncertainty, changing markets, and visibility to greater amounts of information when they occur in the traditional environment.

Relationship management can enable trading partners to more efficiently deal with increased visibility of information afforded by the e-commerce environment. Information overload often leads to uncertainty as firms struggle with decisions regarding which information is important and how to interpret it. Results of this research underscore the importance of managing relationships to reduce uncertainty by working collaboratively toward a shared understanding of what information is relevant and how the information is most advantageously used. The effective management of information flows among supply chain members is critical to gaining competitive advantage in the e-commerce environment. In the absence of proper management, the flood of information can quickly overwhelm managers operating in this environment. Efforts to collect, organize, and disseminate this information can deplete valuable human and financial resources. Trained in the efficient and effective management of information flows, logisticians may prove to be invaluable in helping firms to adapt to the new information economy.

There are also implications for theory from this research. By finding the linkage between the perceptions of uncertainty and the importance of relationship management, this study has supported existing theory from the channels literature. Transaction cost analysis and resource dependence theory have been used to help explain why companies form relationships with other companies in their supply chain when faced with uncertainty. Firms purposely structure interorganizational relationships to help minimize uncertainty by decreasing the cost of transactions and establishing a flexible yet stable source of assets through ongoing relationships. In this respect, e-commerce is a different environmental context where these theories provide support for uncertainty leading to the formation and management of interorganizational relationships.

An interesting implication of this research is the finding of the relationship between uncertainty and information visibility in the e-commerce environment. Informants in this study linked increased information visibility to higher levels of uncertainty. In contrast, several studies in other contexts support the role of increased information search as a strategy for reducing uncertainty (Bauer, 1960; Cox, 1967; Moorthy *et al.*, 1997; Urbany *et al.*, 1989). Perhaps the extremely high level of information visibility in the e-commerce environment provides a context for examining the natural boundary of the utility of increased information as a source of uncertainty reduction.

Limitations and future research

The greatest strength of this study also contributes to its greatest limitation, that is, its inductive/qualitative approach, use of interviews, sampling, and context. This was a qualitative study relying primarily on 22 participant interviews as data. The study has demonstrated how conceptually rich interpretations yielding theoretical relationships can be obtained through such

methods. In terms of the scientific method, this study was inductive in nature, designed to build theory. Thus, it is limited to theory development. It has not provided validation of the developed theoretical relationships. That must be accomplished through further empirical investigation using research design for theory testing.

The use of one-on-one interviewing also creates limitations for this study. There exists the potential for interviewers to affect the nature and quality of participants' responses. A strength of depth interviews is their reliance on well-trained interviewers as research instruments. As a sophisticated information processor whose abilities in many ways far exceed other instrument capabilities, human interviewers can help guide their interviews toward relevant and meaningful (for the study participants) topics and elaboration. However, there is always the risk that the interviewer may overly influence participants' stories, thus the need to validate the findings and ensure that results are not due to the method.

Sampling procedures also limit this study's contributions. This study relied on purposive theoretical sampling; therefore, findings cannot be generalized to large populations. All population members within e-commerce, or even within a single company, did not have an equal probability of being selected as study participants. Participants were selected expressly for the purpose of elaborating on the study's emergent themes. The sample consists of a few carefully chosen business development and operations managers within eight organizations.

At the most limited level, this study's findings can be generalized to the study participants, assuming that the interpretations that span all 22 participants partially describe each individual's past experiences. Member checks were used to examine this level of generalizability. This study's findings depict perceptions of the e-commerce environment and its impact on supply chain relationships, which apply to similar kinds of companies within e-commerce. However, this level of generalizability cannot be stated from this study alone due to the sampling method and sample size.

The study presented opens the door for future research to expand these findings. As a first step, the dimensions of e-commerce and their impact should be examined in greater depth by extending the sample to a larger number of firms to gain a richer understanding of the phenomenon. For example, does the impact on supply chain management differ based on the length of time in e-commerce? This study examined the phenomenon from the single-firm point of view. It would be interesting to explore the effect of e-commerce on supply chain relationship management from a dyadic perspective or perhaps an extended supply chain. Are other supply chain members' experiences the same as or different from those evaluated? Do factors such as company size, position in the supply chain, or characteristics of other firms in the supply chains play a role in the impact? These and other potential moderating or mediating factors should be included in the theory.

