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THE EFFECTS OF INDIVIDUALS' SOCIAL NETWORK CHARACTERISTICS AND INFORMATION PROCESSING CHARACTERISTICS ON THEIR SENSEMAKING OF COMPLEX, AMBIGUOUS ISSUES

A THESIS

SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL

OF THE UNIVERSITY OF MINNESOTA

BY

Marc Howard Anderson

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

Mary Lippitt Nichols (Adviser)

JANUARY, 2002

UNIVERSITY OF MINNESOTA

This is to certify that I have examined this copy of a doctoral thesis by

Marc Howard Anderson

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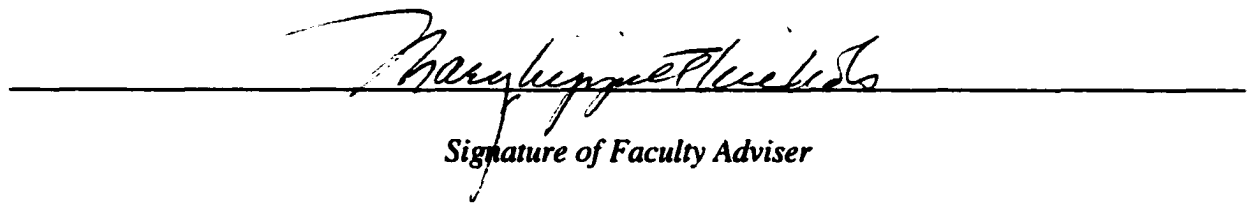

Signature of Faculty Adviser

11/30/02

Date

GRADUATE SCHOOL

ACKNOWLEDGMENTS

Horror stories abound regarding how terrible pursuing a Ph.D. degree can be. My experience has instead been quite enjoyable, and this has been in large part because of the people below. Their support was essential to making my dissertation a success, and I heartily thank them.

My greatest intellectual inspiration came from Professor Karl E. Weick. I was fortunate enough to take an M.B.A. class from Karl at the University of Michigan. His uncanny ability to ask tremendously interesting questions regarding how people make sense of confusing situations helped motivate me to enter a Ph.D. program and greatly inspired this dissertation research.

Soon after I began my Ph.D. studies at Minnesota, I was amazed by Professor Larry L. Cummings. The terror he struck in the hearts of many students forced us to work exceptionally hard and strive for research excellence. The dedication he showed to students was unequaled, and included meeting with Jeff Thompson (a fellow student) and I every other week for many months to cover the material in his Organizational Behavior seminar (because he wouldn't be teaching it again). His untimely and tragic death was a serious blow to the field of organization studies in general and the students at Minnesota in particular.

After Larry's passing, I entered one of the most uncertain times during my journey, and especially I struggled with the question of who would be a good advisor. I was enormously lucky that Professor Mary L. Nichols returned from working in the Dean's office to rejoin our department. She has proven to be an outstanding advisor! By always listening and asking useful questions, yet never trying to overly influence the course of my ideas, she struck the perfect balance between providing assistance and letting me struggle and develop as an independent researcher. Another important way she helped was connecting me with Professor Norm Chervany.

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Although not directly related to this dissertation, three other professors with whom I have worked on research projects during my Ph.D. journey have greatly helped improve my understanding of how to conduct excellent research: Professors Alfie Marcus, Bala

Chakravarthy, and Sri Zaheer. Working with them gave me a broader perspective on both research and the professional aspects of life as a professor.

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Focusing the entirety of one's attention on their Ph.D. studies is a sure path to madness, and extracurricular activities are essential to maintain a proper balance. I am greatly indebted to my two martial arts teachers, Shuman Lee and Nels Hennum, as well as a variety of other martial arts instructors and students, for supporting me and enabling me to progress down the other great path I follow. By forgetting my Ph.D. troubles for a brief time while practicing, I was better able to surmount them afterwards.

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Finally, I want to sincerely thank the CEMBA and MOT students who took their time to participate in my research. Without their help my dissertation would have been impossible. With this dissertation and my future work, I hope I can contribute to a better understanding of the fantastic world of organizations and help them, and all people, live better lives by that understanding.

Thank you all so very much!

DEDICATION

TO

MY MOM – LANA GAYLE ANDERSON
MY DAD – TERRY MITCHELL ANDERSON
MY WIFE – CHRISTIANNE VANESSA DUIM RIBEIRO ANDERSON

This dedication is to you – the three
my heart holds most dear: Mom, Dad, and my Love.

Kind Mother – too soon to heaven above...
Through my lonely years you believed in me.
When uninteresting, you still found interest.
Now so deeply missed... I wish you were here!

Brilliant Dad – in my esteem without peer.
Sometimes stubborn, but I've been doubly blessed
with your confidence and intelligence,
Still great after regression to the mean.

Chris – the most stunning beauty ever seen!
This success, and any excellence
that I achieve, is inspired by you.
Know now and forever – my love is True!

ABSTRACT

A key challenge managers face is making sense of what complex, ambiguous issues mean for their businesses. Models of this sensemaking process highlight the role that information gathering plays. In this dissertation, I test whether social network, personality, and contextual characteristics affect three measures of information amount: (1) the time spent searching for information, (2) the effectiveness of that search, and (3) the diversity of information found. I then test whether these three measures of information amount predict two key aspects of individuals' interpretations: (1) changes in the extent to which they see electronic commerce (e-commerce) as a threat and/or opportunity to their businesses, and (2) the integrative complexity of their thinking about how the issue of e-commerce will affect their businesses.

The research setting involved two executive-level classes at the University of Minnesota, and 72 individuals participated. The methodology involved four waves of data collection: (1) an initial survey measuring individuals' social network, personality, and contextual characteristics, (2) a survey measuring managers' perceptions that the issue of e-commerce is a threat and/or opportunity to their businesses, (3) an information log where individuals recorded details of their information search process as they completed a report on how e-commerce would affect their businesses, and (4) a second threat and/or opportunity survey. The data was analyzed using multiple regression analysis.

Results showed that individuals' social network size was significantly related to the amount of information they gathered. In addition, there were significant interaction

effects between network size and personality (i.e., need for cognition), as well as average tie strength and personality, on the amount of information gathered. Managers with larger networks gathered more information, especially if they had a high need for cognition. High need-for-cognition managers with social networks filled with weaker ties also spent more time gathering information. Finding more information was related to changes in perceptions toward seeing e-commerce as more of a threat. However, if that information was diverse, perceptions changed toward seeing e-commerce as less of a threat. Interestingly, there were no significant findings related to the integrative complexity of individuals' thinking about the issue of e-commerce.

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CHAPTER 1

RESEARCH PROBLEM AND QUESTIONS

Today's business environment is complex, rapidly changing, highly interdependent, and global. Competing in this environment requires managers and their organizations to effectively recognize and make sense of a variety of new and emerging strategic and organizational issues. These issues can be defined as "emerging developments, events or trends that have potential consequences for an organization's performance" (Dutton, Stumpf, & Wagner, 1990: 144). Possible issues include judging the implications of new technologies for existing and potential businesses, examining emerging threats from new competitors, determining future technological standards, reacting to shifts in socio-cultural trends and values, deciding whether to adopt new organizational practices, and adapting to important legal and regulatory changes.

One of the key challenges individuals face is identifying and making sense of what these new and emerging issues might mean for their businesses. As Schneider (1994: 244) notes, the "process of identifying, interpreting, and prioritizing strategic issues plays an important role in formulating strategy and is thus critical to company survival." Managers who fail to recognize or simply ignore important shifts in the underlying fabric of their competitive landscape risk losing their competitive advantage and leading their firms into bankruptcy and possibly obsolescence. Conversely, individuals who overestimate the urgency of issues that eventually prove to be unimportant risk wasting valuable resources. Striking a balance between recognizing important issues before competitors and avoiding new business fads that promise elusive or illusory benefits is a critical task managers face on a regular basis. In addition, the

increasing rate of change in the business environment entails a commensurate increase in the pace at which potentially important issues emerge.

Issue interpretation is the starting point for organizational change efforts. When external business environment conditions change, managers must first identify those changes and then determine whether and how their firms must adapt. Several researchers have mentioned the critical role of issue interpretation in organizational and strategic change. May, Stewart, & Sweo (2000: 403) note: "The basis for corrective strategic action is managerial problem sensing (Kiesler & Sproull, 1982), consisting of activities associated with noticing, interpreting, and incorporating environmental stimuli." The identification of potentially important issues can be considered a part of environmental analysis, which "requires executives to make forecasts, predictions, and assumptions about significant uncontrollable environmental elements likely to affect the prospects for particular strategies" (Stubbart, 1989: 327). Barr (1998: 644, in abstract) notes: "a key component in a firm's strategic response to unfamiliar environmental events is the interpretations managers develop about the event itself and about key dimensions of their strategy."

However, while researchers recognize the importance of issue interpretation, they lament the fact that we don't understand issue interpretation and especially the role of information gathering in this process. O'Reilly (1983:105) notes: "While a very large number of laboratory studies of decision making exist, comparatively little attention has been paid to the acquisition of information by decision makers and its use in actual organizational settings." Milliken (1990: 42) states: "Although the processes of noticing and interpreting environmental changes are clearly critical to organizational performance

and survival, relatively little research has investigated those processes." Jones & MacLeod (1986: 222) claim that "little research has examined variations among decision makers regarding where and how information used in decision making is obtained. Even less exists on noncomputerized information sources." Finally, Huber (1991: 100) states that with regard to research on information search, "in recent years there has been a *lack of theory-testing field work*" (italics in original).

The focus of this dissertation is to investigate the amount of information individuals' gather or receive and how this affects their interpretations of an emerging, complex, ambiguous organizational issue. This research seeks to add to the existing literature by proposing and testing a model of the factors that affect the amount of information individuals gather, as well as exploring how differences in the amount of information affect issue interpretation and sensemaking outcomes. The broad research questions this dissertation addresses are these:

Research Question 1: How does the amount of information individuals gather and receive affect interpretations of a complex, ambiguous issue?

Research Question 2: What factors determine the amount of information individuals gather and receive as they attempt to better understand a complex ambiguous issue?

This first chapter describes the general model of individuals' sensemaking processes that has been presented in the management literature and discusses several gaps in our understanding related to that model. It then presents a model of the determinants of the amount of information they gather and receive. In doing this, it illustrates several of the important contributions this dissertation makes to the literature. Finally, this chapter

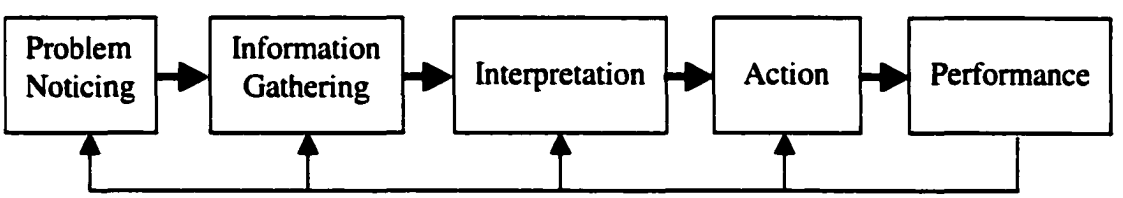
briefly discusses the issue of electronic commerce (e-commerce) as a prototypical complex, ambiguous organizational issue.

General Models of Sensemaking

Much of the early work in organization studies ignored the role of individuals' interpretations in organizational behavior. Stubbart (1989) notes that the foundational works in strategic management also do not include chapters on managerial thinking. However, more recent work has actively sought to clarify the process by which individuals recognize and make sense of confusing and ambiguous situations. The importance of their interpretations for understanding organizational behavior and performance has been increasingly recognized. The majority of this work falls under the domain of managerial and organizational cognition.

A variety of research and theory (Daft & Weick, 1984; Milliken, 1990; Huber, 1991; Thomas, Clark, & Gioia, 1993) suggests that there are five key steps in the sensemaking process, as depicted in Figure 1.1.

Figure 1.1
General Model of the Sensemaking Process



The sensemaking sequence begins when a problem is first noticed or identified (Milliken, 1990; Koppes & Billings, 1988). The recognition of a problem spurs the individual to gather data and information, a step that is also called "scanning" (Aguilar, 1967;

Hambrick, 1981, 1982; Thomas, Gioia, & Ketchen, 1997). As information is gathered, an interpretation develops. It is at this step that the gathered information becomes meaningful (Huber & Daft, 1987; Huber, 1991; Thomas, Gioia, & Ketchen, 1997). Depending on what interpretation is made of the data, specific actions are taken (Daft & Weick, 1984; Thomas, Clark, & Gioia, 1993; Chattopadhyay, Glick, & Huber, 2001). Finally, these actions result in some kind of a performance outcome (Thomas, Clark, & Gioia, 1993; Thomas, Gioia, & Ketchen, 1997).

The majority of the research investigating these sensemaking processes has focused on two areas: (1) the link between interpretations and action (Barr, Stimpert, & Huff, 1992; Barr, 1998; Dutton, Stumpf, & Wagner, 1990; Ginsberg & Venkatraman, 1992, 1995; Gioia, Thomas, Clark, & Chittipeddi, 1994; Tripsas & Gavetti, 2000); and (2) the link between action and performance (Thomas, Clark, & Gioia, 1993; Ginsberg, 1994; Thomas, Gioia, & Ketchen, 1997). The link between the amount of information gathered and interpretations has received much less attention. Furthermore, research investigating the determinants of the amount of information gathered is underdeveloped and fragmented. The next two sections discuss these links.

The Interpretation-Action and Action-Performance Links

The general model presented above explains why researchers are interested in individuals' interpretations and sensemaking processes – they affect *action* and *performance*. A growing body of work is clearly establishing the importance of individuals' sensemaking and interpretation processes. The way an individual interprets a strategic issue affects the range of solutions considered, the amount of resources allocated, and organizational change efforts (Dutton & Duncan, 1987; Jackson & Dutton,

1988; Gioia & Thomas, 1996; Thomas & McDaniel, 1990; Thomas, Clark, & Gioia, 1993; Ginsberg & Venkatraman, 1995). There is evidence that individuals' interpretations guide organizational action, which subsequently determines firm performance (Thomas, Clark, & Gioia, 1993).

The basic reason that interpretations affect action and performance is that different interpretations lead to different actions. Researchers have recognized that information is usually equivocal. Equivocality means that information can give rise to multiple interpretations (Weick, 1969; Daft & Macintosh, 1981; Tushman & Scanlan, 1981). Given the same information, different actors frequently come to different interpretations and this produces different organizational actions and outcomes. For example, Barr, Stimpert, & Huff (1992) found that whereas two U.S. railroads both quickly noticed critical environmental changes, only one interpreted these changes as requiring corresponding changes within the firm. This firm was thus able to "unlearn" its previous cognitive map (i.e., its understanding of how to compete) and adapt to the recognized environmental changes. The other firm continued to see the environmental changes as temporary problems facing the entire industry and beyond their control. This interpretation led to a failure to adapt. Another example of different interpretations leading to different actions is discussed in the work of Ginsberg & Venkatraman (1992). They found that tax return preparation firms invested more heavily in electronic filing when they interpreted this technological innovation as an urgent issue.

The works cited above support the interpretation-action and action-performance links in the sensemaking model presented above. How managers and individuals interpret organizational issues affects their actions. These differences in action in turn affect

individual and organizational performance. The links between problem noticing-information gathering and information gathering-interpretation have been much less investigated and, consequently, have a lesser degree of support. The next section discusses the information gathering-interpretation link, which is the focus of this dissertation.

The Underdeveloped Link Between Information Gathering and Interpretation and the Importance of Information

It is generally argued that as modern business environments increase in complexity (O'Reilly, 1980), those actors who are better suited to process information will develop a better understanding of their environments that will lead to higher performance and success. As Thomas, Shankster, & Mathieu (1994: 1259) state: "the information acquisition and conveying mechanisms of an organization are key determinants of how top managers interpret their environment." Dutton, Fahey, & Narayanan (1983: 307-308) discuss strategic issue diagnosis (SID) and state that "SID refers to those activities and processes by which data and stimuli are translated into focused issues (i.e., attention organizing acts) and the issues explored (i.e., acts of interpretation)." These authors specifically discuss how information search is an important component of SID (noting that Mintzberg, Raisinghani, & Theoret, 1976: 309, found information search to be present in 18 of the 25 decisions they studied).

Information gathering is crucial to interpretation because it provides the raw material for making sense of emerging issues. Interpretations depend on what information executives and managers receive in their environments, the sources from which they receive it, and how they process it. A greater amount and diversity of information gives

actors more raw materials from which to construct their interpretations and make sense of equivocal events in their environment (Thomas, Clark, & Gioia, 1993). Diverse information should increase the chance that alternative viewpoints and ideas will surface, and research has shown that individuals who consider the opposite positions to what they believe are generally less subject to cognitive biases and unwarranted belief perseverance (Koriat, Lichtenstein, & Fischhoff, 1980; Lord, Lepper, & Preston, 1984).

Despite the importance of information, gathering the right kind of information is problematic. There are important differences in the amount and diversity of information that actors have access to. Given the information explosion that has produced information overload (Edmunds & Morris, 2000; Schneider, 1987; O'Reilly 1980), merely gathering information is rarely a difficult task in today's business environment. However, efficiently finding relevant and diverse information is more difficult. "Real managers, as contrasted with rational agents, face busy, immensely complicated, uncertain information environment [sic], which always threatens to overload their information processing abilities" (Stubbart, 1989: 338). In gathering and sifting through available information, a problem individuals frequently face is deciding what are the practical implications of unclear and equivocal information. Even though this information is often equivocal, managers often have to quickly assess its reliability and act on their understanding.

Despite the recognition and research showing the importance of individuals' interpretation and sensemaking processes, researchers have claimed that there has been little research investigating why and how managers select and focus their attention on specific information they receive from their environments and how this information is interpreted in specific ways (Sutcliffe, 1997). After discussing the importance of

information gathering, Boyd & Fulk (1996: 12-13) comment: "Yet little is really known about this critical scanning function, particularly how executives make choices about where and when to seek external information" (pp.12-13). Overall, our understanding of information interpretation is underdeveloped (Huber & Daft, 1987), and a better understanding of what affects individuals' interpretations is critical to improving our understanding of organizations, especially as the business environment becomes increasingly information-rich, complex, rapidly-changing, and highly interdependent.

The Benefits of a Greater Amount of Information

It is important to note that more information is clearly not always better. There is evidence in the management literature for both the idea that too much information impairs performance, and too little information impairs performance. Too much information can result in information overload and poor decision making performance (Schneider, 1987; O'Reilly, 1980). Individuals who are overwhelmed with information are likely to become simply confused and unlikely to have a higher level of performance (Schneider, 1987; O'Reilly, 1980). Indeed, Weick (1979a) states that much of the literature on cognition is a variation on the theme that we simplify the information we receive. Simplification is one method for dealing with information overload.

But while it is true that a greater amount of information is not necessarily always better, there is a wide variety of research suggesting that in most real situations, managers who gather more information do perform better (O'Reilly, 1980). D'Aveni & MacMillan (1990) suggest that firms that pay greater attention to critical aspects of their external environment have greater chances of survival. Fredrickson (1984) and Fredrickson & Iaquinto (1989) found that decision comprehensiveness (the extent to which all relevant

information is considered) was related to performance, at least in stable industries. Eisenhardt (1989) found that faster decision makers used more information and had higher levels of performance. Literature on boundary spanning (e.g., Tushman & Scanlan, 1981; Dollinger, 1984) argues that organization members require information from their environments, and need to translate this information so that it is internally useful. Some of this research (Dollinger, 1984) has found a positive relationship between the extent of boundary spanning activity (operationalized as the amount of contact with external sources of information) and the financial performance of firms.

The accuracy and quality of the information is also important to the resulting interpretations. Although in some cases the accuracy of interpretations may be less critical than simply choosing an interpretation and committing to it (Weick, 1995), there are a number of reasons to suspect that the quality of the interpretations may often be essential. First of all, it is well-established that organizations often become locked into disastrous courses of action, sometimes escalating their commitment until they go bankrupt (Staw, 1976; Staw & Ross, 1987; Staw, 1997). Similarly, employees and managers often persevere in erroneous beliefs even when the evidence for their beliefs is discredited and solid, factual contradictory evidence is presented (Anderson, Lepper, & Ross, 1980; Lord, Ross, & Lepper, 1979). Furthermore, once actors generate a hypothesis regarding some issue, they often seek information that confirms their hypothesis, and are never exposed to contradictory evidence that may discredit their hypothesis and suggest alternative hypotheses (Darley & Gross, 1983; Mynatt, Doherty, & Tweney, 1978; Fiske & Taylor, 1993). These lines of research suggest that initial interpreting processes play a crucial role in subsequent organizational activity. Early interpretations help shape

subsequent interpretations and organizational action. If these interpretations lead to poor actions, later search efforts may be unlikely to result in a better interpretation and the organization may become fixed in a downward spiral of activity, wasting large amounts of resources and perhaps jeopardizing firm survival.

Even fairly concrete information is often interpreted in contradictory ways, such as supporting mutually exclusive arguments (Lord, Ross & Lepper, 1979; Mahoney, 1977). If managers and their organizations become highly committed to a particular course of action based on one interpretation of the information, this conviction may result in a lack of flexibility and an inability to change strategies in light of new information or a better interpretation that suggests a more direct path to success.

In addition to determining what information is relevant, a major problem facing today's businesses is determining what information means, or more precisely, which of a large number of possible interpretations will lead to superior performance. The quality of this information, and the interpretations that result from it, critically impact organizational decision making and performance. Competitive success depends on how the information in the environment is interpreted.

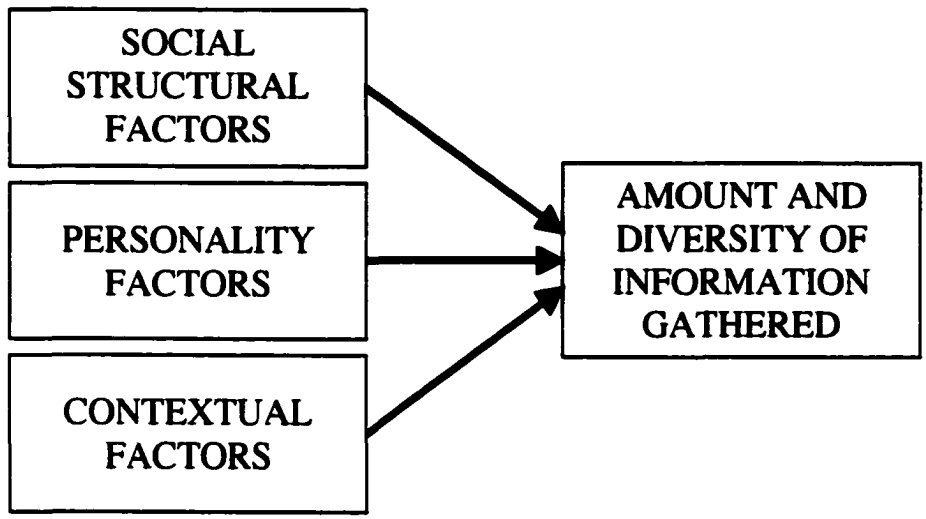
Summarizing the above discussion, the interpretations individuals develop depend on the amount and diversity of the information they receive and how they process that information. Yet researchers in this area have claimed that there has been little research investigating why and how managers select and focus their attention on specific information they receive from their environments and how this information is interpreted in specific ways (Sutcliffe, 1997). This dissertation specifically investigates the

determinants of scanning and information gathering, and their effect on managers' interpretations.

A Proposed General Model of the Amount of Information Gathered

After a problem has been noticed, what factors determine the amount and diversity of information that individuals gather? What characteristics affect the amount of time managers spend gathering information and the extent to which that search is successful? Several diverse literature streams independently address these issues. Building on these literatures and combining them, I propose that the amount and diversity of information individuals gather is driven by three key elements: (1) structural factors dealing with the their social network characteristics, (2) the personality traits of the individuals that relate to information processing, and (3) contextual factors of the business environment in which the individuals' firms compete. The next several sections discuss each of these key elements, and note gaps in the literatures related to each. Figure 1.2 shows these influences.

Figure 1.2
Elements Driving the Amount and Diversity of Information Individuals Gather



Social Networks as a Determinant of Information Gathering Behaviors

The social network literature presents one model of how actors receive important information from their environment. It holds that the structure of the managers' social networks (e.g., the number of people they know, the strength of their relationships with these people, and the extent to which these people know one another) largely determines what information managers receive, as well as how much importance they place on that information. Every actor is embedded in a social network, which is defined by the type and strength of relationships between people. These relationships provide social capital (Coleman, 1988). This social capital can be defined as resources that consist of aspects of social structures that "facilitate certain actions of actors ... within the structure" (Coleman, 1988, p.S98). Three forms of social capital that Coleman discusses are: (1) obligations and expectations, (2) information channels, and (3) social norms. Social capital in the form of information channels is specifically tied in with information

gathering and scanning abilities. Actors with a greater amount of social capital in the form of greater access to information channels will presumably be able to gather a greater amount and diversity of information (Granovetter, 1973, 1982; Burt, 1992, 1997, 2000). This greater social capital should also enable these managers to find more useful information more quickly.

The argument that networks affect various outcomes depends critically on the information flows that occur in the networks. That is, different networks and different positions in those networks lead to different opportunities for receiving and seeking information. Thus, the current model of how networks influence behavior argues that SOCIAL NETWORK CHARACTERISTICS lead to DIFFERENT INFORMATION, which leads to DIFFERENT OUTCOMES.

The Link Between Social Structure and Information Gathering Remains Untested

While research has yielded insights into the relevance of social network influences on information processing, several researchers in the network tradition have noted that network studies to date have not effectively looked at the *process* by which information transfer across the network occurs or the *content* that is transferred (Emirbayer & Goodwin, 1994; Nohria, 1992; Powell & Smith-Doerr, 1994). Seibert, Kraimer, & Liden (2001: 219) note that in many theories of social capital effects, one key explanatory variable is greater access to information. They specifically state that "To date, the role of the proposed explanatory processes—access to information, bargaining control, and referral—have not been empirically examined" (p.221). Powell & Smith-Doerr (1994: 371) state: "we need to know what flows across the links..."

While the effects of social networks have been observed, the mechanisms by which the influence occurs have not been explicitly addressed. In part, this lack of attention to the specific information mechanisms through which social networks have their effects is understandable. Stabell (1978: 120) notes the problem of the abstract nature of the concept of information. It is difficult to measure information transfer. Even in the few existing studies that have attempted to measure these information mechanisms (Seibert, Kraimer, & Liden, 2001; Friedkin, 1993), the authors do not attempt to measure information in an ongoing manner, but only ask general questions concerning individuals' perceptions of their access to information or how much discussion they have had.

Interestingly, in an early review of communication networks and their relevance to organizational studies, Connolly (1977: 224) noted that "our interest will extend beyond the question of whether or not two participants can, in principle, communicate with one another; we will want to ask how much they actually do communicate in some specific context." More than two decades later, Connolly's expressed desire has still not been addressed, although the tools for analyzing social networks have developed tremendously since that time.

The Need to Test the Assumed Link Between Social Structure and Information Gathering

The fact that existing research has not specifically measured the information mechanisms that are theorized to be critical to the observed social network effects is a serious limitation on those explanations. While the information transferred across social networks may in fact affect various outcomes as proposed by various researchers, a more

elaborate demonstration of this would greatly strengthen these claims. Without this demonstration, what is assumed to be information transfer may in fact be the result of other unobserved processes. For example, research rooted in psychology has convincingly demonstrated that individuals who are more similar to one another (in the sense that they share attitudes and beliefs) are generally more attracted to one another as well. Is seems reasonable then that an individual's social network is likely to contain other individuals who are similar in beliefs and attitudes. Research showing that social network connections lead individuals to similar perceptions (e.g., Rice & Aydin, 1991) may have less to do with information transfer across networks, and more to do with the fact that these individuals have the same beliefs to begin with.

More detailed measures are therefore critical to establishing the hypothesized importance of information mechanisms to social network effects, and would provide a much more stable empirical foundation to existing theory.

The Need to Build a Model of Social Structure that Incorporates Active Individuals

Another gap in the literature on the link between social structure and actual amount of information gathered concerns the role of the individual actor. The question of whether individuals and organizations have volition and can impact their outcomes or whether their organizational and environmental situations determine their actions has been central to organizational studies. Astley & Van de Ven (1983) label this the action::structure paradox. In several literature streams, the focus shifts to one or the other extreme, until subsequent research elaborates how reality is more complex and behavior is both self-determined in important ways *and* heavily influenced by external forces. In the field of psychology, Mischel (1968) challenged personality approaches as

explanations for behavior and argued that situational forces generally overwhelm any influence that personality variables would be likely to have. Subsequent research in that tradition has resulted in a distinction between strong and weak situations (Mischel, 1977). Strong situations are those in which situational pressures are dominant, and personality differences play little role in affecting behavior, while the reverse is true in weak situations.

This same tension between volition and external pressure is readily evident in organizational theory. Whereas early institutional theory suggested that organizational action was heavily determined by external forces that pressured organizations into becoming increasingly similar, later work has explicitly demonstrated that organizations often can respond strategically to these pressures (Oliver, 1991; Goodrick & Salancik, 1996; Kraatz & Zajac, 1996), leading to sustained differences in organizational populations.

Research on social networks is following a similar pattern of focusing too heavily on one side of the action::structure paradox. The literature on social networks is currently overly focused on structure, positing that the structure of social relations determines important relevant individual and organizational outcomes, and that differences at the actor level are irrelevant. This proposal argues that a deeper understanding of how individual-level characteristics interact with individuals' network structures will result in stronger findings and better models of individual and organizational behavior.

In arguing for the promise of social network analysis, Knoke & Kuklinski (1982: 11-12) state: "By ignoring the social-structural context within which actors are located, a purely attribute-based analysis loses much of the explanatory potential that relational

analysis can offer." They go on to argue that "The ultimate advance of social scientific knowledge requires combinations of both types of data and the creation of measurement and analysis methods capable of incorporating them" (p.12). However, despite this reasonable suggestion, the overall focus of social network research has been purely structural, focusing only on the relationships between actors, and ignoring differences between those actors. Some social network researchers (e.g., Burt, 1992) have expressed the opinion that many personality effects are really social networks effects in disguise. As Mehra, Kilduff, & Brass (2001: 141) note: "Individual dispositions, to the extent that they have been discussed at all in recent network research, have tended to be dismissed as 'the spuriously significant attributes of people temporarily occupying particular positions in social structure' (Burt, 1986: 106)" (p.141). Stevenson & Greenberg (2000: 652) note: "Many network researchers have operated from a set of assumptions, partially implicit, that has led them to neglect the possibility of agency..."

Increasingly, researchers are questioning this exclusive focus on structural elements in social network analysis. Mehra, Kilduff, & Brass (2001: 121) note that Emirbayer & Goodwin (1994) call for more insight into the importance of individual characteristics. They note that "there has been relatively little work in psychology on how individual differences affect the structures of the social worlds in which people live and work" (p.121). Recently, work has emerged that is beginning to address how individual agency can affect social network use. For example, Stevenson & Greenberg (2000) discuss agency in terms of power, and show that while social network position impacts agency, people in peripheral network positions (generally thought to be powerless) can adopt strategies to overcome disadvantaged network positions.

This lack of research investigating how personality characteristics affect social network use is a critical gap in the literature of social networks. Whereas an exclusive focus on social network characteristics may have been appropriate when social network analysis was just emerging as an extremely useful tool for analyzing social behavior, it is less appropriate today when social network analysis has been extensively used. There is now a great need to explore how personality and social networks interact.

Personality as a Determinant of Information Gathering Behaviors

The context of managers' sensemaking processes is ideal for exploring the joint role of structural and personality characteristics. The approach I'm advocating looks at both the impact of network structure and individual information processing tendencies on important outcomes relevant to interpretation and sensemaking. This research suggests that individual differences affect how the information actors receive from their networks is treated and how they actively search their networks. Actors with different information processing characteristics will exhibit different behaviors regarding how much information they can manage, how capable they are of searching for information, how they treat diversity in the information they are exposed to, and how receptive they are to new information. The underlying rationale for the research is that both the relatively fixed network structure *and* individual information processing characteristics are important for understanding how individuals make sense of complex and equivocal information. Whereas Stevenson & Greenberg (2000) discuss agency in terms of power, this dissertation focuses on agency in terms of the time individuals spend searching for information and the amount and diversity of information they find.

A huge literature has established that individuals differ in key information processing characteristics (Hayes & Allinson, 1994; Tetlock, 1992; Cacioppo, Petty, Feinstein, & Jarvis, 1996; Fiske & Taylor, 1993). These information processing characteristics have sometimes also been called cognitive style (Hayes & Allinson, 1994) or cognitive personality traits (Schaninger & Sciglimpaglia, 1981). Blaylock & Rees (1984: 75) note: "Simon defined cognitive style as 'the characteristic, self-consistent mode of functioning which individuals show in their perception and intellectual activities' [42, p.72]." The overall finding of this literature is that specific differences in information processing exist among individuals and these differences result in different patterns of information search and the consideration of this information. Crucial to this dissertation, Blaylock & Rees (1984: 75) reviewed work suggesting that individuals with different cognitive styles will prefer different information sources. However, as Davies (1998) notes, "there have been very few studies of individual differences in such everyday information processing." This assertion applies even more to experienced managers – very little is known about whether information processing personality characteristics are important in more realistic managerial tasks.

Contextual Factors as Determinants of Information Gathering Behaviors

The final element proposed to affect managers' information gathering behaviors is the broader context within which the managers and their firms operate. While some firms operate in relatively more stable environments, other firms face environments of constant and rapid change. In part, these differences are a function of the industry in which these firms compete. Prior research has argued that the complexity of the environment is crucial to sensemaking behaviors. Weick (1995: 87-100) discusses how information load,

complexity, and turbulence lead to a greater need to simplify the information and rely on habits and routines to manage it. Overall, the existing literature suggests that managers and firms that gather more information will be more successful.

E-commerce as a Prototypical Complex, Equivocal Issue

While the preceding discussion is generally applicable to most emerging issues that are complex, ambiguous, and equivocal, this dissertation focuses on one particular emerging issue. One of the most important issues that managers and organizations have had to address in the past few years is the rise of electronic commerce (e-commerce) (Kauffman & Walden, 2001; Subramani & Walden, 2001). E-commerce broadly refers to business done either over the internet or through electronic networks (Kauffman & Walden, 2001). While e-commerce is widely believed to be fundamentally transforming the business landscape (Evans & Wurster, 1999), the fact is that in most industries the operational implications of e-commerce are unclear, complex, and ambiguous.

At the same time that many sources were hyping the importance of e-commerce, and investors were smiling upon all things dot-com, the majority of managers were uncertain about how to take advantage of all of the promise that e-commerce supposedly held. The performance of e-businesses varied dramatically for different types of businesses (Rosen & Howard, 2000). While businesses that provided specific types of products such as books, music, airline tickets, and investing services (de Figueriedo, 2000) were seeing competitors emerge on-line and become extremely successful (in terms of sales, if not profits), other businesses often invested in e-commerce without really knowing how or if e-commerce would revolutionize the way they competed. This

very uncertainty regarding the issue of e-commerce makes it an ideal issue to investigate in this dissertation.

Summary and Overview

The overall question the dissertation addresses is how do managers make sense of emerging, equivocal issues? Building on a general model of sensemaking from existing literature, this dissertation is an explicit attempt to test and refine the link between information gathering behaviors and specific interpretations. This first chapter has discussed several gaps in the literature on sensemaking and social networks that this dissertation seeks to address. First, existing research has not explicitly modeled the determinants of the time individuals spend searching for information and the amount and diversity of information they find. Second, research on sensemaking processes has yet to adequately test the information gathering-interpretation link in the general model of sensemaking. Third, research on the role of social networks as a determinant of information gathering has not measured the specific information mechanisms held to be responsible for the observed effects of these networks. Fourth, existing research in social network analysis has yet to explore the active role individuals might play, and how personality factors related to information processing might interact with social network mechanisms to affect information gathering behaviors and outcomes.

Chapter Two presents a more detailed discussion of the specific theory as well as the specific hypotheses that will be tested in this dissertation. After presenting a more detailed model of sensemaking, it discusses the theoretical rationale behind each element in the model. This discussion sets the stage for the specific hypotheses that follow.

Chapter Three elaborates on the methodology used to test the research model and hypotheses. The measurement of each element in the research model is discussed in detail, and the statistical techniques used to analyze the data are discussed.

Chapter Four presents the dissertation results. In addition to giving the basic descriptive statistics for all variables in this research, the results of the tests of the hypotheses from Chapter Two are discussed.

Finally, Chapter Five discusses the results presented in Chapter Four, including the significance of the findings for research and practice, a discussion of non-significant findings, a consideration of the limitations of the methodology, and thoughts about the future research needs on this topic.

CHAPTER 2

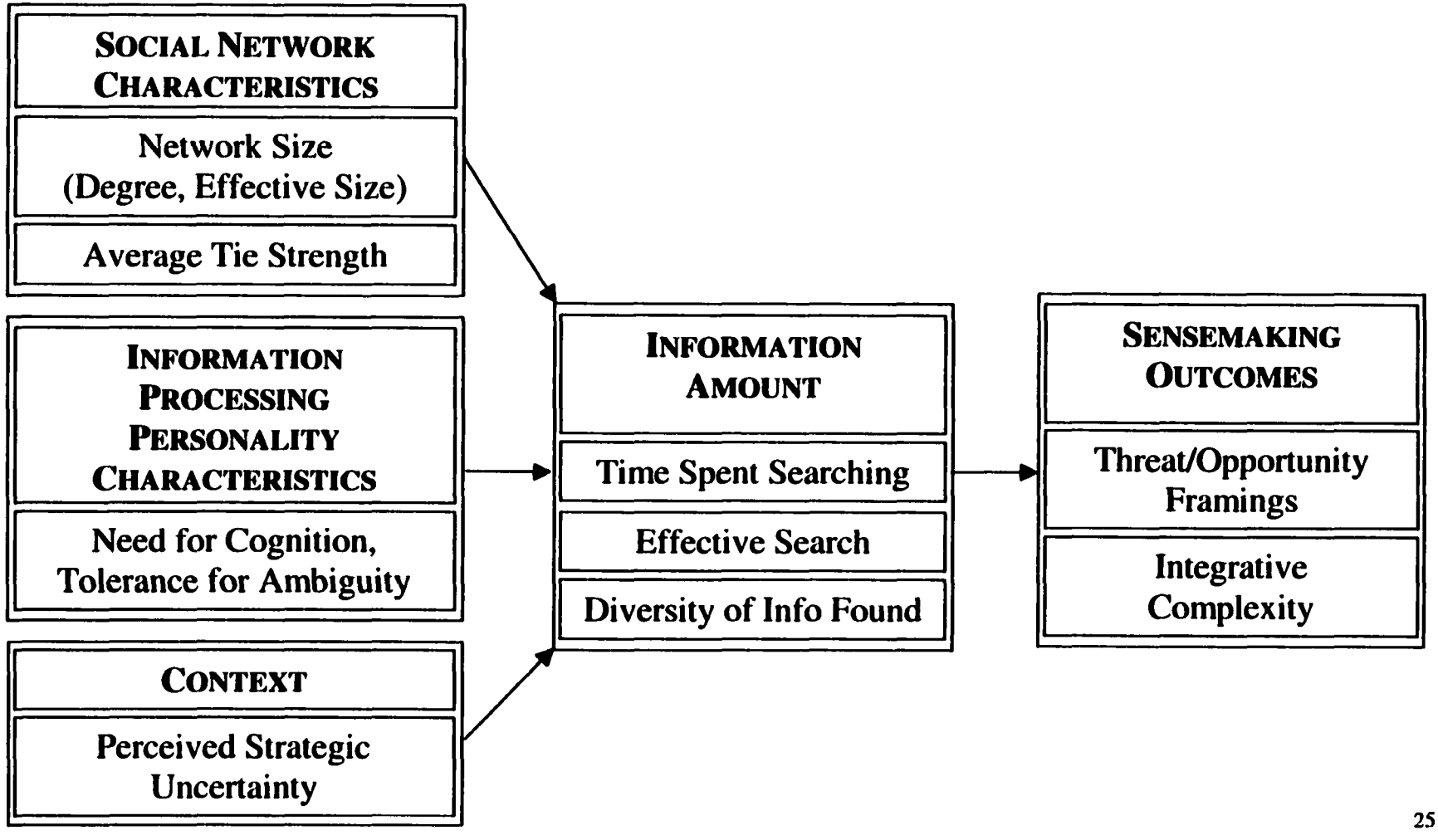
THEORY AND HYPOTHESES

Conceptual Model

Chapter One presented the general model investigated in this dissertation. In this chapter, the specific elements of that model are discussed in more detail, and the theory and rationale behind that model and the hypotheses suggested by that model are presented. The more specific research model is shown in Figure 2.1 on the following page. Whereas Figure 1.1 showed the link between information gathered and interpretation, and Figure 1.2 showed structural, personality, and contextual factors and their influence on the amount of information gathered, Figure 2.1 shows the specific elements of these factors tested in this dissertation. Specifically, it shows the structural characteristics of network size and average tie strength, the information processing personality characteristics of need for cognition and tolerance for ambiguity, and the contextual characteristic of perceived strategic uncertainty. In addition, it distinguishes between three measures of information amount: the time individuals spend searching or gathering information and the effectiveness of that search in terms of the amount and diversity of information found. Finally, the two specific interpretation characteristics of threat/opportunity framing and integrative complexity are identified.

The basic model that this dissertation develops begins with the claim that individuals' sensemaking efforts depend on the information they receive (the raw material) and how they process that information. Social networks, individual information processing characteristics, and contextual characteristics codetermine these two fundamental factors. The specific mechanism explored in this research for how the

Figure 2.1
A Model of the Effects of Individuals'
Social Network and Information Processing Characteristics on Sensemaking Outcomes



differences in network structure and information processing characteristics affect interpretations concerns the amount of information managers find. Three measures of this mechanism are tested: (1) the time managers spend searching for information, (2) the amount of relevant information managers find, and (3) the diversity of information managers find. Although the amount of information has been suggested as the explanatory mechanism for the observed effects of social networks, no research has attempted to directly measure them to show that it is in fact a good explanation.

After briefly discussing the underlying theoretical foundation behind this dissertation research, each of these concepts will be explained in detail, and the particular theory related to each of these key concepts will be discussed. The rationale behind the specific hypotheses tested in this research will then be presented, followed by a summary.

A critical theoretical foundation of this research is the theory of requisite variety (Ashby, 1956; Weick 1979). This theory states that an entity is only able to register the complexity of its environment if it has sufficient complexity itself (Ashby, 1956). In order to optimally function in an environment, an actor's information processing capabilities must equal or exceed the diversity of elements in the environment (Calori, Johnson, & Sarnin, 1994). A simple example helps to illustrate this idea. If a unilingual English speaker attends a conference with a mixture of Spanish and English speaking people, he will only register the English that is spoken. He does not possess the requisite variety to understand those conversations held in Spanish. If important information is discussed in Spanish, he will either miss it completely, or get the information later as someone else (who does possess the requisite variety of being able to speak both English and Spanish) translates for him. Another example would be if a manager cannot

understand information about a new technology, she will not be as likely to understand how that technology has the potential to reshape her competitive environment. Her requisite variety is not sufficient to register the complexities and details about that technology, and her subsequent lack of understanding may have important consequences.

The remainder of the theoretical background for this research model is presented in sections designated by each key concept in the model.

Social Network Characteristics

Chapter One discussed how social networks provide managers with social capital. While that discussion focused on a relatively high-level explanation, I now explain in greater detail several of the specific aspects of social networks that have been theorized to lead to greater social capital and the benefits that capital provides.

Characteristics of both the dyadic relationships in social networks and the overall structure of the social network provide social capital (Rowley, Behrens, & Krackhardt, 2000). The dyadic characteristics concern the relationships between each pair of actors in the social network, and in particular researchers have focused on differences in tie strength.

Tie Strength

The key distinction regarding tie strength that has been made in the social network literature is between strong and weak ties. Granovetter (1973: 1361) posited four properties of strong ties: "The strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie." Krackhardt (1992) further elaborated on

tie strength by defining *philos* relationships as those that involve (1) interaction, (2) affection, and (3) time. Specifically, individuals must interact with one another, feel affection for one another, and have a history of interactions over an extended period of time. When these conditions are met, the strength of the ties between the individuals is much greater. Burt (1997) also confirms the importance of activity and intimacy or emotional closeness, which correspond to Krackhardt's (1992) interaction and affection.

It has been argued that the weak ties (or relationships) between social actors, those characterized by lower amounts of interaction, emotional intensity, intimacy, and reciprocal services, are more important for information transfer (Granovetter, 1973; Powell & Smith-Doerr, 1994). Granovetter (1973) measured the relative importance of weak and strong ties in finding a job, and found that weak ties were much more important. He suggested that weak ties provided a greater diversity of information regarding job opportunities.

Another reason weak ties are theorized to lead to a greater diversity of information is that people who are strongly tied are believed to know the same information. Given that individuals who have similar beliefs and attitudes are more likely to be attracted to one another and thus form a strong or cohesive tie, the argument is that the knowledge will overlap to a significant degree. Burt (1997: 340-341) argues that cohesive contacts "are likely to have similar information and therefore provide redundant information benefits" and that structurally equivalent contacts "have the same sources of information and therefore provide redundant information benefits." Murray, Rankin, & Magill (1981: 122) note that Granovetter (1973) assumes that strong ties are unable to help with getting a job because "they supposedly possess information already known to

the job-seeker." Because strongly-tied individuals are theorized to know the same information, clusters of strong ties are considered to offer relatively little information. As Burt (1992: 23) says: "One cluster, no matter how numerous its members, is only one source of information" (p.23).

Despite these claims, there is at least some evidence that even individuals who have strong ties with one another may have sufficiently different knowledge. Murray & Poolman (1982) found that even scientists who were strongly tied to one another knew different literatures. Interestingly, Seibert, Kraimer, & Liden (2001) found a negative relationship between weak ties and access to information. The existing literature thus suggests that weak ties possess more diverse knowledge, but there are some results that contradict this.

In addition to having more diverse knowledge, weak ties are presumed to require less effort to maintain, and thus strong ties are more costly in terms of interaction resources the individuals have. Since weak ties are less costly to maintain, the argument is that individuals can either have a larger number of weak ties or a smaller number of strong ties. Given that there are benefits to having a larger number of ties (see more below), this is another strength of weak ties.

While weak ties are theorized to give individuals a greater diversity of information, recent research suggests that this only applies to a certain kind of information. Two kinds of information can be distinguished – explicit and tacit (Polanyi, 1966). Explicit information can be easily articulated and thus transferred without difficulty. Tacit information requires much more effort to transfer. Demonstrations of the benefits of weak ties for transferring information typically deal with explicit information

(e.g., Granovetter's, 1973, study of information about job openings). However, Hansen (1999) found that while weak ties were useful in aiding the search for information across units of an organization, strong ties were needed for transferring complex information. Friedkin (1982) suggested that strong ties were more efficient in promoting information flows. Uzzi (1997) argued that strong ("embedded") ties are more useful for fine-grained information transfer and a greater depth of information search.

Although weak ties can lead to a greater diversity of information, this diversity may not always be useful. Constant, Sproull, & Kiesler (1996: 125-126) found that the number of weak ties was *not* related to good advice, and diversity was *not* related to the usefulness of information. They also found (pp.129-130) that the number of ties was *not* related to the average usefulness of the information given, the most useful advice, or solutions to the problems for which the information was solicited. As Murray, Rankin, & Magill (1981) discuss, the information seeker is often more interested in quality of information, not merely quantity. In the context of job seeking, for example, the "job seeker is interested in locating only those positions for which s/he would be considered seriously and would consider accepting. Long lists of undesirable or unobtainable positions are of little interest" (Murray, Rankin, & Magill, 1981: 121). The greater diversity of information theorized to be available from weak ties may thus be irrelevant.

Strong ties may also know more about one another, and therefore recognize better what information will be of use to one another. Brown & Reingen (1987) found that strong ties were more likely to be activated for the flow of product referral information and were more influential. They noted that "Strong-tie consumers will probably know much more about each other than do weak-tie ones, including how relevant they are to

each other as sources of information about consumer goods" (Brown & Reingen, 1987: 353). This may explain why strong ties are often more prevalent in actors' social networks, despite their greater relationship maintenance costs (Brown & Reingen, 1987; Murray, Rankin, & Magill, 1981).

Finally, while weak ties are theorized to have a greater diversity of information, they may be less likely to share that information. Granovetter (1982: 113) notes that "strong ties have greater motivation to be of assistance and are typically more easily available." Actors that are weakly-tied to others may have less social capital in the form of lower obligations and expectations for exchanging information. Krackhardt (1999: 184) mentions that while Burt (1992) "suggests that the strength of the tie is almost irrelevant (Burt, 1992, pp. 26-30)," "at the margin, Burt claims, if you can bridge with a stronger tie, you are better off (stronger ties give you more leverage)." Combining both the usefulness of weak versus strong ties and the motivation those ties have to be of assistance, Erickson (1996: 29) argues that while strong ties are more helpful, moderately strong ties are probably the most useful.

Overall, the literature on the benefits and costs of strong versus weak ties suggests that weak ties have the two primary benefits of leading to more diverse information and being less costly to maintain. Strong ties are better at transferring tacit information and are generally more willing to provide assistance. The case can therefore be made for either strong or weak ties leading to a greater amount of information, and empirical tests contrasting these possibilities are needed.

Network Structure

In addition to the relationships between the dyads in the social network, the larger structure of the network also provides social capital. The core of many arguments for why social networks affect outcomes is that the facets of their structure determine how much information the focal actors have access to (Granovetter, 1973; Burt, 1992, 1997, 2000; Podolny & Baron, 1997). Actors in smaller networks have less social capital in the form of fewer information channels. A central claim of many network models of information transfer is that networks with many weak ties are better than networks with fewer strong ties (e.g., Burt, 1992, 1997). Part of the reason Granovetter (1973) theorized weak ties were so valuable was that since the cost of weak ties appeared to be lower, people either had a few strong ties or many weak ties.

Burt (1992) provided much needed theory about why the structure of relations was as important as many empirical demonstrations had shown (and which are reviewed in Burt, 2000). He argued that what was important for gaining the information benefits social networks provide was not weak ties per se, but the fact that networks with a greater number of weak ties typically contain more structural holes. He defined a "structural hole" as "the separation between nonredundant contacts" (p.18). A structural hole is the lack of a tie between two actors. Another actor who bridges this hole, i.e., has relationships with the two actors who do not know one another, is theorized to have specific information benefits. [Note: The concept of structural holes is also discussed as network constraint or effective network size (Borgatti, 1997)].

Burt (1992) argues that networks filled with structural holes provide three information benefits: access, timing, and referrals. Access means receiving a valuable

piece of information and knowing who can use it. Timing of information is important because early possession gives greater competitive advantage. Referrals mean that actors in a network will alert others to your potential usefulness regarding their problems, so that they will seek you out. Based on these arguments, researchers have argued that managers should maximize the number of structural holes in their social networks (Burt, 1992, 1997). Other researchers have noted that information tends to spread quickly among densely connected groups, and therefore density is expected to be negatively related to the amount and diversity of information present (Friedkin, 1993).

It is important to note that in the research that developed from this theory, the amount of information transferred by each type of tie is not empirically considered, and all ties are expected to transmit the same amount of information. Burt (1992: 30) makes this point in the following quote: "Information benefits are expected to travel over all bridges, strong or weak." Because of this assumption, many weak ties are assumed to lead to a greater amount of information. As Burt (1997: 342) claims: "The volume is higher ... because he reaches more people indirectly. Also, the diversity of his contacts means that the quality of his information benefits is higher." The other assumption here is that a greater diversity of contacts equals a greater cognitive diversity and more diverse information. More fundamentally, this perspective assumes that actors will have the information to transfer, will know who needs it or where to get it (something Erickson, 1996, notes is problematic), will be able to easily transfer the information, and will be willing to transfer the information. If a tie exists (weak or strong), then relevant information is transferred across that tie instantaneously and with high fidelity.

Overall, these theoretical arguments suggest that individuals with larger networks (i.e., people who know more people) will get more information, particularly if the people they know do not know one another. Someone who knows ten other people should get more information, and more diverse information, than someone who only knows three people. And if none of these people know one another, then there should be less redundant or shared information, and thus a larger overall pool of unique information.

Modeling Social Networks as Providing the Possibility for Information Transfer

One of the central explanatory mechanisms for social network effects involves the transfer of information between actors in the network. However, the process of how this information is spread through networks is generally not investigated. Given that the social network literature is almost exclusively structural, no account is taken for individual differences in cognitive processing. That is, the environment that managers operate in and the structure of their social networks are generally modeled as determining what information is received and how managers interpret it. All individual differences and outcomes are seen as resulting from differences in network position and network structure. Differences between the actors in the social network are assumed to be unimportant, or spurious outcomes resulting from the network structure (Burt, 1986). Existing research on social networks has assumed that the information benefits provided by particular network arrangements (in terms of both dyadic and structural characteristics) occur for all actors. Thus far, individuals in social network analyses are treated as interchangeable and equivalent, implying that nothing about the individual matters in explaining how and what information transfers across a social network. And

this simplified approach has yielded insights into what characteristics of social networks are important for information transfer.

Yet while social network research has led to many interesting findings, the assumption that individual characteristics are unimportant has yet to be shown empirically and there is a great need to look more seriously at the individuals involved in the transfer of this information. There is a need for research using social network analysis that treats managers as active participants who seek information, make judgments about the information, and interpret the information depending on their particular style of thinking. In short, research is needed that addresses the active role that individuals play in the reception and transfer of critical information.

These aspects of managerial discretion and individual differences may be essential, as differences in managerial styles of processing information can play a significant role in how information is interpreted and how these interpretations shape subsequent organizational action. For example, research has shown how managers often develop an interpretation or hypothesis early on in the decision making process which subsequently guides their search for additional information (Fiske & Taylor, 1993). Often managers become prematurely committed to decisions based on a partial consideration of the relevant information, and are resistant to information counter to that initial position. Yet this outcome is not inevitable, and research has shown that one strategy for partially overcoming these decision biases is to consider why the opposite decision or outcome may be superior (Koriat, Lichtenstein, & Fischhoff, 1980; Lord, Lepper, & Preston, 1984). This balanced consideration of alternatives can lead to higher quality decision making. While the consideration of alternatives could be driven by social network

structural elements (e.g., an actor in a network filled with structural holes may automatically be exposed to diverse arguments), other actors with networks that have few structural holes may nevertheless consider many sides to any particular issue because of personality factors related to how they process information.

In the context of new employee socialization, Morrison (1993a, 1993b) argued that individual can be proactive in seeking information, and need not merely wait for others to provide information they need. In a similar way, individuals might take a proactive role in their information gathering, particularly if they feel they are not getting enough information from their social networks. To some extent, we might expect that differences in network structures could be actively recognized and partially overcome by more deliberate information search procedures. For example, Allen & Cohen (1969) found that scientists who were seen as important sources for technical information either had larger networks outside the laboratory, or were better read in the relevant literature. This study is important for showing that impersonal sources of information may effectively substitute for network connections.

It is important to note that some network literature has begun to suggest how characteristics of the individual actors may interact with social network characteristics. Casciaro (1998) found that personality traits added to the variance explained by network position in explaining accuracy of social network perceptions. Burt, Jannotta, & Mahoney (1998) found that personality traits correlated with the presence of structural holes. Ibarra & Andrews (1993) looked at tenure, past work experience, gender and then explored the incremental variance added by network characteristics. Mehra, Kilduff, & Brass (2001) explored three models of the joint relationships between the personality variable of self-

monitoring and network structural characteristics: a mediation model, an interaction model, and an additive model. The additive model was supported: personality (as measured by the variable of self-monitoring) and network structure (specifically betweenness centrality) independently affected performance. They also found that personality predicted social structure. This work suggests that there are interesting results to be found in exploring the interrelationships between personality and social network characteristics. However, thus far, even this research that does explore both social network and personality influences on various outcomes has either treated or found that these are distinct influences. My argument is different, in that it says that individuals' information processing characteristics will affect the information they search for and receive from their social networks. That is, managers' personalities will affect how useful the benefits of their social network structure are. While previous research has found additive effects, in that personality characteristics add to the variance explained by social network characteristics, I predict interaction effects, such that personality characteristics related to information processing will affect the nature of the social network effects.