The current research addresses the interface between the e-commerce environment and relationship management. Future research should examine the effects of the e-commerce dimensions on supply chain management, of which interorganizational relationships are a part. Are there implications for all or only certain supply chain management activities, and why? Are there impacts on supply chain performance? Measuring performance across the supply chain in the traditional business environment can be difficult, and whether the speed or connectivity makes measurement easier or more difficult should be explored. Considering how the economy has changed in e-commerce, follow-up with the participant companies as well as new companies may provide new information. These areas may require longitudinal research.

Once the conceptualization is complete, the theory developed by this study should be tested. Measures for the constructs in this context (e-commerce) should be developed and quantitative methods used to test the theoretical relationships. The research currently applies to B2B brick-and-click and pure-play companies in limited industries. A research design that extends the study to a larger sample of firms and/or additional supply chain members engaged in e-commerce, including business-to-consumer firms, would assist in generalizing the findings. The findings could then be more specifically compared to supply chain management in the traditional environment, allowing further refinement of the theory, and offering a deeper understanding of the differences between the traditional and e-commerce environments.

Separately, e-commerce and relationship management have received a great deal of attention in current research. With e-commerce comes the perception that the business environment is more dynamic and more uncertain than its traditional counterpart. Past research has shown that companies react to uncertainty by structuring and maintaining relationships with supply chain members. These relationships help reduce the risk in making and implementing business decisions. Supply chain management is essentially the management of relationships among supply chain members. This study found that businesses participating in e-commerce rely heavily on effective relationship management with supply chain members to overcome the uncertainty created by e-commerce.

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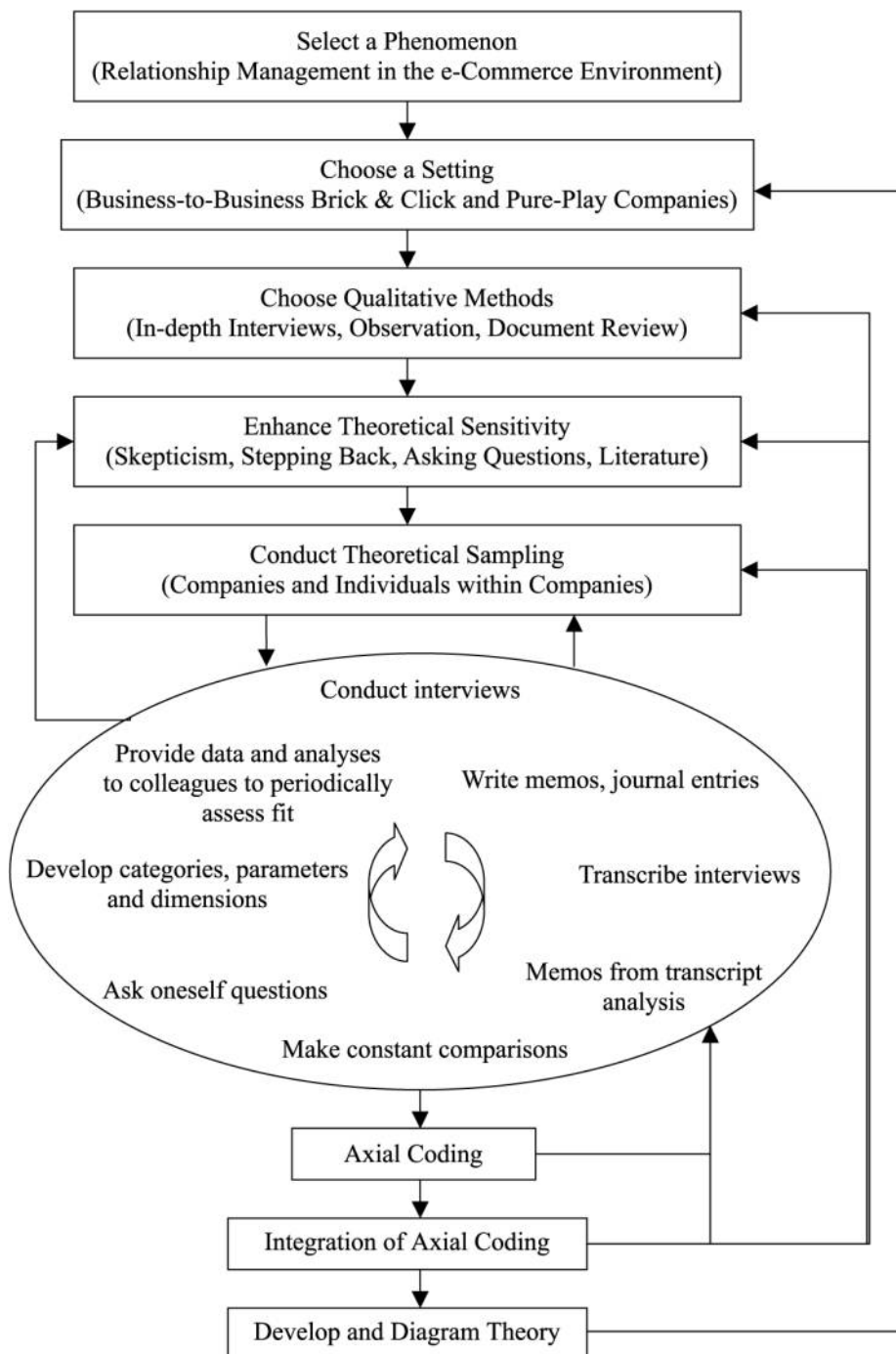
Appendix 1