One way to see how differences in personality may affect how managers use their social networks is to recognize that information from social network linkages can either be received passively (others tell the manager, perhaps because they believe he or she will be interested) or sought actively (by the manager asking those in his or her network, or even asking connections to check with their connections) (Aguilar, 1967; Vandenbosch & Huff, 1997). Social networks may provide the possibility of information transfer, but individuals may differ in the extent to which they take advantage of that possibility. Some people may wait passively for information from their networks, while

others may take a much more active role in seeking information. Even with identical social networks, the amount and diversity of information these individuals would gather would likely be very different. The next section discusses several information processing personality traits that have been theorized and empirically shown to affect the amount of information that managers seek.

Information Processing Personality Characteristics

If social networks provide the capacity for information transfer to occur, what factors distinguish between those individuals who actually use that capacity? If specific personality traits are related to the amount and type of information that managers seek and process, then this may be an important moderating factor that determines which individuals benefit from their network structure. Just as Blaylock & Rees (1984: 88) state that there's no sense in providing information to individuals with cognitive styles that suggest they'd ignore it, managers who occupy social networks that provide a huge amount of information may not benefit from their networks if they ignore it. Blaylock & Rees (1984: 88) suggest that "The value of information cannot be effectively evaluated apart from the users of that information." Although a social network may seem to be well-structured in terms of its ability to provide a great deal of diverse information, the benefits of this type of network may go unrealized depending on the information processing characteristics of the individual.

Research has shown that there are a variety of personality traits related to how individuals process information (Fiske & Taylor, 1993). What this means is that there may be several ways to operationalize a measure of personality characteristics that are related to information search behaviors. In this dissertation, I use two measures of

managers' information processing dispositions. Both of these have in particular been found to relate to information search behaviors and how individuals process the information they receive. These are (1) need for cognition and (2) tolerance for ambiguity, and each is discussed below.

Need for Cognition

Need for cognition is a difference in the amount of thought individuals typically put forth in their everyday activities. "Some individuals tend to act as cognitive misers in circumstances that call forth effortful problem solving in most individuals, whereas others tend to be concentrated cognizers even in situations that lull most individuals into a cognitive repose" (Cacioppo, Petty, Feinstein, & Jarvis, 1996, p.197). Research on this individual difference began with Cacioppo & Petty (1982), and has since been the focus of over 100 empirical studies.

Need for cognition is particularly relevant for information search and scanning activities. Cacioppo et al.'s (1996) review and meta-analysis confirmed that high-NFC individuals are more likely to seek information across many information domains (p.239). Their review concludes that "... individuals high in need for cognition naturally tend to seek, acquire, think about, and reflect back on information to make sense of stimuli, relationships, and events in their world; individuals low in need for cognition, in contrast, are more likely to rely on others (e.g., experts), cognitive heuristics, or social comparison processes to provide this structure" (p.243). They further note that "individuals high ... in need for cognition tend to have active, exploring minds; through their senses and intellect, they reach and draw out information from their environments... Accordingly, they are more likely to expend effort on information acquisition..." (p.243).

Other recent studies (Bailey, 1997; Verplanken, Hazenberg, & Palenewen, 1992) have also found that high-NFC leads to greater information search. In fact, Bailey (1997) found that high-NFC managers searched for more information (from an information display board) even in situations where a less thorough search was optimal.

Tolerance for Ambiguity

Tolerance for ambiguity (TA) is an important information processing characteristic because "Individuals more tolerant of ambiguity should search for more information and should process rather than reject discrepant information" (Schaninger & Sciglimpaglia, 1981: 209). "Budner (1962) defined tolerance for ambiguity as the tendency to perceive ambiguous or inconsistent situations as desirable, and intolerance for ambiguity as the tendency to perceive or interpret ambiguous situations as threatening or undesirable. Those most tolerant of ambiguity should enjoy making more difficult and complex decisions, particularly when ambiguous or discrepant information is present" (quoted from Schaninger & Sciglimpaglia, 1981: 209).

Tolerance for ambiguity has been shown to affect important management topics. For example, Dollinger (1984) found support for a negative relationship between intolerance for ambiguity and boundary spanning activity, which involves seeking information from external sources. He also found that intolerance for ambiguity moderated the relationship between boundary spanning activity and financial performance.

Schaninger & Sciglimpaglia (1981) found that cognitive personality traits, including tolerance for ambiguity, affected information search and the number of alternatives that individuals considered. Vandenbosch & Huff (1997: 91) found that

tolerance for ambiguity is "strongly linked to a predisposition toward scanning generally."

The two information processing personality characteristics of need for cognition and tolerance for ambiguity have both been related to increased information gathering in existing research. It is important to note that while both of these serve as operationalizations of a broader concept of personality traits that impact information processing, they are distinct from one another. Whereas need for cognition is related to individuals' active preferences to engage in additional thinking about issues, tolerance for ambiguity is more specifically related to situations of greater uncertainty. Although both of these traits are suggested to affect information search in similar ways in this dissertation, in other contexts they would likely lead to different outcomes. Supporting this overall difference between the two traits, Cacioppo, Petty, Feinstein, & Jarvis' (1996) exhaustive review of need for cognition research reported one study that found NFC to be insignificantly correlated with intolerance for ambiguity (Petty & Jarvis, 1996).

The Contextual Factor of Perceived Strategic Environmental Uncertainty

In addition to research showing how social networks and information processing personality traits affect the amount of scanning and information gathering behaviors that managers engage in, the context within which the manager operates has also been found to affect information search behaviors. In particular, the amount of uncertainty CEOs face in the larger organizational environment has been related to the amount of information gathering they engage in (Daft, Sormunen, & Parks, 1988; Greve & Taylor, 2000). These researchers argue that as the complexity, rate of change, and importance of various environmental sectors (the competition sector, the customer sector, the technological

sector, the regulatory sector, the economic sector, and the sociocultural sector) increases, managers need to gather more information in order to be successful.

When managers perceive a large amount of uncertainty in important and changing environmental sectors, they gather information to reduce that uncertainty. To the extent that managers are able to find information that helps to reduce this uncertainty, they should be more successful. Indeed, Daft, Sormunen, & Parks (1988) find that the correlations between the amount of uncertainty and scanning frequency are higher for high-performing firms than low-performing firms.

Information Mechanisms

There is an emerging interest in better understanding the process and content of information transfer in social network research, and researchers have called for greater attention to these issues (Hansen, 1999; Emirbayer & Goodwin, 1994). The usual practice in the social network literature is to measure the network structure and use it as a proxy for information transfer. Although the arguments of network researchers have face validity, the heavy reliance on networks as proxies would rest on a more secure foundation if more studies actually did empirically demonstrate the implied connections between structure and information.

The reason why social network researchers generally use social network structure as a proxy for information transfer is because the actual measurement of information is difficult (Stabell, 1978; Daft & Macintosh, 1981). The result is that while the theoretical rationale for why social networks have their effects (i.e., information transfer) appears plausible, these mechanisms have not really been tested. The few studies that have attempted to measure information mechanisms behind social network effects (Siebert,

Kraimer, & Liden, 2001; Friedkin, 1993) merely asked individuals one or a few questions about their perceptions of their access to information or how much discussion they have had. While these approaches are a step toward measuring what information is flowing across managers' networks, and are consistent with other research that has used a few questions to attempt to measure the amount of information (e.g., Daft & Macintosh, 1981), they are very rudimentary. Studies that measure information amount at a more micro level are clearly needed.

The practice in psychological studies exploring how personality traits are related to information transfer is generally to present subjects with a homogenous information environment (Stabell, 1978). This is often done because the amount of information is frequently an experimental manipulation (Stabell, 1978). But this approach has severe limitations, particularly for studies of managers in their natural working environments, because managers simply do not face homogenous information environments. In a social network context, this approach is impractical, because managers' differing access to information is precisely why social networks are interesting.

Perhaps the most innovative manner in which research to date has attempted to measure information are studies by Stabell (1978) and Jones & McLeod (1986). After partitioning the information environment into three categories: personal, impersonal, and a Portfolio Composition System (an information database), Stabell (1978) asked managers at the end of the day to record how many times they communicated with each source (from an exhaustive list including 18 impersonal sources and 91 people). He found that breadth of source use correlated with the volume of information. Jones & McLeod (1986) had executives and their secretaries complete an information log in which they

recorded each information source the manager had contact with and how important each of the sources was. These studies, particularly that by Jones & McLeod (1986), represent much more detailed methods for gathering micro-level data on the specific information sources managers use.

However, Stabell (1978) notes a problem with his measure of volume in that his study treated reading a 20-page report the same as using a Quotron system to check a stock quote. "In short, the measures do not capture the amount of information transferred when a source is used" (p.137). "In summary, there is apparently a need for a measure of information use that considers the amount of information transferred. This is, at best, a problematic requirement as amount of information depends not only on the content of a communication, but also on the state of the receiver. One possible indicator is the amount of time spent sampling the different sources."

In this dissertation, I measure the mechanism of amount of information in three ways: (1) the time spent searching for information, (2) the amount of information found, and (3) the amount of diversity of information found. In prior literature, these three measures are generally assumed to be equivalent, in that the time individuals spend searching for information is expected to be highly related to the amount and diversity of information they find. For example, Burt's (1992) discussion tends to assume that a greater amount of information implies a greater diversity.

In this dissertation, these three measures are distinguished. Although they are expected to behave similarly (following previous research), it is important to empirically explore the extent of this similarity. Certainly one can imagine how they might be different. One way to illustrate this is to consider each pair of these and ask whether it

makes sense for one to be low and the other high. For example, one can imagine 10 sources of information that all deal with how e-commerce is beneficial to a firm (high amount, low diversity), versus four sources of information, two on the pros of e-commerce and two on the cons (lower amount, greater diversity). If a manager is looking for information on the risks of e-commerce, then the first situation discussed above would not be very useful, while the second would be more useful. Similarly, we can imagine a manager who spends a great deal of time searching for information, but is not particularly effective, and finds a small volume of information that has little diversity. For these reasons, the amount of information is operationalized in multiple ways to explore how adequate previous assumptions regarding their equivalence are.

Dimensions of Interpretations

Researchers have investigated a variety of specific types of interpretations that managers may have about particular issues. This dissertation investigates two types of interpretations that other researchers have argued are particularly important for managerial and organizational performance. These are: (1) strategic issue interpretation and perceptions that an issue represents a threat versus an opportunity and (2) the level of integrative complexity of the individuals' understandings of an issue. Each of these is discussed next.

Strategic Issue Interpretation

A growing body of work is establishing how the sensemaking activity of labeling strategic issues in certain ways affects organizational action and performance. Highhouse, Paese, & Leatherberry (1996) note that "Mintzberg, Raisinghani, and Theoret (1976)

described strategic decision making as a series of phases. The first phase posited by Mintzberg *et al.* is the issue-identification phase in which opportunities, problems, and crises are recognized and labeled as such" (p.96). Thomas & McDaniel (1990) discuss how the way a manager perceives a strategic issue affects the range of solutions considered, the amount of resources committed, and steps made toward organizational change.

There are a number of specific labels that have been theorized to affect organizational action and have been investigated, but the label that has received the greatest attention to date is opportunity vs. threat (or problem; Fredrickson, 1985). Opportunity and threat labels depend on whether issues are seen as positive (or gain) vs. negative (or loss), and controllable vs. uncontrollable. The dimensions of positive vs. negative and gain vs. loss were originally seen as two distinct labels, but empirical work (e.g., Thomas & McDaniel, 1990) found them to be operationally indistinguishable.

Highhouse, Paese, & Leatherberry (1996: 96) note that decision makers are often exposed to equivocal issues that may be seen as threats or opportunities. They state that: "Often, it is necessary for decision makers to subjectively interpret issues *prior* to identifying or considering various courses of action" (Highhouse, Paese, & Leatherberry, 1996: 96).

Staw, Sandelands, & Dutton (1981) reviewed a large body of work that finds that perceptions of events as threats lead to a narrowing of information processing and a constriction of control. This rigidity can be maladaptive in situations requiring innovation and new actions, and can lead to downward performance spirals (Lindsley, Brass, & Thomas, 1995). Jackson & Dutton (1988) argued that inferences managers make would

be stronger if issues were labeled as opportunities or threats instead of as neutral. Their research found that issues labeled as positive (or gain) and as controllable are more likely to be seen as opportunities. Jackson & Dutton (1988: 370) note that perceiving issues as opportunities results in more open information searching and in more overt appraisal processes. Other research suggests that when organizations perceive events as controllable, they are more likely to search for information (Kefalas & Schoderbek, 1973). In one of the few studies that has suggested how social networks affect interpretation processes, Dutton (1992: 208) suggests that issues are more likely to be seen as opportunities if issue sponsors are located centrally in organizational networks.

Interpreting events as controllable should in fact lead to greater efforts at control, while events seen as uncontrollable should lead to non-action. This is independent of the actual ability to control, and labeling controllable events as uncontrollable should thus lead to a reduced set of possible actions and perhaps lower performance.

Another body of work that looks at how issues are framed involves Kahneman & Tversky's (1979) prospect theory, which posits that situations framed as positive/gain vs. negative/loss affect decisions in fundamental ways (Chattopadhyay, Glick, & Huber, 2001). Situations framed as gains are associated with risk aversion, while those framed as losses promote risk seeking behavior. This theory has received broad support, and has recently been specifically integrated into the threat/opportunity framing literature (Chattopadhyay, Glick, & Huber, 2001).

Thomas & McDaniel (1990) tested the relationship between the structure of top management teams and individual information processing variables on the interpretation of strategic issues by CEOs. They found that the top management teams' capacity for

information processing was related to the amount of information used in their sensemaking and positively related to interpretations that used the labels of positive, gain, and controllable. Thomas, Clark, & Gioia (1993) found that high levels of information use were positively related to labeling issues in positive/gain terms and as controllable.

Although past work (e.g., Thomas, Clark, & Gioia, 1993) has controlled for individual-level variables such as age, type of education, amount of managerial work experience, and years of experience with strategic decision making, these individual differences are too far removed from the specific information processing to help uncover how information processing affects strategic issue diagnosis and sensemaking (Kuvaas & Kaufmann, 1999). This has led to mixed findings. Some studies have found that information processing does affect sensemaking. Thomas & McDaniel (1990) operationally define the information processing structure of a top management team with the dimensions of participation, interaction, and formalization, and find that these affect the amount of information usage. Other studies find that individual level variables hypothesized to be related to information processing are not related to strategic issue interpretation. Thomas, Shankster, & Mathieu (1994) specifically found that individual-level demographic variables including executive level, positional tenure, and academic background were not important to the interpretation of strategic issues, contrary to their predictions. Although these demographic variables are potentially important, and Hitt & Tyler (1991) argue that they should affect managerial interpretations, they are somewhat removed from the immediate information processing engaged in. The information processing characteristics included in this dissertation should be much more clearly

related to interpretation because they are much more specifically related to information processing concerns.

While the majority of the literature on threat and opportunity framings has treated these as opposite ends of a single dimension, more recent literature suggests that this may not be accurate (Denison, Dutton, Kahn, & Hart, 1996; Chattopadhyay, Glick, & Huber, 2001). Denison, Dutton, Kahn, & Hart (1996) specifically suggest and use a conceptualization of threat and opportunity as two distinct dimensions instead of a single threat/opportunity dimension (p.461), and find support for their separation. I build on this research to explore how information may affect threat and opportunity differently. In particular, I suggest that a greater amount of information may lead managers to see a complex issue as having both aspects that suggest the issue is a threat and other aspects that suggest it is an opportunity. The fact that these interpretations may be distinct suggests that they might both be high in equivocal situations. Alternatively, perceptions of the threat nature of an issue may change with additional information, while perceptions of the opportunity nature of the issue may remain stable. Either of these findings would lend support to treating threat and opportunity as distinct dimensions rather than the endpoints of a single continuum.

Thus far, research on threat and opportunity interpretations has not considered what factors lead to changes in individuals' interpretations. As Barr (1998) notes, "despite the proposed importance of interpretation to adaptation, little is understood about how interpretations change to accommodate changes in the internal or external environments." Thus, while we know that managers do think about issues in terms of threat and opportunity, we know very little about what factors cause issues to be seen as

threats at one point in time and non-threats later on. This dissertation explores the possibility that the amount of information managers find regarding complex, equivocal issues may be an important determinant of changes to managers' interpretations. Specifically, once an individual has an interpretation of the extent to which an issue is a threat and opportunity, I suggest that the amount of information they find regarding the issue will lead to seeing additional aspects of the issue that are suggestive that it is both a threat and an opportunity. Importantly, additional information may also suggest ways that managers can cope with and perhaps minimize the threat aspects of the issue and capitalize on the opportunity aspects. There is little in the existing literature on threat and opportunity framing to suggest which of these is more likely.

Integrative Complexity

Another sensemaking outcome that has received some attention (though still rather sparse) in recent years by management researchers is integrative (or cognitive) complexity. [Although often stated as cognitive complexity theory in the management literature, the larger body of theory uses the term integrative complexity, and I will use this label]. One representative definition of integrative complexity is "the ability to differentiate alternative perspectives and to integrate these perspectives into a decision" (Stone, Sivitanides, & Magro, 1994, p.244). Integrative complexity theory distinguishes between two cognitive stylistic variables: *differentiation* and *integration*. Differentiation "refers to the number of evaluatively distinct dimensions of a problem that are taken into account in interpreting events," while integration "refers to the development of complex connections among differentiated characteristics" (Tetlock, 1992, p.381).

While early theorists considered integrative complexity to be a stable individual disposition (e.g., Schroder, Driver, & Streufert, 1967), "a more situational view of complexity has become the dominant paradigm" (Feist, 1994: 476). Research has shown that integrative complexity is domain specific (Feist, 1994), and individuals can be integratively complex in some domains while remaining integratively simple in others.

Integrative complexity is important because "cognitively complex individuals and groups identify more attributes in information and better integrate these attributes into decisions than do cognitively simple individuals and groups" and a "considerable body of evidence suggests that cognitively complex individuals are more effective in complex information processing tasks" (Stone, Sivitanides, & Magro, 1994, p.246). Goodwin & Ziegler (1998: 373) note: "Relative to noncomplex individuals, complex individuals process more information (Blaylock and Rees, 1984; Suedfeld and Streufert, 1966), transmit more information (Tripodi and Bieri, 1964), differentiate and integrate information better (Goodman, 1968; Messick, 1976; Streufert and Streufert, 1978), and are more able to handle a diversity of information received (Haase *et al.*, 1979)."

Several management researchers have discussed the theoretical importance of integrative complexity. Weick & Bougon's (1986: 120) work on cause maps (which are diagrams of an individual's beliefs about cause-effect relationships) also draws heavily on the theory of cognitive complexity, arguing that cause maps include the two components of cognitive complexity – *differentiation* and *integration*. They state the following as an important research question: "under what conditions can people build, maintain, and apply more complex maps so that a wider range of problems is represented appropriately" (p.124). The practical implication is that when a wider range of problems

is represented appropriately, organizational actors will be in a better position to address those problems and achieve better organizational performance (this is related to the theory of requisite variety; Ashby, 1956). McGill, Johnson, & Bantel (1994) found that the cognitive complexity of managers was related to performance in turbulent environments.

One of Weick's (1979b: 261-262) prescriptions for managers was to do whatever necessary to complicate themselves. Bartunek, Gordon, & Weathersby (1983) specifically linked Weick's advice to the construct of integrative complexity and discussed how to develop training aimed at complicating managers. Dollinger (1984) found that integrative complexity was positively related to boundary spanning activity and found that integrative complexity moderated the relationship between boundary spanning activity and financial performance. It has been argued that cause maps include both the components of differentiation and integration and thus incorporate integrative complexity. Although the direction of causality was not clear, Calori, Johnson, & Sarnin (1994) related CEO levels of integrative complexity (the complexity of CEO's cognitive maps) to the scope of their firms' international activity. Finally, McGill, Johnson, & Bantel (1994) found support for a positive relationship between integrative complexity and performance.

In terms of the factors that lead to integrative complexity, Driver & Streufert (1969) long ago predicted that information load or amount would be related to integrative complexity. However, they also predicted that extreme levels of information load would overwhelm the information processor and decrease the integrative complexity of their output. In the social network literature, Granovetter (1982) predicted that people with

networks filled with weak ties would help develop their cognitive flexibility, since they would be exposed to a greater variety of opinions and outlooks (as reported by Nohria, 1992, p.257).

In addition to this management literature, there is a large literature on integrative complexity in the political science and social psychology literatures (Tetlock, 1992; Suedfeld, 1985; Feist, 1994; Tetlock, Peterson, & Berry, 1993; Suedfeld, Tetlock, & Streufert, 1992). Much of this literature has investigated whether the opinions of people who hold minority versus majority viewpoints are higher or lower in integrative complexity (e.g., Tetlock, 1983; Mandel, Axelrod, & Lehman, 1993; Gruenfeld, 1995; Gruenfeld, Thomas-Hunt, & Kim, 1998) or whether more moderate views represent higher levels of integrative complexity (de Vries & Walker, 1988). Other research shows that significantly stressful periods during a person's life increase the level of integrative complexity in their thinking (Suedfeld & Bluck, 1993), that revolutionary leaders show lower levels of integrative complexity during revolutionary periods than afterwards (Suedfeld & Rank, 1976), and that military success on the battlefield may be related to the levels of integrative complexity of the commanding generals (Suedfeld, Corteen, & McCormick, 1986). Tetlock, Peterson, & Berry (1993) show that integratively complex manager profiles are associated with both positive aspects (e.g., openness and creativity) and negative aspects (e.g., narcissism and antagonism), and there is a positive side to integratively simple managers (e.g., practical, decisive, and principled).

Hypotheses

Building on the research model and theory presented above, I now present the specific hypotheses investigated in this dissertation. There are three different types of

relationships hypothesized between these variables. First are a series of main effects, second are a series of mediating relationships, and third are several interaction effects. These hypotheses are stated at the level of the constructs. However, because there are multiple operationalizations of several of these key constructs in this research, there are a variety of sub-hypotheses related to each primary hypothesis. These sub-hypotheses are listed in Appendix 1.

Main Effects

Actors who are connected to more alters in their networks should be exposed to more information, and should be able to actively search for more information, since there are more people from whom they can seek and receive information. The logic for the first hypothesis is straightforward: ceteris paribus, a greater number of direct network connections should lead to more information. If each individual that an actor knows has a certain percentage of different or unique knowledge, then being connected to more individuals increases the possibility of encountering different information. This logic is supported by the arguments of Burt (1992), although he contends that these network contacts must be unconnected with each other in order to provide diverse information. However, as noted earlier, Murray & Poolman (1982) found that even actors who were strongly tied to one another had different information. Siebert, Kraimer, & Liden (2001) find that the number of contacts in other functions and the number of contacts at higher levels are related to access to information. In addition, more network ties should increase the accessibility of information, and Swanson (1987) discusses how information source use is related to channel accessibility. In the following hypothesis, I propose that network size alone will have a direct impact on the amount of information managers find.

H1: Network size will be positively related to the amount of information an individual will gather.

Some of the current literature suggests that average tie strength should be negatively related to the amount of information an actor gets, since stronger ties are more costly to maintain, and since information is expected to transfer similarly over weak and strong ties (Burt, 1992, 1997). Thus, fewer, stronger ties, are theorized to mean less information and less diversity. However, others (e.g., Hansen, 1999) have shown that strong ties are better suited to transferring complex information, and have suggested that actors should trust (and thus transfer important information to) strong ties more than weak ties (e.g., Krackhardt, 1992). If this is true, then a stronger average tie strength may lead to the sharing of more information, as these strong relations have greater motivation to be of assistance. These arguments lead to the following two conflicting hypotheses.

H2a: Average tie strength will be negatively related to the amount of information an individual will gather.

H2b: Average tie strength will be positively related to the amount of information an individual will gather.

Previous studies have shown that the information processing personality traits of need for cognition and tolerance for ambiguity are related to greater information search (Cacioppo, Petty, Feinstein, & Jarvis, 1996; Bailey, 1997; Dollinger, 1984; Schaninger & Sciglimpaglia, 1981). This tendency to search more should lead to a greater amount of information.

Because individuals high in need for cognition enjoy thinking deeply about issues, they should seek a larger amount and diversity of information for solving their problems

and aiding in their understanding of complex issues. Whereas low-NFC individuals will be less likely to engage in sustained mental effort and will attempt to reach a conclusion sooner, a high-NFC should lead individuals to remain open to the potential usefulness that additional information may provide. Because high-NFC individuals will continue to engage in effortful thought about issues, they should see more information as useful to their understanding. Individuals who prefer to think more about issues (high-NFC) should in general be more receptive to counter-arguments and diverse information, since they inherently enjoy thinking deeply about issues. In addition, a higher level of mental effort directed at an issue or problem should lead to the realization of more alternatives and thus a greater diversity of information.

A higher tolerance for ambiguity should lead to greater consideration of alternative viewpoints and information, and less avoidance of important but threatening information. That is, where individuals who are more intolerant of ambiguity will be threatened by contradictory information that doesn't match their current beliefs, and thus avoid it, individuals who are tolerant of ambiguity will be more accepting of this diverse information. (However, it should be noted that while previous research has found a link between tolerance for ambiguity and information search, it is possible that highly tolerant individuals may actually search for less information, since they should feel less of a need to resolve ambiguities in their understanding). These arguments lead to the following hypothesis:

H3: Information processing personality traits will be positively related to the amount of information an individual will gather.

Following the arguments presented in Daft, Sormunen, & Parks (1988), managers who perceive higher levels of uncertainty in important sectors of their environments should seek more information to enable them to deal with that uncertainty. These authors found support for this prediction, and I expect to similarly find a relationship between perceptions of strategic environmental uncertainty and the amount of information managers find. Vandenbosch & Huff (1997) also discuss perceived environmental uncertainty as an important predictor of information retrieval behavior, but were unable to measure the variable.

However, there is at least some evidence that if managers perceive the environmental sector as too complex, particularly if they see that sector as less strategically important, they will seek less information (Boyd & Fulk, 1996). In addition, Elenkov (1997) did not find that perceived strategic uncertainty across sectors was related to frequency of scanning among Bulgarian decision-makers. She did find, though, that perceived strategic uncertainty was related to the frequency of scanning using personal, external modes. Nevertheless, I expect the relationship stated in the hypothesis below.

H4: Perceptions of strategic environmental uncertainty will be positively related to the amount of information an individual will gather.

Individuals who have more information should be less threatened by equivocal events, and should see more ways that potentially threatening events can result in opportunities for them and their firms. In part this is because the actor should have more information about cause and effect relationships (Thomas, Clark, & Gioia, 1993) and will be better able to find resources that can be used to change a negative situation into a positive one. In addition, an increased amount of information should include a better

indication of the risks of even apparently beneficial situations. An increased diversity of information should lead to seeing events as both opportunities and threats, since the diversity may give them advance intelligence that they can benefit from (and that competitors do not have) or may highlight alternative courses of action that others with less diversity are not able to recognize. This line of reasoning leads to the next hypothesis:

H5: The amount of information an individual gathers will be positively related to changes in the perception that a complex, equivocal issue is both a threat and an opportunity.

Individuals who have a greater amount of information have a greater amount of raw materials from which to make sense of their environments, and in particular, complex, ambiguous issues whose importance are unclear (Thomas, Clark, & Gioia, 1993). This greater amount of raw material should lead to richer interpretations that demonstrate a higher level of integrative complexity. An increased diversity of information should lead to richer interpretations of complex events that include a greater number of constructs. In essence, this argument suggests the level of diversity of the raw materials from which sense is made should be reflected in the actual interpretations that are constructed by managers. This is formally stated in the next hypothesis.

H6: The amount of information an individual gathers will be positively related to the level of integrative complexity of thinking about a complex, equivocal issue.

Mediating Effects

While the hypotheses stated above all deal with the main effects between the different sets of variables in Figure 2.1, I also expect that if individuals' social network characteristics and information processing traits affect sensemaking outcomes, they do so through the intervening mechanisms of an increased amount and diversity of information. Thus, I expect a mediating relationship between social network characteristics and information processing traits on the sensemaking outcomes. If the network and personality variables do affect managers' interpretations, then it is important to understand why that effect occurs. Existing research suggests that any effect would be the result of an increased amount of information. This dissertation tests this possibility. [Please note that a discussion of the process of establishing mediation is presented in the Analysis section of Chapter Three]. The rationale for each mediating hypothesis is presented below, followed by each hypothesis.

The only explanation suggested by the above theory for why the size of managers' networks would affect their perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity is that the managers have better access to information. The increased information should lead them to see reasons why the equivocality could lead to threats and opportunities, as opposed to seeing the issue as a unilateral threat or unilateral opportunity. For this reason, I hypothesize that any relationship between network size and changes in threat/opportunity framings will be mediated by information amount.