Figure A1.
Grounded theory
research activities

Appendix 2

Standard	Questions	Action(s) to address question
Objectivity	Are the study's general methods and procedures described explicitly and in detail? Is there a record of the study's methods and procedures, detailed enough to be followed as an "audit trail"? Has the researcher been explicit and as self-aware as possible about personal assumptions, values and biases? Are study data retained and available for reanalysis by others?	The methodology is described in detail in the methodology section of the article Interview protocols and general memos on the research process exist in the Nvivo file to provide an audit trail Multiple researchers were used at each stage of collection, analysis and interpretation to minimize any bias All data, including backups, are held in a central data location.
Reliability	Are the research questions clear, and are the features of the study congruent with them? Do findings show meaningful parallelism across data sources? Were coding checks made, and did they show adequate agreement? Were data quality checks made? Were any forms of peer or colleague review in place?	Research question was explained to participants and used to create the interview protocol Similar themes emerged across participants, industries, and companies Independent coding was subsequently reconciled by two researchers Member checks were conducted Additional researcher reviewed interpretations
Internal validity	Does the account "ring true," make sense, seem convincing or plausible? Did triangulation among complementary data sources produce generally converging conclusions? Are the presented data well linked to the categories of prior or emerging theory? Were the conclusions considered to be accurate by original informants?	Researchers and participants reviewed and approved of the interpretations Conclusions from different data sources (interviews, memos, field notes, company documents) converged Data are linked to prior theory (resource dependence, transaction cost) Member checks were conducted with all original informants
External validity	Is the sampling theoretically diverse enough to encourage broader applicability? Does the researcher define the scope and the boundaries of reasonable generalization? Are the findings congruent with, connected to, or confirmatory of prior theory? Does the report suggest settings where the findings could fruitfully be tested further?	Different types of companies, industries, participant positions, time in e-commerce The scope and boundaries of generalization are defined in the conclusions The findings are confirmatory of prior theory (resource and transaction cost) Settings for further testing are suggested in the conclusions
Utilization	Do the findings stimulate "working hypotheses"? What is the level of usable knowledge offered? Do the findings have a catalyzing effect leading to specific actions?	Propositions for future testing are proposed Conscious-raising information and implications are offered Implications are offered to prompt specific actions

Table AI.
Summary of evaluation criteria

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