H7: Any effect of network size on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the amount of information an individual gathers about that issue.

Ego-network size is hypothesized to be related to the richness of individuals' interpretations of a complex, ambiguous issue (in terms of its integrative complexity) because of the greater amount and diversity of information that a larger ego-network should offer. There may be, however, other reasons why a large ego-network could be related to a higher level of integrative complexity in individuals' interpretations. Perhaps individuals who have richer interpretations attract a greater number of people in their social networks. Establishing mediation by the information amount will offer support to my argument that it is the information advantages that larger ego-networks provide that lead to richer interpretations. Therefore, I propose the following mediation hypothesis:

H8: Any effect of network size on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the amount of information an individual gathers about that issue.

The rationale behind my expectations that individuals' average network size would affect changes in perceptions that a complex, equivocal issue is both a threat and an opportunity is similar to the argument presented for network size – a higher average tie strength may lead to a greater amount of information. Thus, any effect between average tie strength and changes in threat/opportunity interpretations would be mediated by information amount, as the next hypothesis states.

H9: Any effect of average tie strength on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the amount of information they find about that issue.

One potential alternative explanation for why a larger average tie strength is related to the integrative complexity of managers' interpretations is that managers who have richer interpretations somehow are more prone to developing strong or weak ties. Although this may seem unlikely, and I have no rationale for such an explanation, demonstrating mediating relationships through the three information variables as hypothesized below will give support to my theorized predictions that are based on information.

H10: Any effect of average tie strength on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the amount of information an individual gathers about that issue.

Individuals' information processing personality trait profile may affect the extent to which they see a complex, equivocal issue as having aspects that represent both threats and opportunities, independent of the amount of information. For example, individuals who are intolerant of ambiguity may have a more difficult time seeing two sides of an issue regardless of the information they seek and receive from other sources. Managers with a low need for cognition may simply latch onto one interpretation of an issue and ignore additional information they receive from their information environment. My predictions are that although this may be true, at least part of the effect of these personality characteristics on changes in managers' perceptions that an issue is both a threat and an opportunity will be due to the mediating relationship with information amount as discussed in the following hypothesis.

H11: Any effect of information processing personality traits on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an

opportunity will be mediated by the amount of information an individual gathers about that issue.

Individuals' information processing personality traits may also affect the level of integrative complexity of their thinking toward an issue independent of the information they receive about the issue. For example, individuals who are intolerant of ambiguity may inherently think of complex issues as black or white, with little room for qualifications or considerations of alternative perspectives. My prediction, in contrast, is that these individuals receive and seek less information. Establishing mediation as the next hypothesis predicts would support my contentions.

H12: Any effect of information processing personality traits on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the amount of information an individual gathers about that issue.

Interactions or Moderating Effects

Individuals' information processing personality characteristics may pose a potentially important boundary condition on the influence of their social network characteristics. Social network characteristics may have differential effects depending on the personality traits of the actors. Possessing a great social network structure may be of limited value if a manager has a personality profile that suggests he or she won't search for information in that network anyway. Alternately, social network advantages may help compensate for personality trait profiles that suggest the individual will not actively seek information. For example, an individual with a low tolerance for ambiguity may avoid information that challenges her worldview. However, in a larger network, this conflicting information may nonetheless be encountered and have an effect on the information

variables of interest in this study. Similarly, an individual high in need for cognition may desire information and alternatives, but if located in a small network, they may not realize the benefits from their preferred information orientation, since they receive only limited exposure to alternative and conflicting viewpoints. These are examples of interaction (also called moderating) hypotheses. In general, the two interaction hypotheses stated below suggest that the effect of information processing characteristics on the information variables is contingent on social network characteristics. The rationale for expecting this to be the case is discussed for each of the interaction hypotheses. Graphs of the nature of the expected interaction relationships are presented in Appendix 9.

While both social network and personality characteristics are hypothesized to have direct effects on individuals' information seeking, these effects may be contingent upon the interaction of those factors. While someone with a high tolerance for ambiguity or need for cognition should actively search for information, they may be limited by their network size. Even if they desire to seek more information, they may know of only a few people they can easily go to. A small network size may frustrate their efforts to gather more information. This may lead the manager to either abandon their information search efforts, or it may make their search efforts less effective.

When managers possess the personality traits that suggest they prefer to actively seek information, and they have a large network size in which they can seek that information, I expect they will find a higher amount of information relative to other combinations of these two factors. Overall, these suggestions lead to the following interaction hypothesis:

H13: There will be an interaction effect between network size and information processing personality traits on the amount of information an individual will gather, such that individuals with both large network sizes and high information processing personality traits will gather the most information.

While individuals may prefer to seek a great deal of information according to their information processing personality characteristics, their average tie strength may be weak and thus hinder their efforts. Given that weak ties have been suggested to be less helpful, a manager's information search may be frustrated, limiting the effectiveness of that information gathering and lowering the amount of information he or she receives. However, these weak ties may provide a greater diversity of information.

On the other hand, a manager with a strong average tie strength should only benefit from that strength if he or she is willing and able to accept the information benefits those ties provide. If these strong ties have similar knowledge, however, there may be little new information to gain.

One argument is thus that if managers have both a strong average tie strength and a personality suggesting they will seek a greater amount of information, then their information search efforts should be the greatest. For example, given the contention that strong ties are more willing to be of assistance (Krackhardt, 1992), high-NFC individuals should be more likely to use their strong ties to get information, since they like to think more deeply about issues, and thus may be more likely to ask more questions and probe more deeply. Thus the potential information benefits of strong ties should be greater for high-NFC individuals than for low-NFC individuals.

The other argument holds that since weak ties provide more information, managers with a weak average tie strength and a personality that suggests they actively

seek a lot of information should gather the most information. These considerations lead to the next two interaction hypotheses.

H14a: There will be an interaction effect between average tie strength and information processing personality traits on the amount of information an individual will gather, such that individuals with a lower average tie strength and high information processing personality traits will gather the most information.

H14b: There will be an interaction effect between average tie strength and information processing personality traits on the amount of information an individual will gather, such that individuals with a higher average tie strength and high information processing personality traits will gather the most information.

Summary

This chapter presented the detailed research model developed and tested in this dissertation. In addition to elaborating on the theoretical rationale behind the research model, the theory related to each element of the model was discussed. A series of specific hypotheses was derived from this theory and elaborated.

The next chapter discusses the methodology used to test the research model and hypotheses. The specific measures of each construct are discussed in detail, and the research design and approach are discussed. Chapter Four then presents the results of the hypotheses tests, and Chapter Five discusses these results and their importance.

CHAPTER 3

METHODOLOGY

Unit of Analysis

The individual is the unit of analysis for this study. Prior research on issue interpretation has argued that the individual is the appropriate unit of analysis. For example, Highhouse, Paese, & Leatherberry (1996: 96) state that strategic decisions are those where "there is uncertainty about the future, incomplete information, and a rapidly changing external environment (Taylor, 1987). According to Taylor, most of these decisions are made by individuals, rather than groups, and therefore require an individual unit of analysis."

Overview of the Research Design

Testing the research model presented in Chapter Two required a setting in which practicing managers would complete a report on a particular complex and equivocal issue and detail their search process while they gathered information to complete that report. The basic research design involved four waves of data collection: (1) an initial survey measuring the subjects' social networks, information processing characteristics, perceived strategic environmental uncertainty, and background information, (2) a second survey measuring their perceptions of the extent to which e-commerce is a threat and/or opportunity for their businesses, (3) an organizational assessment of the implications of e-commerce for their specific businesses, along with an information log wherein they record information about each information source they find, and (4) a final measure of their perceptions of the extent to which e-commerce is a threat and/or opportunity (to measure the change in their perceptions).

Research Site and Sample

An ideal research site was found in two Information Technology classes taught by Professor Norm Chervany during the first quarter of 2000. One of these classes was a Carlson Executive MBA (CEMBA) class, the other a similar Masters of Technology (MOT) class. There were 52 students in the first-year CEMBA class and 25 students in the MOT class.

The students in these two programs continue to work full-time while completing the programs and are older and more experienced than typical MBA students. The average subject in this study was 36.6 years old and had 11.9 years of work experience in their particular industries. These managers represent a broad spectrum of experience in various functions. A variety of service and manufacturing industries are represented, and the specific titles of the subjects include CEOs, Presidents, and Vice Presidents, as well as various other general managers. In this dissertation I was particularly interested in how experienced managers gathered information and made sense of emerging issues, and therefore the managers in these two classes were particularly appropriate as participants in this research. Clearly, however, the findings from this relatively higher-level sample might not generalize to less experienced managers.

Data Collection Procedures

Survey 1

In mid-January of 2000, subjects completed the initial survey. This survey is included as Appendix 2a, and measured managers' social network characteristics, information processing personality characteristics, the contextual factor of perceived

strategic environmental uncertainty, and various background questions (including e-commerce expertise) and demographic information. This survey was pretested by several Ph.D. students to ensure that its length did not result in excessive respondent fatigue. The survey took about an average of 30 minutes to complete.

Survey 2

Two weeks after completing the initial survey, subjects completed a short survey that measured their perceptions of whether e-commerce was a threat and/or opportunity to their businesses. This survey is presented in Appendix 2b.

E-Commerce Reports

During the same class, but after subjects completed the second survey, the specific organizational assessment relating to the issue of e-commerce was distributed and discussed. This assignment was one of two major organizational assessments the students had to complete as a part of the course requirements. It was discussed as relating to e-commerce, and the specifics of the assessment are given below.

"For a major product or service in your organization, define the major components in the current supply-operation-distribution-sales value chain (i.e., define your business proposition, your value proposition). For this value chain:

1. Identify the major places where information is a component of value.
2. Where are the trade-offs being made between richness and reach?
3. In what situation – under what conditions – will [or could] these trade-offs be eliminated?

4. Describe the degree to which you are using a 'push' strategy versus a 'pull' strategy in dealing with your customers.
5. In what situation – under what conditions – will [or could] this current 'push-pull' balance be altered?
6. What would be the strategic consequences for your organization and for your industry if – when? – #3 and/or #5 happens?
7. What new business proposition – new value proposition – would be required to be competitive if – when? – #3 and/or #5 happens?"

Two elements of this assessment need elaboration. The first concerns questions 2 and 3 of the assessment, and deal with the trade-off between richness and reach. Evans & Wurster (1999: 87) discuss richness and reach. They define richness as "the depth and detail of information that the business can give the customer, as well as the depth and detail of information it collects about the customer." They define reach as "how many customers a business can connect with and how many products it can offer to those customers" (p.87). The argument is that while traditional businesses have always had to make a trade-off between richness and reach, e-commerce is making it increasingly possible for businesses to have both, and thus eliminate the trade-off.

The second element requiring explanation is the distinction between push and pull strategies. Push strategies are those in which the business decides what information to give to customers. Pull strategies are those that allow the customer to get information of their own choosing when they want it, and sometimes even allow customers to customize the format in which they want that information. Because e-commerce makes it increasingly easy for customers to access specific information they need, the argument is

that businesses need to alter the balance between push and pull strategies so they are giving more information to customers and allowing those customers to determine more precisely what information they want.

Overall, the type of issue in this organizational assessment is complex and equivocal enough that I expect to see variance related to the variables of theoretical interest in this dissertation. In addition, this issue was especially suitable for my research because it affects a wide variety of industries.

Given the fact that these managers were still working full-time, the instructor of the course did not specify a due date for this organizational assessment. The expectation was that the vast majority of students would complete the assessment by the end of the course at the end of March.

Information Log Booklet

As a part of the e-commerce organizational assessment, students also had to complete an information log where they would record details about each source of information they encountered while completing the assessment. Prior research (Jones & McLeod, 1986) has used this type of information log to gather very specific, micro-level data on the specific sources that managers use and the importance of the information from each source. This information log is presented as Appendix 3.

Although participation in the research project was voluntary, all subjects were required by the professor to fill out this information log as a part of the course requirement. The managers were told that although the information logs would be used for research purposes, the professor was also interested in seeing how managers gathered information. Importantly, subjects were told that their information logs would not be

graded, and that the professor and I did not want them to do anything differently than they would normally do to complete the assignment. We merely wanted them to record details about what they actually did. This was important so that subjects would not attempt to list many sources of information for impression management purposes that they did not in fact use.

For each source subjects received or found information as they completed the organizational assessment, they were asked to record the date, the time spent gathering information (in minutes), the source (e.g., initials of a person, title of an article, website, etc.) and whether that source was inside the firm or not, the topics discussed or located, three questions regarding the amount, usefulness, and novelty of the information found, and finally, whether that source of information identified another source of information. The booklet included space for up to 30 information sources.

Survey 3

In mid-March, a final survey that again measured managers' perceptions of the extent to which e-commerce was a threat and/or opportunity was completed. Because the research model predicts that the amount of information gathered will affect changes in perceptions of whether e-commerce is a threat and/or opportunity, this survey was completed only by those students who had already completed and turned in their e-commerce organizational assessment and information logs. This survey is presented in Appendix 2c.

Measures

Dependent Variables

Changes in Threat/Opportunity Framings. The degree to which the issue of e-commerce is framed as a threat and/or an opportunity was measured with a 15-item scale heavily based on the scale used by Thomas, Clark, & Gioia (1993). The specific items used to measure this variable are presented in Appendix 4.

Denison, Dutton, Kahn, & Hart (1996) have suggested that threat and opportunity may be distinct dimensions instead of ends of a single continuum. Because I hypothesize that some managers will see e-commerce as representing both a threat and an opportunity, it was important to empirically check whether it made sense to consider threat and opportunity as distinct constructs. Therefore I used exploratory factor analysis to check whether the positive/gain and controllability dimensions would emerge as separate factors and also to see whether threat would emerge as a separate factor. Because I expected these three concepts should be somewhat correlated with one another, oblimin rotation was selected as the rotation method.

An initial factor analysis with all 15 threat/opportunity items at time 1 resulted in a four-factor solution in which one of these factors was a single item. This item was dropped and the factor analysis was rerun using the remaining 14 items. The results of this analysis for time 1 are presented in Table 3.1 and for time 2 are presented in Table 3.2. The three factors at time 1 account for 66.5% of the variance, while the three factors at time 2 account for 73.9% of the variance.

These factor analyses results generally provide strong support for the separation of the threat/opportunity items into three distinct variables – positive/gain, controllability,

and threat. However, the factor analyses results were not perfect. Specifically, in the factor analysis at time 1, one of the threat items having to do with a lack of controllability loaded with the controllability items. At time 2, this item loaded with the other threat items. At time 2, one of the positive/gain items loaded at 0.72 on the positive/gain factor and 0.64 on the controllability factor. Despite these minor discrepancies, the reliabilities for the three scales at the two time periods were all above the 0.70 cutoff specified by Nunnally (1978) and others (Peterson, 1994). Table 3.3 gives these reliability scores.

As another check on the distinctiveness of the threat and opportunity constructs, I looked at whether some managers saw e-commerce as either simultaneously representing *both* a low threat and a low opportunity or *both* a high threat and a high opportunity. If every subject saw the issue as being either low threat and high opportunity or high threat and low opportunity, then this would suggest that threat and opportunity really are opposite dimensions of a single scale. However, if some managers see the issue as representing neither a threat nor an opportunity, or both a threat and an opportunity, then this argues against threat and opportunity being opposite ends of a single dimension.

To check for this possibility, I split the samples from time 1 and time 2 along their medians for both threat and opportunity and then checked how many subjects were in each of the four possible cells. Figure 3.1 shows the results for the 69 managers who provided data at time 1, and Figure 3.2 shows the results for the 40 managers who provided data at time 2. In each of these tables it is clear that a nontrivial percentage (30-38%) of individuals saw e-commerce as either both a threat and an opportunity simultaneously, or neither a threat nor an opportunity. This also supports the argument that threat and opportunity truly are distinct constructs.

Table 3.1
Exploratory Factor Analysis of Threat and Opportunity Items at Time 1

	Factor 1	Factor 2	Factor 3
POSITIVE/GAIN ITEMS			
Perceive that benefits will come from the situation for your business?	0.73	-0.01	0.14
Feel the future will be better for your business because of the situation?	0.85	0.28	0.10
Label the situation as a potential gain for your business?	0.90	0.04	0.07
See the situation as having positive implications for the future of your business?	0.83	0.31	0.05
Feel that there is a high probability of your business gaining a great deal?	0.83	0.28	0.20
Label the situation as something positive for your business?	0.92	0.28	0.17
CONTROLLABILITY ITEMS			
Feel your business has the capability to address the situation?	0.36	0.79	0.38
Feel your business can manage the situation instead of the situation managing it?	0.52	0.73	0.26
THREAT ITEMS			
Label the situation as something negative for your business?	0.19	-0.10	0.68
Feel that there is a high probability of your business losing a great deal?	0.03	0.32	0.68
See your business as constrained in how it could interpret the situation?	-0.16	0.50	0.57
Feel that how the situation is resolved by your business will be a matter of chance?	-0.04	0.71	0.14
Label the situation as a potential loss for your business?	0.33	0.47	0.72
See the situation as having negative implications for the future of your business?	0.44	0.27	0.78

Table 3.2
Exploratory Factor Analysis of Threat and Opportunity Items at Time 2

	Factor 1	Factor 2	Factor 3
POSITIVE/GAIN ITEMS			
Perceive that benefits will come from the situation for your business?	0.79	0.29	0.14
Feel the future will be better for your business because of the situation?	0.88	0.30	0.06
Label the situation as a potential gain for your business?	0.92	0.32	0.16
See the situation as having positive implications for the future of your business?	0.88	0.31	0.19
Feel that there is a high probability of your business gaining a great deal?	0.72	0.64	-0.09
Label the situation as something positive for your business?	0.92	0.35	0.18
CONTROLLABILITY ITEMS			
Feel your business has the capability to address the situation?	0.36	0.93	0.38
Feel your business can manage the situation instead of the situation managing it?	0.31	0.95	0.31
THREAT ITEMS			
Label the situation as something negative for your business?	0.29	0.23	0.65
Feel that there is a high probability of your business losing a great deal?	0.04	0.24	0.86
See your business as constrained in how it could interpret the situation?	0.12	0.09	0.71
Feel that how the situation is resolved by your business will be a matter of chance?	-0.04	0.30	0.79
Label the situation as a potential loss for your business?	0.18	0.29	0.84
See the situation as having negative implications for the future of your business?	0.19	0.27	0.89

Table 3.3
Reliability Scores for Threat and Opportunity Subscales

Variable	# of Items	Reliability Score
Positive/Gain Subscale at Time 1	6	0.92
Positive/Gain Subscale at Time 2	6	0.92
Controllability Subscale at Time 1	2	0.80
Controllability Subscale at Time 2	2	0.91
Threat Subscale at Time 1	6	0.72
Threat Subscale at Time 1	6	0.88

Figure 3.1
Median Split Analysis of Managers'
Perceptions of Threat and Opportunity at Time 1

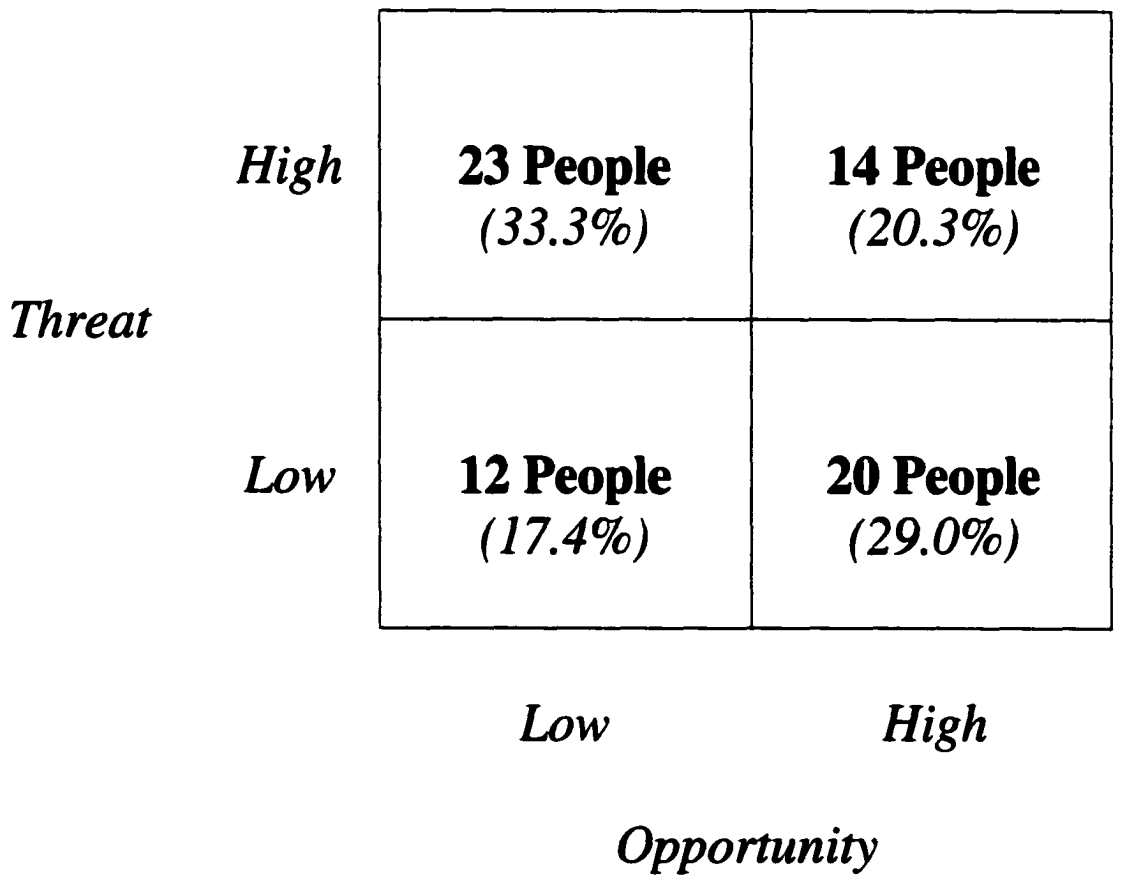
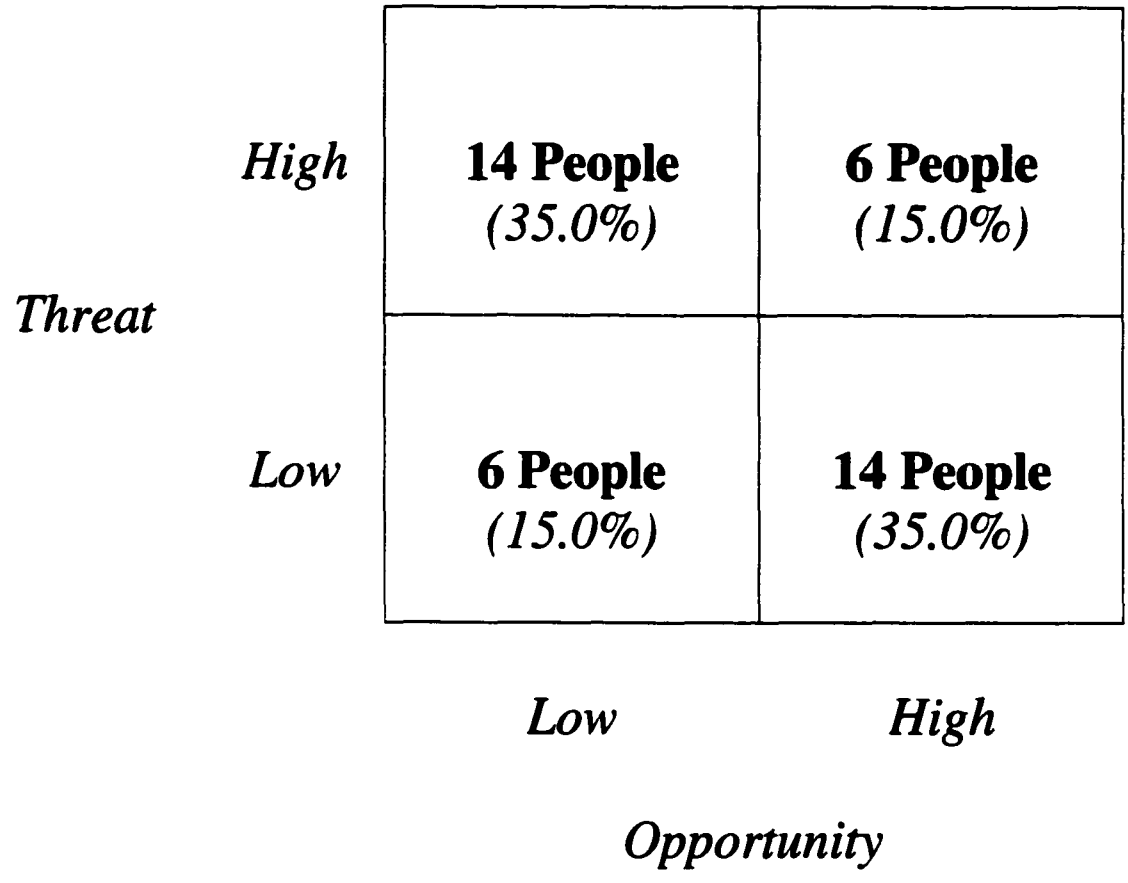


Figure 3.2
Median Split Analysis of Managers'
Perceptions of Threat and Opportunity at Time 2



An additional construct validity check was performed at time 2. After the subjects answered the 15 threat/opportunity items, they answered an additional two questions relating to threat and opportunity perceptions. These items were: "To what extent do you believe the emergence of e-commerce represents a THREAT to your business" and "To what extent do you believe the emergence of e-commerce represents an OPPORTUNITY for your business?" The correlations between these single item measures of threat and opportunity were then compared to the subscales at time 2. The single item measure of

threat correlated with the threat subscale at 0.80. The single item measure of opportunity correlated with the positive/gain subscale at 0.62 and the controllability subscale at 0.43. All of these correlations are significant at the 0.01 level, and this provides additional construct validity for the threat, positive/gain, and controllability measures.

Five variables were created from the threat/opportunity items for use in the analyses. Because my hypotheses suggest that managers can view a complex, ambiguous issue simultaneously as a threat *and* an opportunity, I needed a measure that would capture this. Two measures were used. The first was an additive measure that simply took the sum of the threat and opportunity items. A manager who saw e-commerce as both a threat and an opportunity would have higher scores on each of these dimensions. The second measure was a multiplicative measure. To create this measure I multiplied each subjects' average threat score by their average opportunity score. The benefit of this measure is that it more easily distinguishes cases where the subject rates both threat and opportunity high from situations where the subject rates either threat or opportunity high and the other low. For example, in the additive measure a manager who has an average opportunity score of six and an average threat score of two would look identical to a manager who rated both threat and opportunity with scores of four. The benefit of the multiplicative measure is that it can give a higher weight to the manager who sees both threat and opportunity as high (specifically, the first manager in the above example would get a score of [2 x 6 =] 12 while the second manager would get a score of [4 x 4 =] 16).

In addition to these measures of the overall degree to which subjects saw the issue of e-commerce as a threat and/or opportunity, I created separate variables for changes in

each of the three subscales. For each of these change measures, the score for each manager at time 1 was subtracted from the score at time 2.

Integrative Complexity. As Carley (1997: 536) notes, "Texts can be thought of as containing a portion of the author's mental model at the time the text was created (Kaufer and Carley, 1993)." The text of the e-commerce assessment was content analyzed in order to assess levels of integrative complexity following the widely used method for assessing this variable (Baker-Brown, Ballard, Bluck, De Vries, Suedfeld, & Tetlock, 1992; Tetlock & Suedfeld, 1988). This procedure involved the coding of a random sample of five paragraphs from each report, as recommended by Baker-Brown et al. (1992). The level of differentiation and integration are determined for each paragraph, giving a score on a one-to-seven scale. An individual's overall integrative complexity score is the average of their scores on the five paragraphs that are coded. More detailed information on how this variable is coded is presented in Appendix 5.

In order to code for integrative complexity, the usual practice is for the scorer to become qualified as an independent scorer. Therefore, in addition to following the specific coding guidelines and procedures in Baker-Brown et al. (1992), I followed the procedures for becoming an expert scorer. This was a very time consuming process, and involved completing the practice coding materials and test provided by Peter Suedfeld and his colleagues at The University of British Columbia. This process involved downloading eight practice sets of paragraphs (135 paragraphs in total) and their answers from this website:

www.psych.ubc.ca/suedfeld/RESTlab/Complexity/Workshop/downloads.html

The first five of these sets includes not only the answers but also explanations of those answers and comments on common mistakes. After completing these eight practice sets, I completed the formal test consisting of 30 paragraphs. The scores I gave these 30 paragraphs were then submitted to Suedfeld's group for assessment. I received a reliability score of .973. David Eichhorn, the research assistant for Dr. Suedfeld who scored the test, said of this score: "I can unequivocally state that I have never seen a higher score." By achieving this high score on the integrative complexity coding test, I have been certified as an independent scorer. I coded the e-commerce assessment reports for integrative complexity in May and June, 2001.

Information Amount. Information amount is a difficult variable to operationalize (Stabell, 1978: 120; Daft & Macintosh, 1981). This study uses three measures. The first, following the recommendation of Stabell (1978), is the sum of the number of minutes that subjects report being in contact with various sources. This variable is called Time Spent Searching. Everything else equal, someone in contact with a source for twice as long should get more information. Other researchers have measured information amount in a similar manner, although at a much more macro level. For example, Hambrick (1981) asked executives to rate the number of hours per week they spent learning about each of four different environmental sectors. In commenting on studies of time allocation, Sproull (1984: 12) notes: "The most positive contribution of these studies is to use relatively systematic data on actual time expenditures to challenge an idealized view of managing."

The second measure of this variable uses self-reported answers to the following item on a seven-point scale: "How *much* information relevant to the assignment would

you say you received from this source." This variable is called Effective Search. Because some subjects chose to separate out particular sources (e.g., listing three websites as individual sources), while others listed these separately (i.e., listing all three websites as a single source), there was a potential problem with simply summing up the ratings of the amount. Specifically, if both of these subjects gave these sources scores of 6 on a seven-point scale, a sum of the ratings would give the subject who listed the three websites as separate sources a score of 18, while the subject who listed them together would get a score of 6, even though these are identical sources. However, even if the subjects listed their sources differently, the number of minutes spent with each of the sources would differ. That is, the subject listing the sources together should report spending a greater amount of time for this combined source than the subject listing them separately. Thus, in order to overcome the problem of aggregation of sources, it was decided that the measure of the amount of information received from each source needed to be weighted by the time spent with that source. This yields a conceptually meaningful measure of the amount of information that is distinct from the first measure in that the extent to which that relevant information was found during the search is taken into account. This method is conceptually similar to that suggested by Sproull (1984: 12), who argued that because elapsed time was not a perfect measure of attention, "One possible solution would entail weighting time allocation data after the fact by an effort or importance factor..." My measure improves on this suggestion because the weights are determined at the same time that the time allocation was recorded, and by the individual collecting the information.

The third measure of amount of information is more specifically targeted toward the diversity or novelty of the information found. Similar to the second measure of information amount, managers also answered the following question for each information source on a seven-point scale: "To what extent was the information you received from this source *different* from the information you already had?" This variable is called Diversity of Information Found. For the same reason discussed above, these ratings were multiplied by the number of minutes spent with each source.

Although none of these measures is ideal, I argue that these measures represent an important improvement in the measurement of the amount of information that managers find. Prior research suffers from one of three problems. First, several studies attempt to measure the amount of information managers find with survey measures asking about managers' perceptions of their access to information (e.g., Spreitzer, 1996: 498; Siebert, Kraimer, & Liden, 2001), asking managers to list which of many sources of information they find useful and then assuming that the use of many sources means a greater amount of information (Cooper, Falta, & Woo, 1995), or asking managers the extent to which they use various sources of information (e.g., on a 1-5 scale – Daft, Bettenhausen, & Tyler, 1993). I argue that these types of global measures do not explicitly measure information in a manner that is targeted enough. Had I followed this procedure, I would not have asked managers to rate the amount of information they found from each source, but instead merely asked at either the beginning or end of their search process how much information they found or which sources they thought were useful. In fact, my initial survey included several questions that asked about how important various classes of information were to the managers (following Daft, Sormunen, & Parks, 1988) and none

of these measures correlated significantly with the more targeted measures used. Even studies that ask how often managers use different sources on Likert scales (e.g., Culnan, 1983, who used a five-point scale from "never" to "at least once a week") do not measure the amount of information that managers find on a particular issue, but rather their perceptions of their overall information usage.

Measures that have asked managers to report the number of hours per day or week (Kefalas & Schoderbek, 1973; Hambrick, 1981) have not captured this data in real time as the manager is engaged in information gathering. Research has found problems with this type of measure (Farh, Hoffman, & Hegarty, 1984) and has questioned managers' abilities to accurately judge the amount of time spent in scanning in a retrospective fashion.

Two other problems are discussed by Stabell (1978). First, prior studies generally present a homogeneous information environment, in part because the volume of information presented is a frequent experimental manipulation (e.g., Dukerich & Nichols, 1991; Verplanken, Hazenberg, & Palenewen, 1992; Murphy, 1994). While this type of research design can test for differences in how managers notice information, it is obviously ill-suited for testing for how managers with different networks gather information. Practicing managers do not face a homogeneous information environment, and therefore studies that seek to explore differences in how managers use their social networks cannot use this experimental simplification.

Finally, Stabell (1978) notes how much prior research typically doesn't use many types of information sources (e.g., personal/impersonal or interactive/passive). Practicing managers can gather information from several distinct types of sources. Merely gathering

information about the specific individuals that a manager receives information from, for example, ignores the possibility that some managers may overcome deficiencies in their social networks as a source of information by using impersonal sources more extensively. By specifically asking managers to report information on each source of information they find, this limitation of previous studies is overcome.

Independent Variables

Information Amount. The three operationalizations of this variable are described above as dependent variables. For some hypotheses these are also independent variables.

Ego-Network Size. There are two measures of ego-network size used in this dissertation: (1) *degree* (or actual size) and (2) *effective network size*. Degree is the number of people that managers list in response to the following question: "Please *enter the initials* of up to 12 people who are important sources of information regarding the impact of technological trends and issues on your business or industry." This variable has a range of 0 to 12. An upper limit of 12 was chosen for two reasons. First, existing research suggests that managers' networks include fewer than 12 ties (e.g., Carroll & Teo, 1994, who found that the mean network size among managers was 3.42 with a standard deviation of 1.70, and Seibert, Kraimer, & Liden, 2001, who found a mean network size of 5.32 with a standard deviation of 1.99). Second, asking managers to give information on more than 12 people was judged to risk serious respondent fatigue. Although it is possible that individuals could have networks larger than 12 people, it is unlikely that managers would be willing to continue listing sources indefinitely, particularly as they were asked several additional questions about each of these sources.

Effective network size (Burt, 1992; Borgatti, 1997) is a measure of network size that is discounted for the extent to which there is redundancy in the managers' social network (this measure is also discussed as "structural holes" in the literature). As discussed in Chapter Two, networks where everyone knows everyone else are theorized to have a greater amount of knowledge overlap, and consequently a smaller amount of unique knowledge. Effective network size takes this type of redundancy into account. Specifically, the effective network size of an actor is "just the actual size minus the average degree of the alters" (Borgatti, 1997: 37).

In order to calculate effective network size, one needs to know whether each of the people in a manager's social network know one another or not. After having the managers list the people they considered important sources of information, they were presented with a matrix and asked: "Now, please indicate whether or not these individuals know each other by circling the appropriate letter in the matrix above. For example, if individuals one (1) and two (2) know each other then circle "Y" in the cell located at row 1 and column 2." In the administration of the survey instrument, I explained this section to ensure that the managers understood what was being asked of them. I also was available to answer any questions. Through this process, it was clear to the managers how to fill out this part of the survey.

Average Tie Strength. Granovetter's (1973) original operationalization of tie strength dichotomized ties into strong or weak, and measured strong ties as those who interact at least twice a week and weak ties as those who interact less than twice per week and more than once per year. Subsequent research has pointed out the problems with using frequency as the primary measure of tie strength, and has cautioned against such an

operationalization, favoring instead a measure of closeness or affection (Marsden & Campbell, 1984). In this research, I operationalized tie strength according to the three elements that Krackhardt (1992) discusses as being critical: (1) interaction, (2) affection, and (3) history of interaction. For each person managers listed as being important sources of information, they answered three items to measure tie strength. The first item measures closeness or affection and asks: "I consider this individual to be a close colleague." This is measured on a seven-point scale with the endpoint anchors being "strongly disagree" to "strongly agree." The second item measures interaction and asks: "During the past year, how often have you sought or received information or advice from this person?" This is measured on a seven-point scale with the endpoint anchors being "twice a year" to "daily." The third item is a measure of the interaction history and asks: "How many years have you known this individual?" These three items were standardized and combined to create an overall measure of tie strength for each individual in the manager's network. The average tie strength for each manager was then created by taking the average of the tie strengths for each individual.

Need for Cognition. This variable is measured using the scale from Cacioppo, Petty, & Kao (1984), which is reproduced in Appendix 6. Individual differences in this variable have been the focus of over 100 empirical studies (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Need for cognition has been shown to have high convergent and discriminant validity, reliability, and a single factor structure (see Cacioppo, Petty, Feinstein, & Petty, 1996, for an extensive review). The coefficient alpha (reliability) for this scale is 0.79.

Tolerance for Ambiguity. This study used MacDonald's (1970) AT-20 measure due to its superiority over other measures in terms of reliability and validity. The specific items used to measure this variable are presented in Appendix 7. The coefficient alpha (reliability) for this scale is 0.69.

Perceived Strategic Environmental Uncertainty. The operationalization of this variable is taken from Daft, Sormunen, & Parks (1988). It is measured by having managers rate the importance, rate of change, and complexity of each of six environmental sectors (the competition sector, the customer sector, the technological sector, the regulatory sector, the economic sector, and the sociocultural sector). The perceived strategic uncertainty is then calculated as the importance of the sectors multiplied by the sum of the complexity and rate of change scores. That is,

$$PSEU = I \times (C + R)$$

Where: PSEU = perceived strategic environmental uncertainty

I = perceived sector importance

C + R = perceived sector uncertainty

C = perceived sector complexity

R = perceived sector rate of change

Whereas Daft, Sormunen, & Parks (1988) were concerned with specific differences across sectors, this research used a single measure of perceived strategic uncertainty that averaged the values across all six sectors. The specific items used to measure this variable are presented in Appendix 8.

Control Variables

E-Commerce Expertise. Individuals and their firms may differ in their pre-existing knowledge and experience with e-commerce. This knowledge and experience may have a significant impact on managers' sensemaking of the issue of e-commerce, and thus needs to be controlled. E-commerce expertise is measured with the average of the following two items: "Which of the following best describes the level of experience and knowledge you possess about e-commerce related issues?" and "Which of the following best describes the extent to which your business is currently involved with e-commerce?" Both of these items are measured with a seven-point scale where 1 = none at all and 7 = an extraordinary amount. The correlation between these two items is 0.66 (significant at the 0.01 level), and the reliability for this two-item scale is 0.79.

Class. Because there may be differences between the individuals in the two classes (CEMBA & MOT), I first tested for differences in the means between these classes on all of the independent variables using t-tests. The only difference was that the CEMBA managers had a lower tolerance for ambiguity (mean = 0.49) than the MOT managers (mean = 0.58). I decided to include a dummy variable for class in the regression models to control for other possible differences that could influence the results.

Response Rates

Due to the longitudinal nature of this research, the response rates varied across the different surveys. Overall, 72 out of 77 managers in the two classes participated, for a response rate of 93.5%. A total of 70 people completed the first survey and 69 completed

the second survey. Sixty-one (61) of these individuals completed the e-commerce assessment and the information log, for a total of 84.7% of the 72 people who responded to either of the first two surveys.

The response rate for the third survey (which measured perceptions that e-commerce was a threat and/or an opportunity at time 2) was substantially lower – only 40 managers completed this survey (55.6% of those participating). The primary reason for this drop was the fact that the third survey was administered during one of the last class meetings in order to maximize the response rate. Many of the managers had not yet completed their e-commerce assessments by this time (there was no fixed deadline for the assessment due to the extremely busy schedules of these full-time, practicing managers). Because I was interested in the role of individuals' information gathering on the change in their perceptions, I only asked those individuals who had completed their e-commerce assessments to fill out the third survey. While many of these individuals did eventually complete their assessment and the associated information log (which explains why the sample size for those items is 61), they did not complete the third survey. T-tests showed no differences on the study variables between study participants who completed the third survey and those that did not.

Statistical Analyses

The primary analyses involve using multiple regression to test for the direct effects of individual-level network and information processing variables on the three information mechanism variables and the two sensemaking outcomes, as well as the direct effect of the information amount variables on the sensemaking outcomes. Several models were run using the different operationalizations of the specific variables. The

following regression equation expresses the fundamental analysis for the main effects hypotheses: $Y = B_0 + B_1$ (*Independent Variable #1*) $+ B_2$ (*Independent Variable #2*) $+ B_3$ (*Independent Variable #3*) $+ B_4$ (*Independent Variable #4*) $+ B_5$ (*Control Variable #1*) $+ B_6$ (*Control Variable #2*). If the hypotheses relating to the influence of each of the independent variables are supported, then the overall regression model will be significant and will show that each specific variable has significant effects.

Testing for mediation effects (Hypotheses #7 through #12) involves estimating a series of regression models (Baron & Kenny, 1986). Specifically, for each hypothesis involving mediation I regress these three equations: (1) the mediator on the independent variable, (2) the dependent variable on the independent variable, and (3) the dependent variable on both the independent variable and the mediator (Baron & Kenny, 1986). Establishing mediation requires that the following four conditions hold: (a) the independent variable affects the mediator (in the correct direction), (b) the independent variable affects the dependent variable (in the correct direction), (c) the mediator affects the dependent variable (in the correct direction), and (d) the effect of the independent variable on the dependent variable must be less in the third equation than in the second (Baron & Kenny, 1986).

The following equations illustrate the three equations for hypothesis #8 (all other mediation hypotheses follow a similar pattern):

(1) Y (*Information Amount*) $= B_0 + B_1$ (*Network Size*) $+ B_{2-4}$ (*Other Independent Variables*) $+ B_{5-6}$ (*Control Variables*)

(2) Y (*Integrative Complexity*) $= B_0 + B_1$ (*Network Size*) $+ B_{2-4}$ (*Other Independent Variables*) $+ B_{5-6}$ (*Control Variables*)

(3) Y (*Integrative Complexity*) = B_0 + B_1 (*Network Size*) + B_2 (*Information Amount*) + B_{3-5} (*Other Independent Variables*) + B_{6-7} (*Control Variables*)

Showing a mediating relationship in the above example means finding that (1) network size is a significant predictor of information amount (in equation 1); (2) network size is a significant predictor of integrative complexity (in equation 2); (3) amount of information is a significant predictor of integrative complexity (in equation 3); and (4) the effect of network size on integrative complexity must be smaller in equation 3 than in equation 2.

The following regression equation expresses the fundamental analysis for the interaction effects hypotheses: Y = B_0 + B_1 (*Independent Variable #1*) + B_2 (*Independent Variable #2*) + B_3 (*Independent Variable #1 * Independent Variable #2*) + B_4 (*Control Variable #1*) + B_5 (*Control Variable #2*). An interaction effect is present if B_3 in the above equation is significant. For example, this regression equation for hypothesis #13 would be:

Y (*Information Amount*) = B_0 + B_1 (*Ego-Network Size*) + B_2 (*Need for Cognition*) + B_3 (*Ego-Network Size * Need for Cognition*) + B_{4-5} (*Other Independent Variables*) + B_{6-7} (*Control Variables*).

Following the recommendation of Friedrich (1982: 824), variables were converted into z-scores before multiplying them together to create the interaction terms. Appendix 9 provides interaction graphs that show the predicted shape of the relationships for the two interaction hypotheses.

Since there are several distinct operationalizations for some of the key variables, separate models will be run for each operationalization. While it would be ideal to run all of these operationalizations together in a single model, the small sample size of this study precludes this possibility. Neter, Kutner, Nachtsheim, & Wasserman (1996: 330) specifically address the issue of small sample sizes in regression analysis, and state that a minimum of six to ten subjects per independent variable are needed. With a total of 53 subjects for some of the regression models, a maximum of eight independent variables could be tested. The sample size is related to the statistical power of the tests to find significant results, and this issue is discussed in more detail below. There is a tradeoff between sample size and richness that is frequently made in research studies. While clearly large sample sizes are desirable, the use of smaller sample sizes is considered appropriate when studying rich, interactive behavior such as that investigated in this dissertation. Barr (1998), using a sample of only six firms in her study of changes in interpretations over time, notes that: "Due to the rich, interactive behavior to be studied, small sample size methodologies are the proper way to address the research questions (Eisenhardt 1989, Pettigrew 1990, Yin 1986)."

Despite the somewhat small sample size that precludes throwing every variable into a single regression equation, it is a strength of this dissertation methodology that several operationalizations are tested. Findings that hold for multiple operationalizations are considered stronger, while findings that hold only for a specific operationalization may be suggestive of the weakness of that method of measuring the variables of interest.

Finally, it is important to recognize that all of the measures involved in this study are collected from a single-source. The reason for this is that these individuals are the

best respondents to give the information for each variable. The information processing and sensemaking outcome variables need to be collected from the individual. Although collecting social network data by surveying each alter that an individual lists as being in their social network is conceivable, this would likely be too intrusive and lead to a much reduced willingness to participate. For these reasons, common source bias was unavoidable and appropriate.

Statistical Power

This section presents an analysis of the statistical power of the regression models that will be analyzed. It is important to determine how much statistical power the sample size in this study provides in order to know how likely it is that the tests of the hypotheses will be able to find effects that exist in the population.

Statistical power in multiple regression analysis is determined by four factors: (1) the sample size, (2) the significance level (alpha), (3) the effect size, and (4) the number of predictor variables in the model. I have selected an alpha level of 0.05 in order to minimize the possibility of Type 1 errors. The effect size is measured using f^2, which is "the proportion of variance accounted for by some source in the population relative to the residual variance proportion." This relationship is: $f^2 = R^2/(1-R^2)$ (Buchner, Erdfelder, & Faul, 2001). I used G*Power to calculate the power values and plot graphs of these values (Erdfelder, Faul, & Buchner, 1996; Buchner, Erdfelder, & Faul, 2001). Cohen (1992) has specified the following conventions with regard to effect size: (1) large effects correspond to effect sizes of 0.35, (2) medium effects correspond to effect sizes of 0.15, and (3) small effects correspond to effect sizes of 0.02.

While it has been argued that most effects in the social sciences are small (Ferguson & Ketchen, 1999; Mazen, Hemmasi, & Lewis, 1987), and it would clearly be desirable to have sufficient statistical power to detect small effects, the large sample sizes required to achieve this power render it extremely difficult to achieve. Most research in strategic management has sufficient power to detect only large and sometimes medium sized effects (Ferguson & Ketchen, 1999; Mazen, Hemmasi, & Lewis, 1987), as does the research reported in this dissertation.

There are three sets of regression analyses. The regressions with information amount as the dependent variable have a sample size of 53. The regressions with integrative complexity as the dependent variable have a sample size of 55. The regressions with changes in threat and/or opportunity as the dependent variable have a sample size of 38.

Figure 3.3 illustrates the power for a multiple regression model with eight predictors and a sample size of 53. The figure illustrates that the regression model will be able to detect large effects with an 82% probability, medium effects with a probability of 40%, and small effects with a probability of only 8%. This means that these regression models will be able to detect medium-large to large effects with a reasonable level of power, but will not be able to detect small to medium effects that may exist. While it would clearly be desirable to have a larger sample size and thus greater statistical power, this level of power is judged to be adequate given the exploratory nature of this research.

Figure 3.3
Statistical Power of Information Amount Regressions

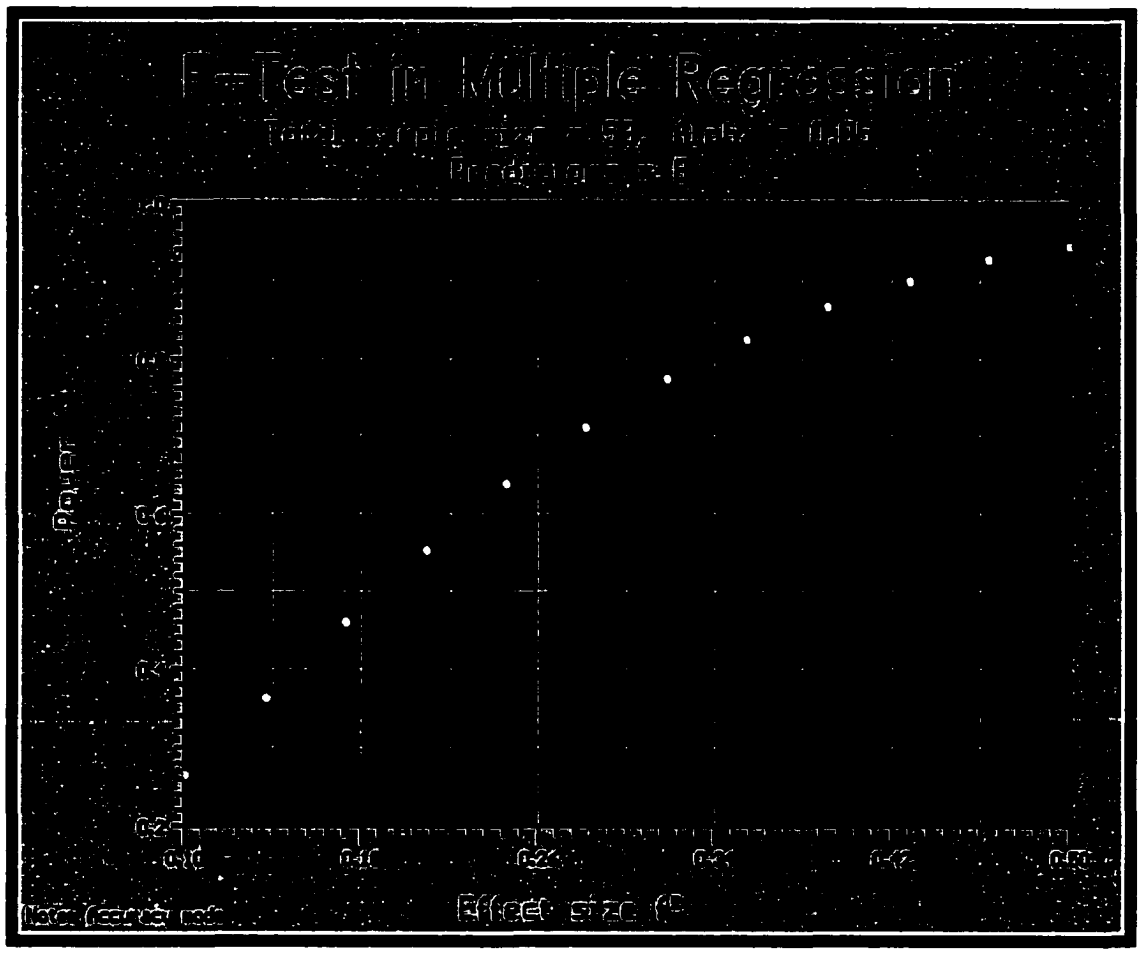


Figure 3.4 illustrates the power for a multiple regression model with six predictors and a sample size of 55. The figure illustrates that the regression model will be able to detect large effects with an 89% probability, medium effects with a probability of 49%, and small effects with a probability of only 9%. This means that these regression models will be able to detect medium-large to large effects with a reasonable level of power, but will not be able to detect small and medium size effects that may exist.

Figure 3.4
Statistical Power of Integrative Complexity Regressions

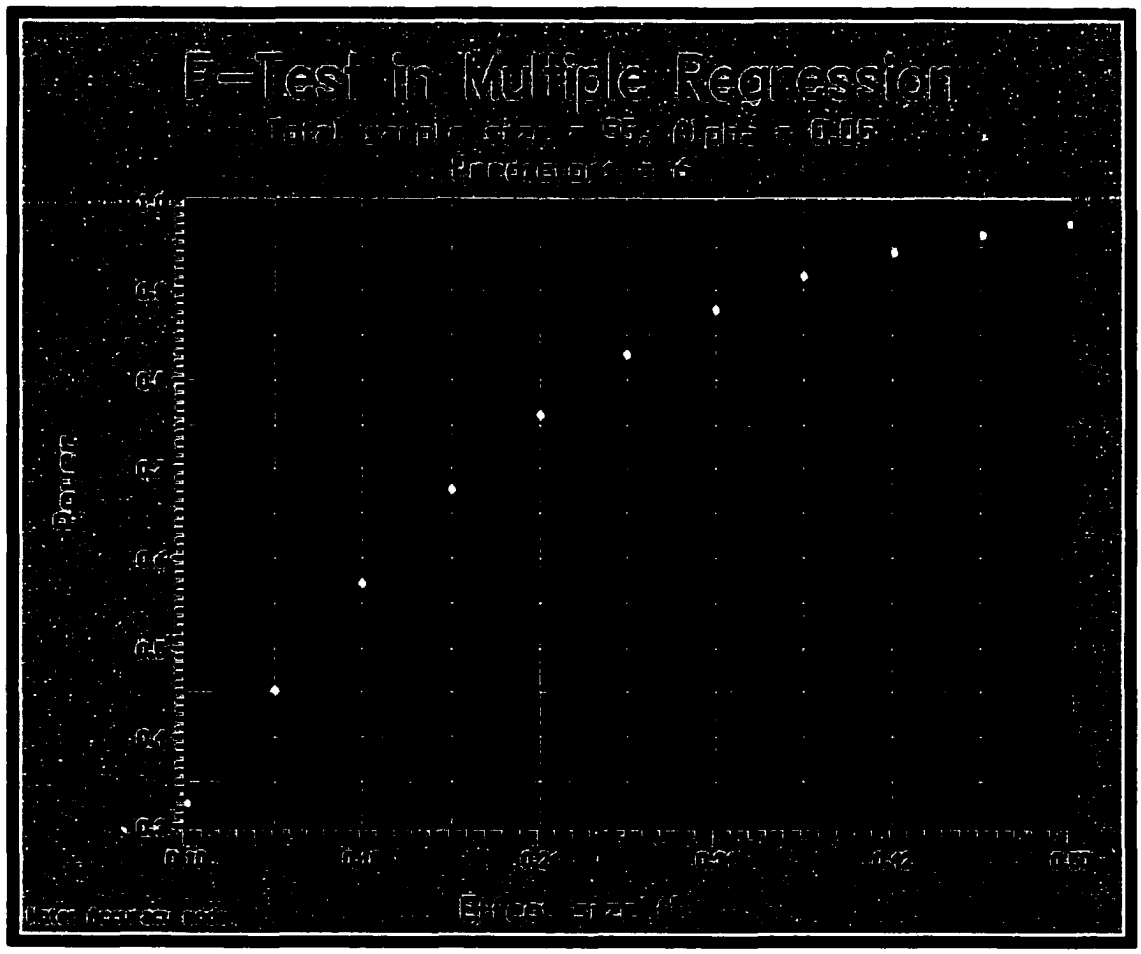


Figure 3.5 illustrates the power for a multiple regression model with six predictors and a sample size of 38. The figure illustrates that the regression model will be able to detect large effects with an 69% probability, medium effects with a probability of 32%, and small effects with a probability of only 8%. This means that these regression models will be able to detect large effects with a reasonable level of power, but will not be able to detect small and medium size effects that may exist. Again, while a larger sample size and the resulting greater statistical power would be desirable, the ability to reasonable detect large effects is adequate given the exploratory nature of this research.

Figure 3.5
Statistical Power of Threat/Opportunity Regressions

Summary

This chapter has presented the overall research design and methodology that is used to test the research model and hypotheses presented in Chapter Two. I discussed each specific measure and how they are operationalized. This chapter also discussed the statistical power that the regression models provide. Chapter Four presents the results for the tests of the hypotheses. Chapter Five discusses these results and their implications.

CHAPTER 4

RESULTS

This chapter presents the results of the data analyses used to test the hypotheses discussed in Chapter Three. I first discuss how the data set was constructed. The basic descriptive statistics (means, standard deviations, and correlations between the study variables) are then discussed. The specific results of the regression analyses are then presented, and are discussed in light of the hypotheses. I also present several post hoc analyses that explore the nature of the significant interaction effects. A table summarizing the results is presented at the end of this chapter.

Data Set Creation

After the data was collected, I entered it into a database in Microsoft Excel. This database was then imported into SPSS for Windows, Release 10.07 (June, 2000), which was used to perform all statistical analyses. Once the entered data was verified for accuracy, composite variables were created. The measurement properties of these composite variables have already been discussed in Chapter Three.

Descriptive Statistics

Table 4.1 presents the means, standard deviations, and correlations between the study variables. The correlations are pairwise correlations (and thus based on different sample sizes). These basic descriptive statistics show several interesting characteristics of the data. The average level of integrative complexity is fairly low at 2.33 and the standard deviation is fairly small at 0.62. This level of integrative complexity of manager's thinking is in line with levels reported by other researchers [Tetlock, Peterson, & Berry,

1993, reported a mean of 2.2 and a standard deviation of 0.81]. Surprisingly, integrative complexity does not correlate with *any* of the other study variables.

After gathering information, the overall levels of change in managers' perceptions of the extent that e-commerce is a threat and/or opportunity are very small, particularly if the threat/opportunity variable is disaggregated into the threat, positive/gain, and controllability components identified by the factor analysis (and discussed in Chapter Three). Table 4.2 shows the amount of change between the two time periods (Note: Each column is rank ordered – the values across columns do *not* correspond to one another). The mean level of change for the additive measure of both threat and opportunity is only 0.02 (*note: this measure is the sum of the extent to which the issue is seen as a threat and the extent to which it is seen as an opportunity*). The mean level of change in the multiplicative measure of both threat and opportunity is 0.16 (*note: this measure is the product of the extent to which the issue is seen as a threat and the extent to which it is seen as an opportunity*). The average amount of change in perceptions of threat is 0.00. The average amount of change for the two components of opportunity is 0.01 for perceptions that the issue is positive and represents a gain, and 0.07 for perceptions that the issue is controllable.

The two measures that combine threat and opportunity into a single measure are very highly correlated at 0.88. Interestingly, the measure of change in threat perceptions is uncorrelated with the measures of change in positive/gain or controllability perceptions. This also supports their distinction.

In addition to looking at the levels of change in managers' perceptions of the extent that e-commerce is a threat and/or opportunity, it is interesting to examine the means of the scores for each of the threat/opportunity subscales both before and after the managers gathered information. Before gathering information, the mean for the threat subscale is 2.58 (with a standard deviation of 0.99), the mean for the positive/gain subscale is 5.38 (standard deviation = 1.18), and the mean for the controllability subscale is 4.59 (standard deviation = 1.44). After gathering information, the mean for the threat subscale is 2.56 (with a standard deviation of 1.19), the mean for the positive/gain subscale is 5.49 (standard deviation = 1.16), and the mean for the controllability subscale is 4.74 (standard deviation = 1.83). Thus, managers primarily see the issue of e-commerce as an opportunity, and not that much of a threat.

Table 4.1
Means, Standard Deviations, and Correlations Between Study Variables

Variable	Mean	S.D.	1	2	3	4	5	6	7
1. Integrative Complexity	2.33	0.62							
2. Change in Threat/Opportunity 1	0.18	0.65	.08						
3. Change in Threat/Opportunity 2	0.16	6.56	.06	.88**					
4. Change in Threat	0.00	1.06	.06	.60**	.89**				
5. Change in Positive/Gain	0.01	0.97	.05	.71**	.33*	-.07			
6. Change in Controllability	0.07	1.32	.01	.45*	.16	-.17	.43**		
7. Time Spent Searching	422.73	339.70	-.05	.09	.18	.27	-.18	.07	
8. Effective Search	1.72	3.66	-.15	-.12	-.15	-.13	-.09	.09	.64**
9. Diversity of Information Found	0.90	3.76	-.08	-.50**	-.56**	-.43**	-.30	-.05	.14
10. Strategic Env. Uncertainty	27.45	7.93	-.11	-.18	-.10	.03	-.23	-.19	.42*
11. Need for Cognition (NFC)	4.01	0.45	-.07	.03	-.11	-.16	.22	.00	.14
12. Tolerance for Ambiguity (TFA)	0.52	0.18	-.20	.07	.07	.05	.02	.09	.08
13. Network Size (Degree)	8.03	3.03	-.08	-.05	-.05	.00	-.08	.00	.20
14. Effective Network Size	3.74	2.35	-.01	-.19	-.19	-.11	-.17	-.03	.20
15. Average Tie Strength	-0.02	0.36	-.20	-.05	-.04	-.04	.00	-.08	.26
16. NFC * Network Size	0.23	1.01	-.08	.17	.20	.21	.07	-.08	.34*
17. NFC * Effective Network Size	0.16	1.00	-.22	-.03	-.02	-.02	-.03	.01	.42**
18. NFC * Average Tie Strength	-0.13	1.02	.00	.03	.02	.07	.05	-.18	-.07
19. TFA * Network Size	0.03	1.09	-.13	-.10	-.15	-.15	.03	-.05	-.02
20. TFA * Effective Network Size	0.19	0.85	-.14	-.32*	-.40*	-.38*	-.13	.10	-.05
21. TFA * Average Tie Strength	0.23	0.99	-.01	.18	.09	.08	.23	-.06	.00
22. E-Commerce Expertise	3.76	1.40	.03	.02	-.05	.02	-.02	.07	.13
23. Dummy for Class	0.35	0.48	-.05	.01	.00	-.03	.09	-.09	-.22

Table 4.1 *(continued)*
Means, Standard Deviations, and Correlations Between Study Variables

8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
.59**														
.28*	.19													
.12	.12	.17												
.07	-.02	.13	.38*											
.22	.25	.14	.24*	.03										
.28*	.23	.31*	.16	-.13	.67**									
.06	-.04	.00	.19	.23	.23	.04								
.28*	-.01	.05	-.07	.13	-.09	-.13	.25							
.41*	.09	.22	.01	.07	-.13	-.04	.17	.69**						
-.14	.02	.02	.22	-.04	.30*	.20	.33**	.23	-.09					
-.08	.03	.01	.13	-.06	.24*	.02	.33**	.25*	.18	.28*				
-.05	-.01	.03	.07	-.03	.03	.06	.28*	.22	.38**	.05	.74**			
.03	.05	-.04	-.04	-.28*	.36**	.28*	.21	.20	-.02	.51**	.16	-.04		
-.15	-.17	.44*	.21	.10	.17	.26*	-.10	-.07	.04	.07	.02	.07	.06	
-.24	-.20	-.07	.10	.24*	-.12	-.18	.00	.06	-.05	.05	-.03	-.07	-.12	.06

Table 4.2
Amount of Change in Five Threat/Opportunity Measures (N=40)

Change in Both Threat and Opportunity (additive)	Change in Both Threat and Opportunity (multiplicative)	Change in Threat Perceptions	Change in Positive/Gain Perceptions	Change in Controllability Perceptions
-0.86	-14	-2	-2.33	-3.5
-0.86	-11.42	-1.83	-1.83	-3
-0.86	-8.25	-1.5	-1.33	-2.5
-0.79	-7.65	-1.5	-1.17	-1.5
-0.71	-5.52	-1.33	-1.17	-1.5
-0.71	-4.31	-1.17	-1	-1.5
-0.71	-4.08	-0.83	-1	-1
-0.57	-3.96	-0.83	-0.87	-0.5
-0.52	-3.96	-0.67	-0.83	-0.5
-0.43	-3.52	-0.67	-0.67	-0.5
-0.43	-3.5	-0.5	-0.5	-0.5
-0.36	-3.47	-0.5	-0.33	-0.5
-0.36	-3.08	-0.5	-0.33	0
-0.29	-2.67	-0.5	-0.33	0
-0.29	-2.67	-0.5	-0.26	0
-0.29	-2.67	-0.17	-0.25	0
-0.21	-2.5	-0.17	-0.17	0
-0.07	-1.02	-0.17	-0.17	0
-0.07	-0.77	-0.17	0	0
-0.04	-0.73	-0.17	0	0
0	0	0	0	0
0	0.52	0	0	0
0.07	0.63	0	0.17	0
0.14	1.38	0.17	0.17	0.5
0.14	1.44	0.17	0.17	0.5
0.21	1.83	0.17	0.17	0.5
0.29	2.02	0.5	0.28	0.5
0.29	2.06	0.5	0.33	0.5
0.29	2.83	0.5	0.33	0.5
0.36	3.13	0.67	0.67	0.5
0.36	3.27	0.67	0.83	1
0.36	3.9	0.67	0.83	1
0.43	4.06	0.67	1.17	1
0.48	5.04	0.83	1.17	1
0.5	5.08	1	1.17	1.26
0.64	5.75	1	1.17	2
0.79	6.5	1.33	1.33	2
1.14	8.85	1.83	1.5	2
1.43	13.25	1.83	1.83	2.5
2.21	24.42	3.33	1.83	2.5
Mean = 0.02	Mean = 0.16	Mean = 0.00	Mean = 0.01	Mean = 0.07
St. Dev. = 0.65	St. Dev. = 6.56	St. Dev. = 1.06	St. Dev. = 0.97	St. Dev. = 1.32

The average amount of time individuals spent searching for information to complete their e-commerce assessments was 422.73 minutes, or just over seven hours. However, there was a fair degree of variation in this amount. Interestingly, while the time spent searching for information was strongly correlated with how effective the search was (0.64, $p<.01$), and the effectiveness of the search was highly correlated with the diversity of information found (0.59, $p<.01$), the amount of time spent searching was *not* correlated with the diversity of information found (0.14, n.s.). This suggests that while some of these measures are similar to one another, there are important differences as well. While spending a lot of time seeking information is likely to result in managers finding relevant information, it may not lead to diverse information.

The mean of the individual information processing characteristic of tolerance for ambiguity is very close to the middle of the scale on which it was measured, which means that the individuals in this study were not all highly tolerant of ambiguity. The mean level of individuals need for cognition was 4.01 (on a five-point scale), indicating that the managers in this study have a somewhat high need for cognition on average. The standard deviations of these two measures show a fair degree of variation.

The characteristics of subjects' social networks reveal some interesting findings. First, the average network size (degree) of these managers' networks is 8.03 people. This is substantially higher than the network sizes of managers reported by other researchers (Carroll & Teo, 1996, reported an average for managers' network size of 3.42; Siebert, Kraimer, & Liden, 2001, found an average network size of 5.32). One possibility is that because the question used in this study was targeted in that it asked managers to list people who are important sources of information regarding important emerging trends

and issues in their industry, it elicited a greater level of mental processing which resulted in more contacts being listed.

While managers' network size is fairly large, the effective network size of their networks is substantially lower (3.74). However, network size (degree) is highly correlated with effective network size ($r=0.67$, $p<.01$) (though not to the extreme extent discussed by Borgatti, 1997).

Perceptions of strategic environmental uncertainty are highly related to the time individuals spent searching for information ($r=0.42$, $p<.05$), the effectiveness of their search ($r=0.28$, $p<.05$), and their effective network size ($r=.31$, $p<.05$). Interestingly, perceived strategic environmental uncertainty was *not* correlated significantly with managers' tolerance for ambiguity ($r=.0.13$, n.s.). Thus, even if managers are less tolerant of ambiguity, that does not mean that they do not see it.

Table 4.3 shows the means of the individual components that were combined to create the perceived strategic environmental uncertainty variable. As mentioned in Chapter Three, perceived uncertainty consists of individuals' ratings of the complexity of each of the six sectors plus their ratings of the rate of change in these six sectors. Perceived strategic environmental uncertainty multiplies this perceived uncertainty by the ratings of the importance of each sector.

Although not central to the research questions addressed in this dissertation, the comparison my results with those of Daft, Sormunen, & Parks (1988) are interesting and important. Daft et al. (1988) hypothesized that the task sectors (which Bourgeois, 1980, says are those with direct transactions with the organization and which are considered by Daft et al., 1988, to be the technological, customer, and competitor sectors) would create

greater perceived strategic environmental uncertainty than the general environment sectors. Daft et al. (1988) found that this hypothesis was not supported in their study as the economic sector (part of the general environment) had a higher uncertainty than did the technological sector (part of the task environment). In the Daft et al. (1988) study, the sectors in decreasing order of perceived strategic environmental uncertainty were customer, economic, competitor, technological, regulatory, and sociocultural. The ranking in this study is technological, customer, competitor, regulatory, economic, and sociocultural, and these results support Daft et al's (1988) hypothesis that sectors in the task environment will have higher uncertainty than sectors in the general environment.

Table 4.3
Means for Components of Perceived Strategic Environmental Uncertainty

Sector	*Competitor*	*Customer*	*Technological*	*Regulatory*	*Economic*	*Socio-Cultural*
Importance	4.30	4.66	4.17	3.83	3.41	2.84
Rate of Change	3.40	3.30	3.97	2.86	3.17	2.51
Complexity	3.61	3.67	4.06	3.43	3.23	2.67
Perceived Uncertainty	7.01	6.97	8.03	6.29	6.40	5.19
Perceived Strategic Environmental Uncertainty	30.81	32.80	34.84	26.16	23.40	16.69

There are a few correlations between the control variables and the other study variables. E-commerce expertise is correlated significantly with perceived strategic environmental uncertainty ($r=0.44$, $p<.05$) and effective network size ($r=0.26$, $p<.05$).

The dummy variable for class correlates significantly with tolerance for ambiguity ($r=0.24$, $p<.05$).

In addition to the basic descriptive information given above for the study and control variables, some additional information on some of the components of those variables is warranted. The 70 respondents who completed the social network measures report a total of 562 network ties, with a minimum of zero (one manager said he doesn't get information from anyone in particular, but rather gets all his information from impersonal sources such as printed and online material) and a maximum of 12 (as discussed earlier, this was the upper limit).

The 59 individuals who completed the information log report a total of 456 distinct sources. This is an average of 7.7 sources per manager. The range is between zero and 29 sources. A total of 55% of these sources were other people, 23% were printed materials (books and articles), and 22% were websites. As discussed in Chapter Three, subjects rated each source in terms of the amount of relevant information they received from that source, and the extent to which that information was novel. Overall, the mean rating individuals gave their sources for providing relevant information was 4.80 with a standard deviation of 1.57 and the mean rating they gave the novelty of the information they received from these sources was 4.37 with a standard deviation of 1.70 (on seven-point scales).

Regression Results

There are three dependent variables in this study: (1) amount of information, (2) changes in perceptions that e-commerce is a threat and/or an opportunity, and (3) integrative complexity of individuals' thinking regarding e-commerce. In order to

facilitate the presentation of the regression results, the results of the hypothesis tests that deal with each of these dependent variables is presented separately. Results pertaining to the main effects hypotheses (H1-H6) and interaction effects hypotheses (H13-H14) are presented first. The hypotheses predicting mediating effects (H7-H12) are discussed afterward. I examined the variance inflation factor (VIF) values for each regression to check for evidence of multicollinearity. For the regressions with the information amount variables as the dependent variables, the highest VIF score was 1.557. For the regressions with the threat/opportunity variables and integrative complexity as the dependent variables, the highest VIF score was 3.798. These values are well below the cutoff value of 10 specified by Neter, Kutner, Nachtsheim, & Wasserman (1996: 387) as the point indicating that multicollinearity may be unduly influencing the regression estimates.

Results of Hypotheses Addressing Amount of Information

Because there were two operationalizations of information processing characteristics (need for cognition [NFC] and tolerance for ambiguity [TFA]), and two operationalizations of network size (degree and effective network size), there were four regressions run for each of the three measures of information amount. Regressions were run both without the interaction variables and with them. These results are presented in four tables. Each table presents the results of using one of the two operationalizations of individual information processing characteristics and one of the two operationalizations of network size. Table 4.4 shows the results of the regressions using degree and need for cognition. Table 4.5 shows the results of the regressions using effective network size and need for cognition. Table 4.6 shows the results using degree and tolerance for ambiguity and Table 4.7 shows the results using effective network size and tolerance for ambiguity.

Table 4.4
Regression Analyses *(using Degree and Need for Cognition)*

	Time Spent Searching		Effective Search		Diversity of Information Found	
	No Interactions	Full Model	No Interactions	Full Model	No Interactions	Full Model
Degree	0.04	0.14	0.19	0.30*	0.29*	0.30*
Average Tie Strength	0.21	0.20	-0.07	-0.07	-0.18	-0.17
Need for Cognition	0.09	0.13	0.13	0.17	0.13	0.13
Perceived Strategic Uncertainty	0.34*	0.28^	0.33*	0.27^	0.27^	0.26
Degree * Need for Cognition		0.33*		0.33*		0.01
Average Tie Strength * Need for Cognition		-0.28*		-0.31*		-0.04
E-Commerce Expertise	-0.02	0.01	-0.36*	-0.32*	-0.37*	-0.37*
Class Dummy	-0.19	-0.20	-0.17	-0.17	-0.10	-0.10
F	2.79*	3.63**	2.58*	3.60**	2.50*	1.80
Adjusted R-Square	0.17	0.29	0.15	0.29	0.15	0.11
N	53	53	53	53	53	53
Values are standardized coefficients ^ *p<.10,* * *p<.05* ** *p<.01* *** *p<.001*						

Table 4.5
Regression Analyses *(using Effective Size and Need for Cognition)*

	Time Spent Searching		Effective Search		Diversity of Information Found	
	No Interactions	Full Model	No Interactions	Full Model	No Interactions	Full Model
Effective Network Size	0.01	0.10	0.22	0.32*	0.23	0.24
Average Tie Strength	0.22	0.24^	-0.02	-0.01	-0.12	-0.13
Need for Cognition	0.10	0.10	0.13	0.13	0.15	0.15
Perceived Strategic Uncertainty	0.33*	0.23	0.30^	0.16	0.23	0.21
Effective Network Size * Need for Cognition		0.26^		0.35**		0.06
Average Tie Strength * Need for Cognition		-0.16		-0.18		0.00
E-Commerce Expertise	-0.02	0.00	-0.36*	-0.34*	-0.36*	-0.36*
Class Dummy	-0.16	-0.17	-0.14	-0.11	-0.09	-0.08
F	2.77*	3.05**	2.69*	3.79**	2.12^	1.54
Adjusted R-Square	0.17	0.24	0.16	0.30	0.11	0.08
N	53	53	53	53	53	53
Values are standardized coefficients ^ *p<.10* * *p<.05* ** *p<.01* *** *p<.001*						

Table 4.6
Regression Analyses *(using Degree and Tolerance for Ambiguity)*

	Time Spent Searching		Effective Search		Diversity of Information Found	
	No Interactions	Full Model	No Interactions	Full Model	No Interactions	Full Model
Degree	0.06	0.09	0.20	0.20	0.32*	0.32*
Average Tie Strength	0.22	0.31*	-0.07	-0.01	-0.17	-0.17
Tolerance for Ambiguity	0.05	0.02	0.10	0.12	0.00	-0.01
Perceived Strategic Uncertainty	0.34*	0.35*	0.33*	0.35*	0.28^	0.28^
Degree * Tolerance for Ambiguity		-0.18		-0.15		0.01
Average Tie Strength * Tolerance for Ambiguity		-0.08		0.02		-0.01
E-Commerce Expertise	-0.02	0.00	-0.35*	-0.35*	-0.36*	-0.36*
Class Dummy	-0.19	-0.18	-0.17	-0.16	-0.07	-0.07
F	2.72*	2.30*	2.52*	1.99^	2.32*	1.66
Adjusted R-Square	0.17	0.17	0.15	0.13	0.13	0.09
N	53	53	53	53	53	53
Values are standardized coefficients ^ *p<.10,* * *p<.05* ** *p<.01* *** *p<.001*						

Table 4.7
Regression Analyses *(using Effective Size and Tolerance for Ambiguity)*

	Time Spent Searching		Effective Search		Diversity of Information Found	
	No Interactions	Full Model	No Interactions	Full Model	No Interactions	Full Model
Effective Network Size	0.03	0.02	0.25^	0.24	0.26^	0.25
Average Tie Strength	0.23^	0.32*	-0.02	-0.01	-0.10	-0.12
Tolerance for Ambiguity	0.05	0.02	0.14	0.15	0.05	0.07
Perceived Strategic Uncertainty	0.34*	0.33*	0.29^	0.30^	0.24	0.25
Effective Network Size * Tolerance for Ambiguity		-0.20		-0.06		0.02
Average Tie Strength * Tolerance for Ambiguity		-0.11		0.02		0.06
E-Commerce Expertise	-0.01	0.02	-0.36*	-0.36*	-0.35*	-0.36*
Class Dummy	-0.19	-0.22	-0.15	-0.15	-0.07	-0.07
F	2.69*	2.33*	2.71*	1.99^	1.88	1.37
Adjusted R-Square	0.16	0.17	0.17	0.13	0.09	0.05
N	53	53	53	53	53	53
Values are standardized coefficients ^ *p<.10* * *p<.05* ** *p<.01* *** *p<.001*						

Most of the regression models presented in Tables 4.4-4.7 are significant as shown by the F values. In the main effects model with Time Spent Searching as the dependent variable and using degree and NFC (Table 4.4), perceived strategic environmental uncertainty is the only significant predictor, and the model accounts for 17% of the variance in the amount of time managers spent searching for information. When the interactions between NFC and the network variables are added, the model accounts for 29% of the variance. PSEU remains significant (but only at the $p<.10$ level), and both interaction effects are significant at the $p<.05$ level. Interestingly, the effect of degree*NFC is positive, while the effect of average tie strength*NFC is negative. These interaction effects will be examined and discussed in greater detail in the section on post-hoc analyses and in Chapter Five.

When the effectiveness of managers' search is used as the measure of information amount, the regression model with NFC and degree (and no interactions) accounts for 15% of the variance (Table 4.4). PSEU is again a significant predictor. In addition, individuals' e-commerce expertise is significant, but the coefficient is negative. This indicates that managers with greater e-commerce expertise are less likely to report finding relevant information. Adding the two interaction terms increases the variance accounted for to 29%. PSEU remains significant (though at the $p<.10$ level), as does e-commerce expertise. In addition, degree emerges as a significant predictor, as do both interaction terms. As is the case for time spent searching, the coefficient for degree*NFC is positive and the coefficient for average tie strength*NFC is negative.

The third measure of information amount is the diversity of the information managers found. Table 4.4 shows that the main effects model with NFC and degree is

significant and accounts for 15% of the variance. Degree and e-commerce expertise are significant at the p<.05 level, while PSEU is significant at the p<.10 level. The model with the two interaction terms is not significant and therefore will not be discussed further.

Table 4.5 shows the results when effective network size is used as the measure of network size (instead of degree). The results of the model without interaction terms are similar to those presented in Table 4.4. PSEU is the only significant predictor and the model accounts for 17% of the variance. When the two interaction terms are added, the model accounts for 24% of the variance. PSEU is no longer significant. However, average tie strength does become significant at the p<.10 level, indicating that managers with a higher average tie strength tend to receive a greater amount of relevant information. The interaction between effective network size and NFC is significant, but only at the p<.10 level. The interaction between average tie strength and NFC is not significant in this model.

When effective search is the dependent variable, the results presented in Table 4.5 are fairly similar to those presented in Table 4.4. In the main effects model, PSEU is significant at the p<.10 level, and e-commerce expertise is again significant with a negative coefficient. The model accounts for 16% of the variance. When the interaction terms are added, the variance accounted for by the model increases to 30%. In this interaction model, PSEU is no longer a significant predictor, but both effective network size and the interaction between effective network size and NFC are significant.

The main effects model for diversity of information found shown in Table 4.5 using effective network size (instead of degree) and NFC is significant only at the p<.10

level and accounts for only 11% of the variance. Only e-commerce expertise emerges as a significant predictor, and as before the coefficient is negative. As with the model in Table 4.4, the model that includes the interaction terms is not significant and will not be discussed further.

When tolerance for ambiguity is used as the measure of managers' information processing characteristics and degree is used as the measure of network size (Table 4.6), the model predicting the Time Spent Searching for information accounts for 17% of the variance and PSEU is the only significant predictor. Adding the interaction terms does not increase the variance accounted for, but average tie strength joins PSEU as a significant predictor.

The model of Effective Search using TFA as the measure of managers' information processing personality and degree accounts for 15% of the variance (Table 4.6). PSEU and e-commerce expertise are the only significant predictors. Adding the interaction terms decreases the fit of the model (the r-square drops to 0.13) and the same predictors are significant.

For the model of Diversity of Information Found, the main effects model in Table 4.6 is significant and accounts for 13% of the variance. Degree and e-commerce expertise are significant predictors at $p<.05$, while PSEU is significant at $p<.10$. The interaction model is not significant.

The models with TFA and effective network size are fairly similar (Table 4.7) to the model using TFA and degree. In the main effects model for Time Spent Searching without interaction effects, PSEU is a significant predictor and average tie strength is significant at the $p<.10$ level. The model accounts for 16% of the variance. With the

interaction terms, the variance accounted for is 17%, and the significance of average tie strength increases.

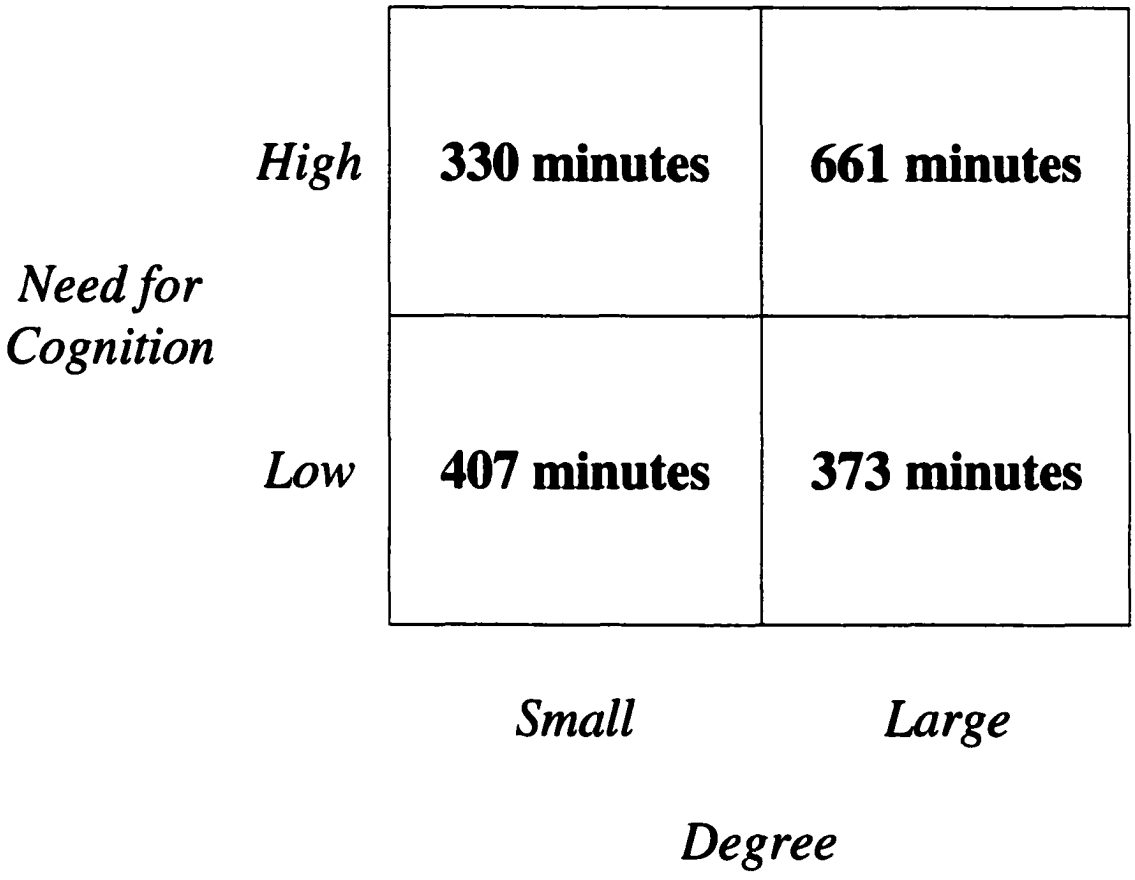
When Effective Search is the dependent variable in Table 4.7, the results are fairly similar to those in Table 4.6. In the main effects model, e-commerce expertise is significant, and both PSEU and effective network size are significant at the $p<.10$ level. Adding the interaction terms reduces the variance accounted for by the model to 13%, and effective size drops out as a significant predictor. It should also be noted that the two models that include TFA and the interaction terms (Tables 4.6-4.7) are significant only at the $p<.10$ level.

Finally, neither of the two models shown in Table 4.7 for Diversity of Information Found are significant. Neither of these models will be discussed further in this chapter.

Post Hoc Analyses

In order to better understand the nature of the interaction results, I split several variables at their medians and give the means of the amount of time individuals spent searching for information for each of the four resulting cells. While there are only an average of 13 cases per cell, the results are interesting and suggestive. Figure 4.1 shows the median split analysis for need for cognition by degree.

Figure 4.1
Median Split Analysis of Need for Cognition and Degree on Time Spent Searching



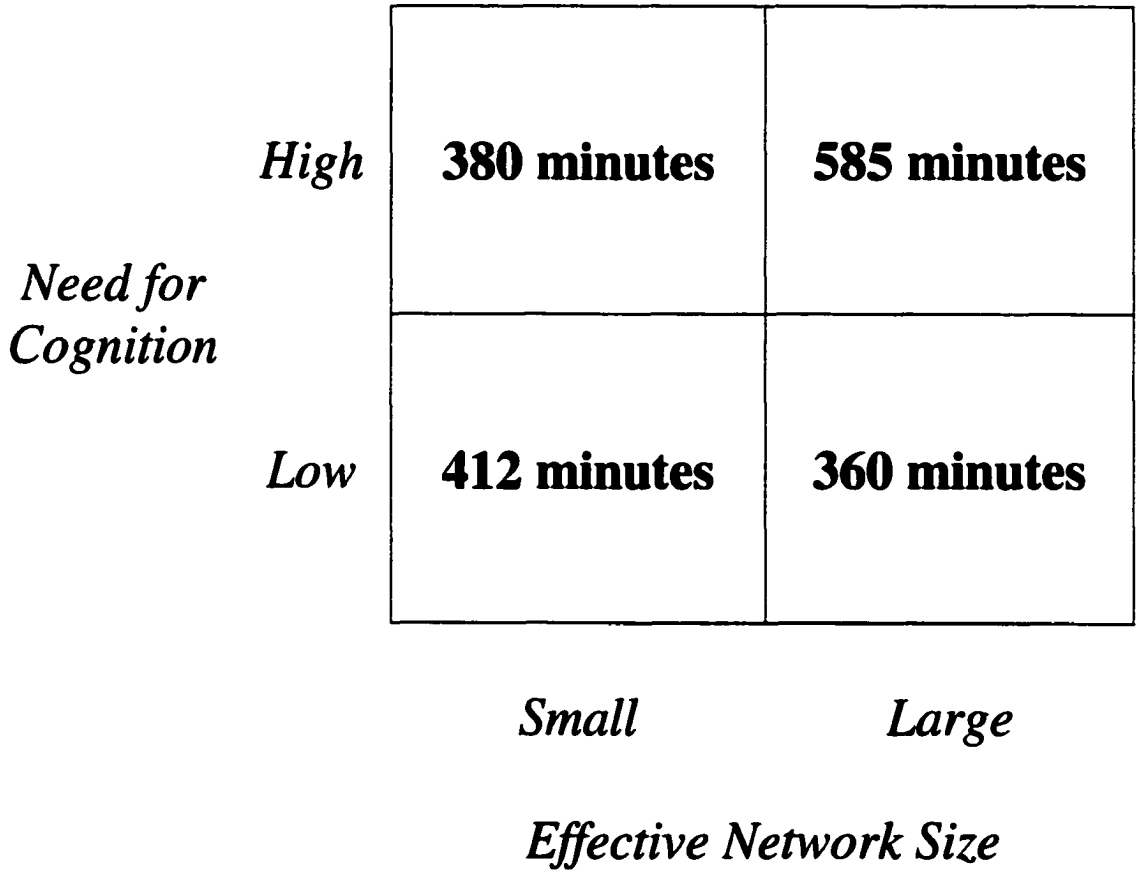
Individuals with a high need for cognition and a large network size (degree) spent an average of 661 minutes on information gathering activities. This was much higher than the individuals in the other cells, and was expected. Individuals with a low need for cognition and a small degree unexpectedly spent a slightly larger amount of time (407 minutes) on information gathering activities than did individuals with a high need for cognition and a small degree (330 minutes) and individuals with a low need for cognition

and a large degree (373 minutes). However, given the small sample sizes in each cell, these differences are fairly small.

It therefore appears that the interaction between need for cognition and degree is driven primarily by the extensive information gathering activities of managers high in need for cognition who also have sizable social networks.

Figure 4.2 shows the median split analysis for need for cognition and effective network size. The results are similar to those using degree as the measure of network size, with two notable differences.

Figure 4.2
Median Split Analysis of Need for Cognition and Effective Network Size on Time Spent Searching

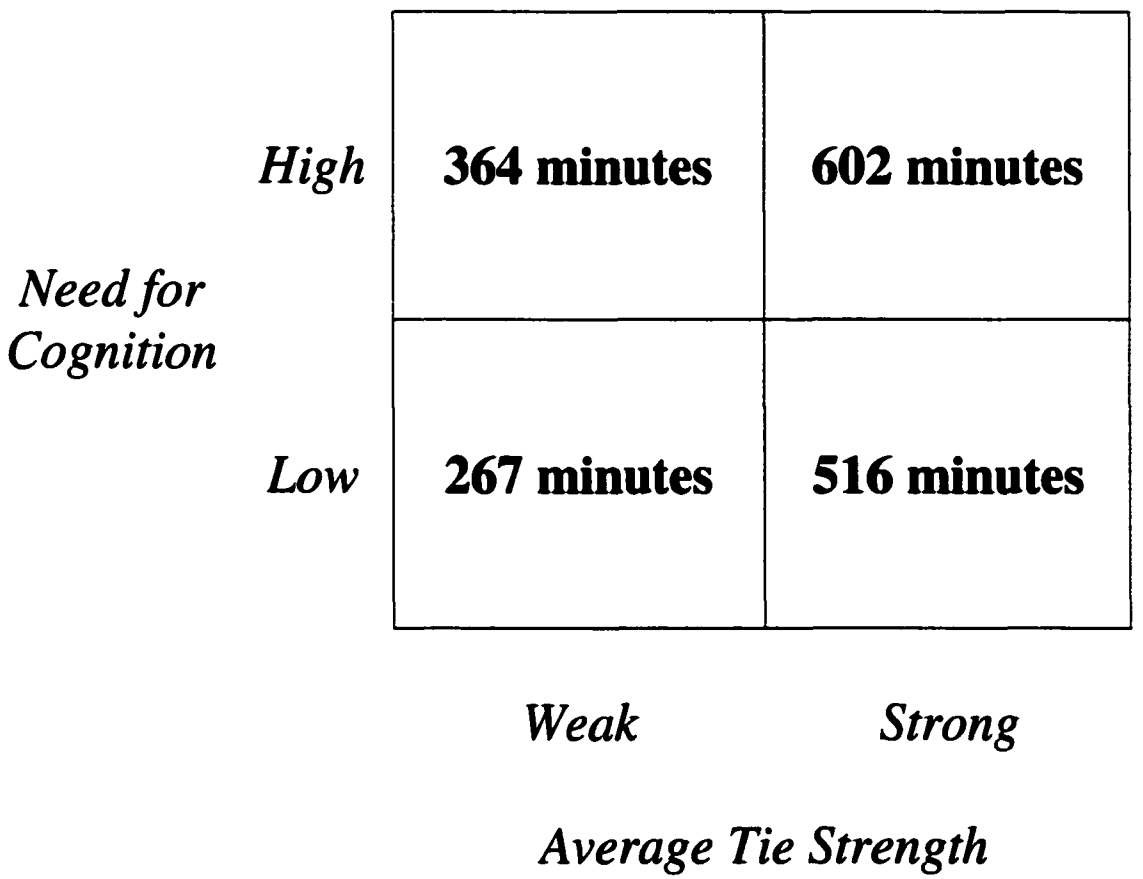


First, while the individuals with a high need for cognition and large effective network size still spent the greatest amount of time gathering information (585 minutes), the differences between this cell and the other cells are not as great as with degree. Second,

the difference between individuals in the high NFC-low effective network size cell and the low NFC-high effective network size cell is smaller, only 20 minutes.

The median split analysis of NFC by average tie strength is shown in Figure 4.3.

Figure 4.3
Median Split Analysis of Need for Cognition and Average Tie Strength on Time Spent Searching

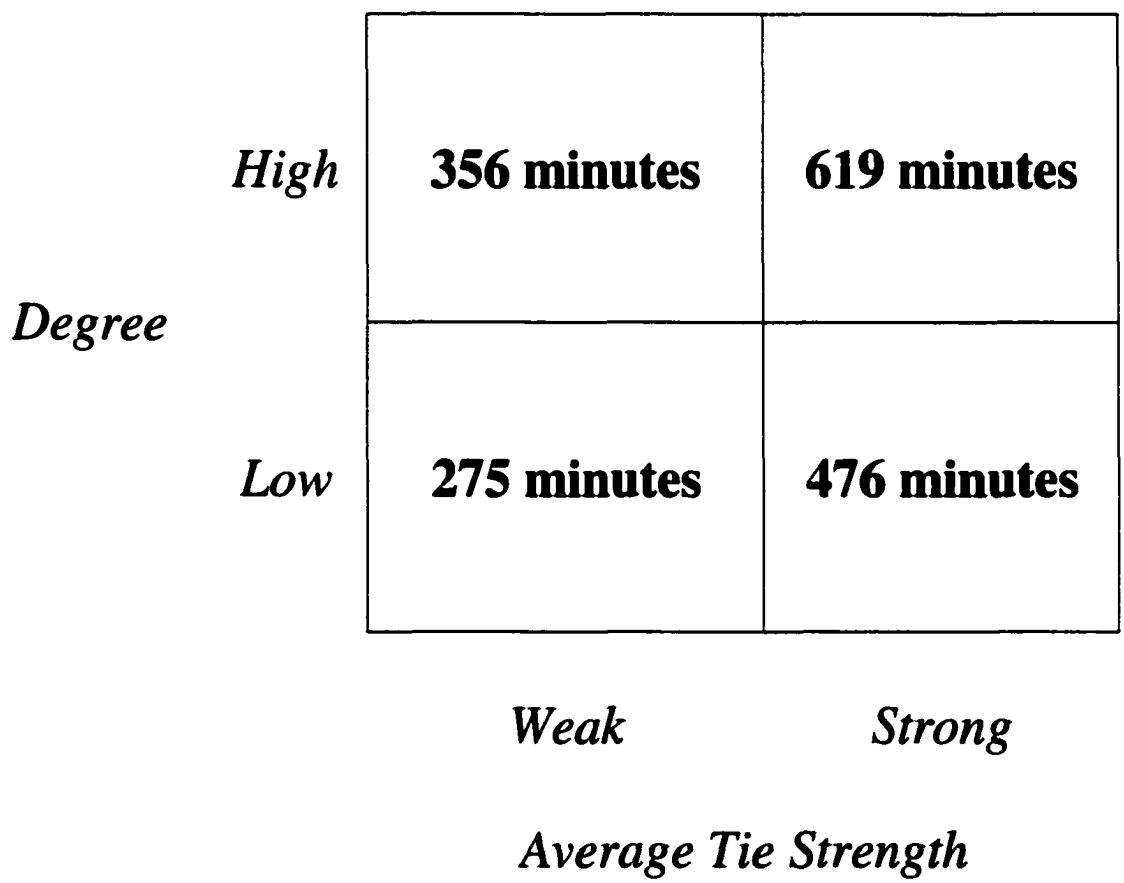


In this figure, there appears to be a strong effect of average tie strength on Time Spent Searching. Looking at individuals with a high NFC, those with a strong average tie strength spent an average of 236 minutes more on information gathering activities than

those with a weak average tie strength. The story is fairly similar for low-NFC individuals – those with a weak average tie strength spent an average of 267 minutes on information gathering activities, while those with a strong average tie strength spent 516 minutes, a difference of 249 minutes.

Figure 4.4 shows the median split analysis for degree by average tie strength. This

Figure 4.4
Median Split Analysis of Degree and Average Tie Strength on Time Spent Searching



final median split analysis is interesting because it suggests the differential effects of both network size and average tie strength on information gathering. In particular, it suggests that both network size as measured by degree and average tie strength are related to Time Spent Searching. Individuals with weak average tie strengths spent an average 81 more minutes on information gathering behaviors if they had larger networks than if they had smaller networks. Individuals with strong average tie strengths spent an average of 143 more minutes gathering information if they had larger networks than if they had smaller networks.

Results of Hypotheses Addressing Changes in Perceptions that E-Commerce Is a Threat and/or an Opportunity

Table 4.8 presents the regression models for the five threat/opportunity variables. In each of these models, the three information amount variables (time spent searching, effective search, and diversity of information found) are the key predictor variables of interest. In addition to these, PSEU, e-commerce expertise, and the dummy variable for class are included as controls. The inclusion of PSEU as a control variable is important because it helps control for the fact that these managers are in different industries, and perceptions of threat and/or opportunity may be influenced by industry. While the inclusion of dummy variables for different industry types would be one possible method for handling this situation, the small sample size available makes this somewhat impractical. Differences in PSEU should capture the majority of the differences among industries that would be likely to affect perceptions of whether e-commerce is a threat and/or an opportunity.

For the additive measure (see Chapter Three) of e-commerce being perceived as both a threat and an opportunity is used as the dependent variable, the model is significant and accounts for 27% of the variance. The only significant predictor variable is the diversity of information found, and the regression coefficient is negative. The interpretation of this negative coefficient is that the perceptions that e-commerce is both a threat and an opportunity changed less to the extent that managers found a greater diversity of information.

The model using the multiplicative measure (see Chapter Three) of e-commerce being seen as both a threat and an opportunity is highly significant and accounts for 41% of the variance. Similar to the results using the additive measure, diversity of information found is a highly significant predictor with a negative coefficient. In addition, the time managers spent searching is also a significant predictor. Individuals who spent a greater amount of time searching for information had a higher level of change toward the view that e-commerce was both a threat and an opportunity for their businesses, but to the extent that the information they found was diverse and novel, this change was reversed.

The regression model for the change in perceptions that e-commerce is a threat to their business is presented next. Testing this variable separately as a dependent variable is important because it can illuminate the nature of the findings of the overall measures of e-commerce being seen as both a threat and an opportunity. The model is significant and accounts for 32% of the variance. Interestingly, the results are very similar to those for the multiplicative measure of both threat and opportunity presented. Specifically, the time spent searching for information was significant with a positive regression coefficient and the diversity of information found was significant with a negative coefficient.

Table 4.8
Regression Analyses on Changes in Threat & Opportunity Variables

	Dependent Variables				
Independent Variables	Change in Both (additive)	Change in Both (multiplicative)	Change in Threat	Change in Positive/Gain	Change in Controllability
Time Spent Searching	0.26	0.50*	0.66**	-0.30	0.00
Effective Search	0.17	-0.05	-0.30	0.44	0.29
Diversity of Information Found	-0.65**	-0.68***	-0.48*	-0.44^	-0.13
Perceived Strategic Uncertainty	-0.22	-0.14	-0.06	-0.10	-0.35
E-Commerce Expertise	0.18	0.08	0.05	0.09	0.28
Class Dummy	-0.09	-0.09	-0.07	-0.10	-0.09
F	3.31*	5.28***	3.95**	0.98	0.79
Adjusted R-Square	0.27	0.41	0.32	0.00	-0.04
N	38	38	38	38	38
Values are standardized coefficients ^ *p<.10* * *p<.05* ** *p<.01* *** *p<.001*					

Neither of the two models predicting changes in positive/gain implications or controllability were significant. Therefore these predictor variables were not important predictors of the extent to which managers' perceptions changed regarding the issue of whether e-commerce would have positive/gain implications for the businesses or that the issue was controllable.

Results of Hypotheses Addressing the Integrative Complexity of Managers' Thinking about E-Commerce

Table 4.9 shows the effects of the information amount variables (and the control variables) on the levels of integratively complex thinking that individuals' demonstrated in their written assessments of how e-commerce would affect their businesses.

Table 4.9
Regression Analyses on the Integrative Complexity of E-Commerce Perceptions

	Full Model
Time Spent Searching	0.11
Effective Search	-0.21
Diversity of Information Found	0.08
Perceived Strategic Uncertainty	-0.23
E-Commerce Expertise	0.18
Class Dummy	-0.15
F	0.72
Adjusted R-Square	-0.05
N	55
Values are standardized coefficients ^ *p<.10* * *p<.05* ** *p<.01* *** *p<.001*	

Surprisingly, the model is not significant. None of the predictor variables appear to be important in determining the levels of integrative complexity evidenced by managers' written reports. This lack of findings with regard to integrative complexity will be discussed in Chapter Five.

Results of Mediating Hypotheses

The first step in testing for mediation effects is to establish that the social network and information processing characteristic variables have a significant effect on the threat/opportunity framing and integrative complexity variables. Tables A10.1-A10.5 in Appendix 10 (and listed below) present the regression results that test for these effects. No effects on the threat/opportunity framing and integrative complexity variables were found for any of the social network and information processing characteristics. Since these independent variables have no direct effect on the sensemaking outcomes, there is nothing for the information mechanisms to mediate. This lack of results is discussed in Chapter Five.

Table A10.1: Mediation Results using Degree and Need for Cognition on Changes in Both Threat and/or Opportunity Perceptions (additive), Changes in Both Threat and/or Opportunity Perceptions (multiplicative), Changes in Threat Perceptions, Changes in Perceptions of Positive/Gain, and Changes in Perceptions of Controllability

Table A10.2: Mediation Results using Effective Network Size and Need for Cognition on Changes in Both Threat and/or Opportunity Perceptions (additive), Changes in Both Threat and/or Opportunity Perceptions (multiplicative), Changes in Threat Perceptions, Changes in Perceptions of Positive/Gain, and Changes in Perceptions of Controllability

Table A10.3: Mediation Results using Degree and Tolerance for Ambiguity on Changes in Both Threat and/or Opportunity Perceptions (additive), Changes in Both Threat and/or Opportunity Perceptions (multiplicative), Changes in Threat

Perceptions, Changes in Perceptions of Positive/Gain, and Changes in Perceptions of Controllability

Table A10.4: Mediation Results using Effective Network Size and Tolerance for Ambiguity on Changes in Both Threat and/or Opportunity Perceptions (additive), Changes in Both Threat and/or Opportunity Perceptions (multiplicative), Changes in Threat Perceptions, Changes in Perceptions of Positive/Gain, and Changes in Perceptions of Controllability

Table A10.5: Mediation Results on Integrative Complexity Scores (using Degree or Effective Network Size and Need for Cognition or Tolerance for Ambiguity)

Summary of Results

Table 4.10 presents each hypothesis in the study, an indication of whether each hypothesis received support or not, and a comment regarding that support or lack of support. Overall, several important components of the model presented in Chapter Two are supported. The significance of the hypotheses that are supported is discussed in Chapter Five, as is the significance of the hypotheses that are not supported.

Table 4.10
Summary Table of Hypotheses and Extent Supported

HYPOTHESIS	SUPPORTED?	COMMENT
H1: Network size will be positively related to the amount of information an individual will gather.	YES	For both the Effective Search and Diversity of Information Found variables.
H2a: Average tie strength will be negatively related to the amount of information an individual will gather.	NO	There was no support for this direct effect.
H2b: Average tie strength will be positively related to the amount of information an individual will gather.	YES	But only for the Time Spent Searching measure of information amount.

H3: Information processing personality traits will be positively related to the amount of information an individual will gather.	NO	There were no direct effects of information processing personality traits on any of the measures of information amount.
H4: Perceptions of strategic environmental uncertainty will be positively related to the amount of information an individual will gather.	YES	This hypothesis received support across most of the regression tests.
H5: The amount of information an individual gathers will be positively related to changes in the perception that a complex, equivocal issue is both a threat and an opportunity.	MIXED	While Time Spent Searching led managers to see the issue as more of a threat, Diversity of Information Found reduced the perception of the issue as a threat. There were no effects for opportunity framings.
H6: The amount of information an individual gathers will be positively related to the level of integrative complexity of thinking about a complex, equivocal issue.	NO	There was no support for this hypothesis.
H7: Any effect of network size on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the amount of information an individual gathers about that issue.	NO	There was no direct effect of network size on threat/opportunity, and thus nothing to mediate.
H8: Any effect of network size on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the amount of information an individual gathers about that issue.	NO	There was no direct effect of network size on integrative complexity, and thus nothing to mediate.
H9: Any effect of average tie strength on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the amount of information they find about that issue.	NO	There was no direct effect of average tie strength on threat/opportunity, and thus nothing to mediate.
H10: Any effect of average tie strength on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the amount	NO	There was no direct effect of average tie strength on integrative complexity, and thus nothing to mediate.

of information an individual gathers about that issue.		
H11: Any effect of information processing personality traits on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the amount of information an individual gathers about that issue.	NO	There was no direct effect of information processing personality traits on threat/opportunity, and thus nothing to mediate.
H12: Any effect of information processing personality traits on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the amount of information an individual gathers about that issue.	NO	There was no direct effect of information processing personality traits on integrative complexity, and thus nothing to mediate.
H13: There will be an interaction effect between network size and information processing personality traits on the amount of information an individual will gather, such that individuals with both large network sizes and high information processing personality traits will gather the most information.	YES	But only for Need for Cognition and only for the Time Spent Searching and Effective Search measures of Information Amount.
H14a: There will be an interaction effect between average tie strength and information processing personality traits on the amount of information an individual will gather, such that individuals with a lower average tie strength and high information processing personality traits will gather the most information.	YES	The interaction between Need for Cognition and Average Tie Strength was related to gathering less information in two of the regression tests.
H14b: There will be an interaction effect between average tie strength and information processing personality traits on the amount of information an individual will gather, such that individuals with a higher average tie strength and high information processing personality traits will gather the most information.	NO	While the median split analyses suggest support for this hypothesis, the regression analyses do not.

CHAPTER 5

DISCUSSION

This final chapter discusses the implications of the research results presented in Chapter Four both in terms of the research models presented in Chapters One and Two, and the broader implications for both research and practice. The first section interprets the pattern of statistically significant results. This is followed by a section that explores the implications of the hypotheses that were not supported by this study. The consideration of both the significant results and the non-results leads to several important suggestions for both research and practice. The third section of this chapter discusses the implications for theory and suggests how future research might incorporate and extend these findings. The fourth section discusses the importance of this research for practicing managers. Finally, the fifth section explores some of the limitations of this study.

Interpreting Significant Results

The overall model presented in this dissertation is fairly well-supported by the significant results. While several operationalizations of key variables were not found to be significant (as discussed in greater detail in the next section), the general thrust of the findings supports the notion that individual social network characteristics and information processing characteristics affect the amount of information managers get, and the amount of information they get affects their sensemaking activities. In addition, the contextual factor of perceived strategic uncertainty had a significant impact on the amount of information managers found.

Interestingly, the impact of the social network and information processing variables varied depending on the operationalization of the amount of information used.

When operationalized as the time individuals spent searching for information, their average tie strength was positively related to information amount, as was the interaction between the measures of network size (degree and effective size) and individuals' need for cognition. When operationalized as the effectiveness of the managers' search activities, both network size and the interaction between network size and need for cognition were significant. Finally, when operationalized as the diversity of information found, only one of the network size measures (degree) was a significant predictor. These differences highlight the need for richer and more precise theorizing about information gathering. Specifically, these results suggest that future research should not assume that a greater amount of time spent searching for information will necessarily result in a greater amount of relevant and diverse information being found. Discussions that vaguely invoke the concept of information amount might benefit from a more explicit treatment of that construct, as there appear to be important differences between measures that frequently have been assumed to be equivalent.

The amount of information managers find significantly affects their interpretations of whether e-commerce is a threat and/or an opportunity for their businesses. Specifically, to the extent that individuals spend more time gathering information, they tend to see e-commerce as more of a threat. However, as the diversity of the information they gather increases, they tend to see e-commerce as less of a threat.

Together, the above significant findings support the research model presented in Chapter Two. Managers' social network characteristics and information processing characteristics do affect their information search activities, and these differences in the amount of information managers find affects their sensemaking activities.

Interpreting Non-Results

While the overall theoretical framework and general model received a fair degree of support, many of the specific aspects of the model were not supported at conventional levels of statistical significance. To the extent that the research provided an adequate test of these aspects (see limitations below), these findings are intriguing, particularly as the theoretical foundation appears sound and is supported by prior studies. This section discusses these non-findings and suggests possible explanations for their lack of support.

Integrative Complexity

Perhaps the most surprising non-finding concerns the level of integrative complexity managers exhibited in their thinking regarding how e-commerce will affect their businesses. Work on cognitive and integrative complexity has long theorized that a greater amount of information will lead to higher levels of integrative complexity (e.g., Weick, 1979b; Ashby, 1956). While this notion has been generally accepted in the management literature, empirical tests have been sparse. Research that has argued that information provides the raw materials from which sensemaking proceeds (e.g., Thomas, Clark, & Gioia, 1993) generally uses weak measures of information amount (as discussed in Chapter Three) and has not tested whether this holds for rigorous measures of integrative complexity. In fact, the literature in management has not really addressed the question of what factors lead to differences in levels of integrative complexity.

There is research in social psychology and political science on integrative complexity that does provide possible explanations that may account for the lack of findings. Tetlock (1983) presents experimental results showing that accountability – the

need to justify one's views to others – leads to more complex thought. One could perhaps argue that some of the individuals in my study felt accountable, while others did not, and this accountability was completely unrelated to social network and information processing characteristics. However, the reports that individuals prepared for this study were not related to costly outcomes, and it seems unlikely that there would be important differences in accountability among the managers who participated in this research.

Another possibility concerns the desirability of reports that exhibit high levels of integrative complexity. Tetlock, Peterson, & Berry (1993) discuss how there are flattering and unflattering views of being both integratively complex and integratively simple. In particular, they note that "the flattering portrait of integratively simple thinkers depicts them as practical, decisive, and principled" (p.501). It is possible that some managers' thinking may have been integratively complex, but for some reason they desired to write reports that did not reflect that complexity, in order to appear practical, decisive, and principled. Perhaps these individuals have learned to communicate in integratively simple ways in order to succeed in their jobs. Given that there is no theoretical elaboration of when integratively complex or simple communications are more effective, this is an issue for future research to investigate.

While neither of these explanations for the lack of a significant relationship between information amount and integrative complexity is compelling, the non-finding clearly suggests a theoretical puzzle that future research should explore. If future studies also fail to find a significant link, existing theory would need to be rethought. Perhaps more likely, there are critical moderating influences related to the situation or task awaiting discovery.

I did rerun the analysis using a different measure of integrative complexity. Specifically, the new measure took the value of the highest-scoring of the five paragraphs in each individual's e-commerce assessment. This new integrative complexity measure had a higher mean (3.64) and standard deviation (0.97) and correlated with the standard measure at 0.73 (significant at $p<.001$). However, the regression model using this new measure also was not significant. The only significant correlation between the new measure and the other variables in the study was with tolerance for ambiguity at –0.27 ($p<.05$).

Perceptions of Opportunity

While I had predicted that individuals who found a greater amount of information would be more likely to see how e-commerce could be both more of a threat and more of an opportunity, the regression models for the two components of opportunity (positive/gain and controllable) failed to reach statistical significance. The factors that were found to influence perceptions that an issue is a threat appear to be unrelated to perceptions that the issue is an opportunity.

There are several possible explanations for this non-finding. Perhaps the processes that determine perceptions of whether an issue is a threat really are different from those that influence whether the issue is seen as an opportunity. While the factor analyses in Chapter Three found that threat was distinct from the two components of opportunity, my research finds that the antecedents of changes in perceptions of threats differ from those of changes in perceptions of opportunities. More specifically, I find effects for the threat variables, but no effects for the opportunity variables. This is consistent with other recent research that has found that threat and opportunity are

distinct in terms of their effects, and that has found no significant effects for opportunity variables. Chattopadhyay, Glick, & Huber (2001: 937, in abstract) found that "threats had the main and moderated effects predicted from the literature, but opportunities did not." Specifically, "control-reducing threats led to more conservative internally directed actions and that likely losses lead to riskier externally directed actions" (p.949), while there were no significant effects for the opportunity variables. Additional research is needed to better understand why and how these perceptions differ.

Another possibility is that the perceptions of threat and opportunity are significantly dependent on the particular issue that is being perceived. Research investigating other issues could test this interesting possibility.

Tolerance for Ambiguity

While the individual information processing characteristic of need for cognition was significantly related to the amount of information individuals found (through its interaction with network size), there were no significant results for tolerance for ambiguity. This non-finding is interesting given prior research that suggests that TFA is an important predictor of search behaviors. One possible explanation for this discrepancy is that prior research has not included network variables, and TFA is merely picking up some of the variance that network variables would otherwise capture. However, given that TFA did not correlate significantly with these network measures makes this explanation unlikely (although the correlation with average tie strength does appear to be approaching significance).

Mediation Hypotheses

Given that individuals' social network characteristics and information processing characteristics had no direct effect on perceptions of threat and/or opportunity and integrative complexity, there was no support for any of the mediation hypotheses. It may be that these variables only affect information gathering activities, and truly have no direct effect. Or it could be that these variables do have direct effects on some sensemaking activities (c.f., Rice & Aydin, 1991), but that the specific sensemaking outcomes tested in this research are too focused and therefore unaffected.

Implications for Theory

This research has several important implications for theory and research in management, especially for research in social networks, information processing, and sensemaking and issue interpretation. While prior theory has suggested that social networks are beneficial because of increased access to information (e.g., Granovetter, 1973; Burt, 1992), research to date has not actively measured the information actors get from their network contacts (Siebert, Kraimer, & Liden, 2001). While the difficulty of measuring information has long been discussed (e.g., Stabell, 1978), and helps explain why social network researchers have merely assumed the relationship, social network research would be much more theoretically secure if empirical research illustrated the assumed information flows more conclusively. The fact that this study found that effective network size was positively associated with the amount of information that managers found from their network sources strengthens the theoretical foundation that many social network researchers use to explain their results. This much more rigorous

and stringent test of the theoretical arguments behind social network effects represents an important contribution to the social network literature.

A more significant implication for research on social networks is the finding that the information processing personality trait of need for cognition interacts with measures of social network size to affect information gathering behaviors. This is a major finding that begins to illustrate why social network researchers need to begin to integrate personality variables into their studies. The few published studies that have explicitly incorporated both social network and personality variables have found that they operate independently to predict outcomes (Mehra, Kilduff, & Brass, 2000; Casciaro, 1998), or has looked at how they correlate with one another (Burt et al., 1998). This study argues and finds that personality is crucial because it can affect how managers *use* their social networks. The important implication for social network research is that any study that posits information gathering behaviors as the explanation for why social network size has an effect on some outcome of interest can potentially improve that explanation by including need for cognition as a moderating variable.

Finding that personality affects social network use is critical to network studies because it points the way for meso-level theorizing about organizational phenomena. It also illustrates how claims that personality variables have important effects only in the absence of social network variables (Burt, 1992) are misguided and unfounded. If personality affects network use, then any effect social networks have on organizational outcomes is potentially an area where personality can add to that explanation. Existing work that invokes information amount as the explanation for why social networks affect

some particular outcome should investigate whether information processing personality traits, particularly need for cognition, are also important.

This study also strongly demonstrates the need for researchers to be more specific in discussing amount of information. Prior research often treats the time individuals spend searching, the amount of information they find (what I have called effective search), and the diversity of information they find as equivalent and interchangable. The implication and apparent expectation of this prior work is that if individuals spend more time searching for information, they will find it, and it will be diverse. This clearly need not be the case. Individuals may spend a lot of time searching for useful information without finding it. Individuals may find a lot of relevant information but which is all similar and thus has low diversity. This study shows that these variables are different and why it matters, both through the correlations between them, the differences in what predicts them, and the differential effects they have on predicting changes in perceptions of threat.

The finding that the time individuals spend searching and the diversity of information they find significantly affects changes in their perceptions that e-commerce is a threat has implications for the literature on strategic issue interpretation. Specifically, it points out how changes in threat interpretations depend heavily on differences in the amount of time managers spent searching for information and the extent to which they find diverse information. Future research is needed to more clearly investigate the explanations behind these effects.

The direction of causality in this finding is also important. Prior research has argued that perceptions of threat and/or opportunity can lead to either more information

seeking (e.g., Lang, Calantone, & Gudmundson, 1997) or less information seeking (e.g., Staw, Sandelands, & Dutton, 1981). My research shows that the causality can also work in the opposite direction, with information seeking affecting perceptions of threat. Interestingly, I did run regression analyses to test whether perceptions of threat and opportunity at time 1 predicted increased or decreased information gathering, and there were no significant findings. In this study, perceptions that e-commerce was either a threat and/or an opportunity were unrelated to information gathering.

The results of the exploratory factor analyses are also important. First, they support the need for future research to differentiate between threat and opportunity, and not treat them as opposite ends of a continuum (Denison, Dutton, Kahn, & Hart, 1996). At the very least, future research should clearly establish whether it empirically makes sense (for that sample and issue) to consider these are ends of a single dimension before assuming they are. My findings also reinforce the distinction between the positive-gain and opportunity dimensions that prior research has found.

That threat and opportunity are distinct constructs was also supported by the median split analyses that showed how a sizable percentage of managers felt that e-commerce was either both a threat and opportunity simultaneously, or neither a threat nor opportunity. These differences, combined with the fact that the predicted relationships held only for threat, suggest that future research is needed that elaborates on why threat and opportunity are distinct and behave differently as predictors. Indeed, richer theorizing around threat and opportunity perceptions that explicitly recognizes how these can be independent could help address some puzzling issues.

For example, this might help explain why I did not find that perceptions of threat and/or opportunity increased information gathering. Prior research and theory that suggests how threat or opportunity perceptions lead to information seeking did not adequately take into account the fact that an issue can be perceived as a threat and opportunity simultaneously. It is possible that there are interaction effects, which make the relationships between perceptions of threat/opportunity and information seeking more complex than previously thought. For example, if managers see an issue as both a threat and an opportunity, does this help them overcome the threat-rigidity effects that would otherwise predict a reduction in information seeking? These issues are important and represent interesting directions for future research in this area.

This research also makes an important contribution to the information processing literature because researchers have recently argued that "... there have been very few studies of individual differences in such everyday information processing" (Davies, 1998, p.456). Much of the literature on information processing characteristics has either used college students as subjects, or has tested for effects in experimental situations that are too remote from the real world that managers face on a daily basis. In addition, much of this literature has not included other categories of variables, such as social network factors and the broader context, that may significantly affect whether the information processing characteristics have an effect. Including these other variables resulted in the personality variables having no direct effect on information gathering. While this suggests that the effects of these information processing personality variables may be weaker than previously believed, the interaction of need for cognition with the social network characteristics clearly suggests that personality differences are important. Future

research should continue to explore how personality and social structure interact to predict important outcomes, rather than investigating social structure or personality in isolation.

Implications for Practice

This research also has implications for practitioners. Importantly, it shows that social network structure does play an important role in determining the amount of information managers gather. To the extent that this is because social network structure influences the ease of gathering information, it suggests managers may want to strategically evaluate their social networks and perhaps try to make additional ties with people who are unknown to the people they already know (thus increasing the effective network size). This facilitates the gathering of a greater amount of information.

Prior research has also argued that one practical implication of work in this tradition is that if increased information leads to interpreting issues as positive and controllable, then organizations should increase the mechanisms for getting information (Thomas, Clark, & Gioia, 1993, pp.258, 261-262). This study suggests that increased information, if it doesn't reflect a greater diversity, can instead lead managers to see increased threat. Gathering diverse information can be particularly valuable in reducing perceptions that an issue is a threat. Given prior research finding that perceptions that an issue is a threat can lead to a narrowing of attention and rigidity of response (the threat-rigidity hypothesis; Staw, Sandelands, & Dutton, 1981), the threat-reducing aspect of diverse information is important.

Study Limitations

Every study has limitations, and it is important to explicitly recognize these limitations so that the results can be properly interpreted. Three potential limitations of this research involve the sample size, the generalizability of the findings, and measurement issues.

Sample Size

One limitation is that ideally the number of individuals participating in this research would have been greater. Chapter Three presented an analysis of the statistical power provided by this sample size. With a larger sample size, some of the non-significant findings might have become significant. However, it is less likely that the direction of the results would have changed. Changing the research procedure so that the managers had a fixed deadline when their e-commerce reports were due would have resulted in more of them completing the third survey and therefore increased the sample size for the tests involving changes in perceptions of threat and/or opportunity.

Generalizability

Two potential limitations regarding the generalizability of the study's findings should be noted. First, the subjects were not a random sample of all experienced managers, but were those enrolled in an executive MBA program at the University of Minnesota. If these managers differ in significant ways from the general population of managers, then these results may not generalize to those different managers.

Second, only a single issue was investigated in this study. There could be important differences in how managers gathered information for and interpreted the issue

of e-commerce that would differ from other emerging, ambiguous issues. Research using this general approach but with different issues is thus desirable.

Measurement Issues

Finally, this research asked managers to indicate whether their social network ties knew one another in order to measure effective network size (structural holes). As Mehra, Kilduff, & Brass (2001: 130) point out: "ego-network data used to assess structural holes are potentially distorted by perceptual biases." If individuals incorrectly identified who knows whom in their networks, then this could weaken or alter the findings. Having each contact individually report on whether they knew each of the other contacts for each manager would have been desirable if it could somehow be made feasible.

Concluding Remarks

Understanding the factors that affect managers' interpretations of emerging organizational issues is crucial to understanding organizational change. This dissertation has developed and tested a model of this process that suggests that managers' social network and information processing characteristics, along with the amount of uncertainty they perceive in their environment, affects the information they find, and this in turn affects their interpretations of the extent to which that issue represents a threat to their businesses. The general support for the model, as well as the specific aspects that were not supported, suggest a number of avenues for future research on this topic that could enrich our understanding of this critical topic. As the rate of change and level of complexity continues to accelerate in most businesses' environments, the number of potentially important new issues will continue to grow. Understanding how individuals

make sense of these issues is vital so management researchers can inform the practice of management.

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TABLE OF APPENDICES

APPENDIX 1:

Hypotheses and Sub-Hypotheses

H1: Network size will be positively related to the amount of information an individual will gather.
H1_1: Degree will be positively related to Time Spent Searching.
H1_2: Degree will be positively related to the Search Effectiveness.
H1_3: Degree will be positively related to the Diversity of Information Found.
H1_4: Effective Network Size will be positively related to Time Spent Searching.
H1_5: Effective Network Size will be positively related to the Search Effectiveness.
H1_6: Effective Network Size will be positively related to the Diversity of Information Found.
H2a: Average tie strength will be negatively related to the amount of information an individual will gather.
H2a_1: Average tie strength will be negatively related to Time Spent Searching.
H2b_2: Average tie strength will be negatively related to the Search Effectiveness.
H2c_3: Average tie strength will be negatively related to the Diversity of Information Found.
H2b: Average tie strength will be positively related to the amount of information an individual will gather.
H2b_1: Average tie strength will be positively related to Time Spent Searching.
H2b_2: Average tie strength will be positively related to the Search Effectiveness.
H2b_3: Average tie strength will be positively related to the Diversity of Information Found.
H3: Information processing personality traits will be positively related to the amount of information an individual will gather.
H3_1: Need for Cognition will be positively related to Time Spent Searching.
H3_2: Need for Cognition will be positively related to the Search Effectiveness.
H3_3: Need for Cognition will be positively related to the Diversity of Information Found.
H3_4: Tolerance for Ambiguity will be positively related to Time Spent Searching.
H3_5: Tolerance for Ambiguity will be positively related to the Search Effectiveness.
H3_6: Tolerance for Ambiguity will be positively related to the Diversity of Information Found.
H4: Perceptions of strategic environmental uncertainty will be positively related to the amount of information an individual will gather.
H4_1: Strategic Environmental Uncertainty will be positively related to Time Spent Searching.
H4_2: Strategic Environmental Uncertainty will be positively related to the Search Effectiveness.

H4_3: Strategic Environmental Uncertainty will be positively related to the Diversity of Information Found.
H5: The amount of information an individual gathers will be positively related to changes in the perception that a complex, equivocal issue is both a threat and an opportunity.
H5_1: Time Spent Searching will be positively related to changes in the perception that a complex, equivocal issue is both a threat and an opportunity. H5_2: Search Effectiveness will be positively related to changes in the perception that a complex, equivocal issue is both a threat and an opportunity. H5_3: Diversity of Information Found will be positively related to changes in the perception that a complex, equivocal issue is both a threat and an opportunity.
H6: The amount of information an individual gathers will be positively related to the level of integrative complexity of thinking about a complex, equivocal issue.
H6_1: Time Spent Searching will be positively related to the level of integrative complexity of thinking about a complex, equivocal issue. H6_2: Search Effectiveness will be positively related to the level of integrative complexity of thinking about a complex, equivocal issue. H6_3: Diversity of Information Found will be positively related to the level of integrative complexity of thinking about a complex, equivocal issue.
H7: Any effect of network size on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the amount of information an individual gathers about that issue.
H7_1: Any effect of Degree on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the Time Spent Searching. H7_2: Any effect of Degree on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by Search Effectiveness. H7_3: Any effect of Degree on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the Diversity of Information Found. H7_4: Any effect of Effective Network Size on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the Time Spent Searching. H7_5: Any effect of Effective Network Size on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by Search Effectiveness. H7_6: Any effect of Effective Network Size on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the Diversity of Information Found.
H8: Any effect of network size on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the amount of information an individual gathers about that issue.

H8_1: Any effect of Degree on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by Time Spent Searching.

H8_2: Any effect of Degree on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by Search Effectiveness.

H8_3: Any effect of Degree on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the Diversity of Information Found.

H8_4: Any effect of Effective Network Size on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by Time Spent Searching.

H8_5: Any effect of Effective Network Size on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by Search Effectiveness.

H8_6: Any effect of Effective Network Size on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the Diversity of Information Found.

H9: Any effect of average tie strength on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the amount of information they find about that issue.

H9_1: Any effect of Average Tie Strength on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by Time Spent Searching.

H9_2: Any effect of Average Tie Strength on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by Search Effectiveness.

H9_3: Any effect of Average Tie Strength on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the Diversity of Information Found.

H10: Any effect of average tie strength on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the amount of information an individual gathers about that issue.

H10_1: Any effect of Average Tie Strength on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by Time Spent Searching.

H10_2: Any effect of Average Tie Strength on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by Search Effectiveness.

H10_3: Any effect of Average Tie Strength on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the Diversity of Information Found.

H11: Any effect of information processing personality traits on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the amount of information an individual gathers about that issue.

H11_1: Any effect of Need for Cognition on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the Time Spent Searching.

H11_2: Any effect of Need for Cognition on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by Search Effectiveness.

H11_3: Any effect of Need for Cognition on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the Diversity of Information Found.

H11_4: Any effect of Tolerance for Ambiguity on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the Time Spent Searching.

H11_5: Any effect of Tolerance for Ambiguity on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by Search Effectiveness.

H11_6: Any effect of Tolerance for Ambiguity on changes in perceptions that a complex, equivocal issue is simultaneously a threat and an opportunity will be mediated by the Diversity of Information Found.

H12: Any effect of information processing personality traits on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the amount of information an individual gathers about that issue.

H12_1: Any effect of Need for Cognition on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by Time Spent Searching.

H12_2: Any effect of Need for Cognition on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by Search Effectiveness.

H12_3: Any effect of Need for Cognition on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the Diversity of Information Found.

H12_4: Any effect of Tolerance for Ambiguity on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by Time Spent Searching.

H12_5: Any effect of Tolerance for Ambiguity on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by Search Effectiveness.

H12_6: Any effect of Tolerance for Ambiguity on the level of interactive complexity of thinking about a complex, equivocal issue will be mediated by the Diversity of Information Found.

H13: There will be an interaction effect between network size and information processing personality traits on the amount of information an individual will gather, such that individuals with both large network sizes and high information processing personality traits will gather the most information.

H13_1: There will be an interaction effect between Degree and Need for Cognition on the Time Spent Searching, such that individuals with both a large Degree and high Need for Cognition will spend the most time searching for information.

H13_2: There will be an interaction effect between Degree and Tolerance for Ambiguity on the Time Spent Searching, such that individuals with both a large Degree and high Tolerance for Ambiguity will spend the most time searching for information.

H13_3: There will be an interaction effect between Effective Network Size and Need for Cognition on the Time Spent Searching, such that individuals with both a large Effective Network Size and high Need for Cognition will spend the most time searching for information.

H13_4: There will be an interaction effect between Effective Network Size and Tolerance for Ambiguity on the Time Spent Searching, such that individuals with both a large Effective Network Size and high Tolerance for Ambiguity will spend the most time searching for information.

H13_5: There will be an interaction effect between Degree and Need for Cognition on Search Effectiveness, such that individuals with both a large Degree and high Need for Cognition will have the highest level of search effectiveness.

H13_6: There will be an interaction effect between Degree and Tolerance for Ambiguity on Search Effectiveness, such that individuals with both a large Degree and high Tolerance for Ambiguity will have the highest level of search effectiveness.

H13_7: There will be an interaction effect between Effective Network Size and Need for Cognition on Search Effectiveness, such that individuals with both a large Effective Network Size and high Need for Cognition will have the highest level of search effectiveness.

H13_8: There will be an interaction effect between Effective Network Size and Tolerance for Ambiguity on Search Effectiveness, such that individuals with both a large Effective Network Size and high Tolerance for Ambiguity will have the highest level of search effectiveness.

H13_9: There will be an interaction effect between Degree and Need for Cognition on the Diversity of Information Found, such that individuals with both a large Degree and high Need for Cognition will find the most diverse information.

H13_10: There will be an interaction effect between Degree and Tolerance for Ambiguity on the Diversity of Information Found, such that individuals with both a large Degree and high Tolerance for Ambiguity will find the most diverse information.

H13_11: There will be an interaction effect between Effective Network Size and Need for Cognition on the Diversity of Information Found, such that individuals with both a large Effective Network Size and high Need for Cognition will find the most diverse information.

H13_12: There will be an interaction effect between Effective Network Size and Tolerance for Ambiguity on the Diversity of Information Found, such that individuals with both a large Effective Network Size and high Tolerance for Ambiguity will find the most diverse information.

H14a: There will be an interaction effect between average tie strength and information processing personality traits on the amount of information an individual will gather, such that individuals with a lower average tie strength and high information processing personality traits will gather the most information.

H14a_1: There will be an interaction effect between average tie strength and Need for Cognition on the Time Spent Searching, such that individuals with a lower average tie strength and high Need for Cognition will spend the most time searching for information.

H14a_2: There will be an interaction effect between average tie strength and Tolerance for Ambiguity on the Time Spent Searching, such that individuals with a lower average tie strength and high

Tolerance for Ambiguity will spend the most time searching for information.

H14a_3: There will be an interaction effect between average tie strength and Need for Cognition on Search Effectiveness, such that individuals with a lower average tie strength and high Need for Cognition will have the highest level of search effectiveness.

H14a_4: There will be an interaction effect between average tie strength and Tolerance for Ambiguity on Search Effectiveness, such that individuals with a lower average tie strength and high Tolerance for Ambiguity will have the highest level of search effectiveness.

H14a_5: There will be an interaction effect between average tie strength and Need for Cognition on the Diversity of Information Found, such that individuals with a lower average tie strength and high Need for Cognition will find the most diverse information.

H14a_6: There will be an interaction effect between average tie strength and Tolerance for Ambiguity on the Diversity of Information Found, such that individuals with a lower average tie strength and high Tolerance for Ambiguity will find the most diverse information.

H14b: There will be an interaction effect between average tie strength and information processing personality traits on the amount of information an individual will gather, such that individuals with a higher average tie strength and high information processing personality traits will gather the most information.

H14b_1: There will be an interaction effect between average tie strength and Need for Cognition on the Time Spent Searching, such that individuals with a higher average tie strength and high Need for Cognition will spend the most time searching for information.

H14b_2: There will be an interaction effect between average tie strength and Tolerance for Ambiguity on the Time Spent Searching, such that individuals with a higher average tie strength and high Tolerance for Ambiguity will spend the most time searching for information.

H14b_3: There will be an interaction effect between average tie strength and Need for Cognition on Search Effectiveness, such that individuals with a higher average tie strength and high Need for Cognition will have the highest level of search effectiveness.

H14b_4: There will be an interaction effect between average tie strength and Tolerance for Ambiguity Ambiguity on Search Effectiveness, such that individuals with a higher average tie strength and high Tolerance for Ambiguity will have the highest level of search effectiveness.

H14b_5: There will be an interaction effect between average tie strength and Need for Cognition on the Diversity of Information Found, such that individuals with a higher average tie strength and high Need for Cognition will find the most diverse information.

H14b_6: There will be an interaction effect between average tie strength and Tolerance for Ambiguity on the Diversity of Information Found, such that individuals with a higher average tie strength and high Tolerance for Ambiguity will find the most diverse information.

APPENDIX 2a:

Survey 1

CARLSON SCHOOL OF MANAGEMENT
UNIVERSITY OF MINNESOTA

SURVEY OF INFORMATION USE BY MANAGERS

January, 2000

INSTRUCTIONS:

The questions in this survey ask you to circle a number that best reflects your response to a specific statement. There are no right or wrong answers – the questions ask you for your opinions and beliefs. Please make every effort to answer all questions as completely as possible since the validity of the study's results depends on complete surveys. Please refer to the main business or business unit to which you belong when answering these survey questions.

ABOUT THIS SURVEY:

This survey was designed and is being carried out by Marc H. Anderson. The information I will obtain from aggregating your responses will improve our understanding of the sources of information that managers use and how they use these sources.

CONFIDENTIALITY:

You are assured complete confidentiality in this survey. No individual responses will be identifiable in any reports. Only aggregated data will be used for analysis, interpretation, and in summary reports.

Please direct any questions or clarifications regarding this survey to:

Marc H. Anderson

Carlson School of Management
University of Minnesota
4-357 CarlSMgmt
321 – 19th Avenue South
Minneapolis, MN 55455

Tel: (612) 625-2361 / Fax: (612) 626-1316

Listed below are four categories of *sources of information* that you might use to learn about business and industry trends. For each category of information source, please indicate the frequency with which you use the source to find useful information that helps you understand the environmental factors that affect your business. Using the following scale, please circle how often you generally receive *useful* information from each category of sources. We stress *useful* information to mean that it helps you understand the environment and plan company actions. Material you receive and do not use should not be counted.

1	2	3	4	5	6	7
Twice a year or less	Quarterly	Once a month	Twice a month	Once a week	Twice a week	Daily

WRITTEN OR PRINTED SOURCES OUTSIDE THE COMPANY Written sources of information from outside your company include such things as trade magazines, newsletters, newspapers (e.g., *Wall Street Journal*), the internet, government reports, books, information services, and the like. Using the above scale, would you tell us how often you generally receive *useful* information from external written sources?	1 2 3 4 5 6 7
WRITTEN OR PRINTED SOURCES INSIDE THE COMPANY Written sources of information from inside your company include such things as reports, special studies, management information systems, and the like. Using the above scale, would you tell us how often you generally receive *useful* information from internal written sources?	1 2 3 4 5 6 7
PERSONAL CONTACTS OUTSIDE THE COMPANY Personal contacts of information from outside your company include such things as business associates, customers, trips and conferences, officials, emails from colleagues in other firms, and the like. Using the above scale, would you tell us how often you generally receive *useful* information from external personal contacts?	1 2 3 4 5 6 7
PERSONAL CONTACTS INSIDE THE COMPANY Personal contacts of information from inside your company include such things as executives, peers, subordinates, salespeople, staff people, memos and emails from any of these people, and the like. Using the above scale, would you tell us how often you generally receive *useful* information from internal personal contacts?	1 2 3 4 5 6 7

The next questions are concerned with how you monitor and learn about things in your business's external environment. By the external environment we mean all the factors and phenomena that exist outside your company. The external environment can be divided into the six sectors listed below. We would like to know how you would rate the *importance*, *rate of change*, and *complexity* of each sector in your business's external environment.

IMPORTANCE refers to how critical it is for your business to monitor this sector and search for information.
RATE OF CHANGE means the extent to which the important companies, agencies, problems, trends, issues, or opportunities change over time in your business's external environment. A low rate of change means things stay about the same from year to year, and a high rate of change means things change quickly and unpredictably from year to year.
COMPLEXITY refers to the diversity of external events that are relevant to your business. The larger the number and diversity of external events, the higher the complexity.

1 Low	2 Somewhat Low	3 Moderate	4 Somewhat High	5 High

THE COMPETITION SECTOR This sector includes the firms and products that compete with your company's products, and companies that make substitute products. It also refers to competitive tactics and actions between your firm and the other competing firms in this industry.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5
THE CUSTOMER SECTOR This sector refers to those companies or individuals that purchase the products made by your company. Customers include companies that acquire your products for resale, as well as final consumers.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5
THE TECHNOLOGICAL SECTOR This sector includes the development of new production techniques and methods, innovation in materials and products, and general trends in research and science relevant to your company.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5
THE REGULATORY SECTOR This sector includes federal and state legislation and regulations, city or community policies, and political developments at all levels of government.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5
THE ECONOMIC SECTOR This sector includes economic factors such as stock markets, rate of inflation, foreign trade balance, federal and state budgets, interest rates, unemployment, and economic growth rate.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5
THE SOCIOCULTURAL SECTOR This sector comprises social values in the general population, the work ethic, and demographic trends such as an increasing number of minorities in the workforce.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5

The following questions ask you about your business's computer hardware, application software, intranet, databases, and the information available on the internet. Please use the scale *above* the set of questions to determine your answer.

1 Very difficult	2 Difficult	3 Somewhat difficult	4 Neither difficult nor easy	5 Somewhat easy	6 Easy	7 Very easy

How easy or difficult is it for you to use each of the following to find information about the issues or problems you face at work?

the computer hardware you have access to in your company?	1 2 3 4 5 6 7
the application software you have access to in your company?	1 2 3 4 5 6 7
the databases you have access to in your company?	1 2 3 4 5 6 7
the company intranet you use in your company?	1 2 3 4 5 6 7
the internet?	1 2 3 4 5 6 7

1 Very uncomfortable	2 Uncomfortable	3 Somewhat uncomfortable	4 Neither comfortable nor uncomfortable	5 Somewhat comfortable	6 Comfortable	7 Very comfortable

How comfortable are you in using each of the following for gathering work-related information?

the computer hardware you have access to in your company?	1 2 3 4 5 6 7
the application software you have access to in your company?	1 2 3 4 5 6 7
the databases you have access to in your company?	1 2 3 4 5 6 7
the company intranet you use in your company?	1 2 3 4 5 6 7
the internet?	1 2 3 4 5 6 7

1 Twice a year or less	2 Quarterly	3 Once a month	4 Twice a month	5 Once a week	6 Twice a week	7 Daily

For business purposes, how frequently do you use:

the databases you have access to in your company?	1 2 3 4 5 6 7
the internet?	1 2 3 4 5 6 7

1 Not at all useful	2 Slightly useful	3 Somewhat useful	4 Useful	5 Very useful	6 Extremely useful	7 Essential

For business purposes, how useful do you find:

the databases you have access to in your company?	1 2 3 4 5 6 7
the internet?	1 2 3 4 5 6 7

Please *enter the initials* of up to 12 people who are important sources of information regarding important business or organizations.

Please enter initials in the ➔ boxes and the first column

	1	2	3	4	5
1		Y / N	Y / N	Y / N	Y / N
2			Y / N	Y / N	Y / N
3				Y / N	Y / N
4					Y / N
5					
6					
7					
8					
9					
10					
11					
12					

Now, please indicate whether or not these individuals know each other by circling the appropriate letter in the matrix column 2.

Also, please answer the questions below by circling the appropriate number for each individual using the scale printed individual and then moving on to the next person.

Individual identified above...	1	2	3	4	5
During the past year, how often have you sought or received information or advice from this person	**1 = TWICE A YEAR 2 = QUARTERLY 3 = ONCE A MONTH** 1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
In general, how useful was the information or advice you received from this individual?	**1 = NOT AT ALL USEFUL 2 = SLIGHTLY USEFUL 3 = SOMEWHAT** 1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
I consider this individual to be a close colleague	**1 = STRONGLY DISAGREE 2 = DISAGREE 3 = SLIGHTLY DISAGREE** 1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
We both have worked in the same functional areas	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
We have very similar backgrounds	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
We have very different areas of expertise	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
We work in the same firm	Y / N	Y / N	Y / N	Y / N	Y / N
How many years have you known this person?	_____	_____	_____	_____	_____

industry trends and issues. These individuals could be either within your work unit, your organization, or in other

6	7	8	9	10	11	12
Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N
Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N
Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N
Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N
Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N
	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N
		Y / N	Y / N	Y / N	Y / N	Y / N
			Y / N	Y / N	Y / N	Y / N
				Y / N	Y / N	Y / N
					Y / N	Y / N
						Y / N

above . For example, if individuals one (1) and two (2) know each other then circle "Y" in the cell located at row 1 and

above the question(s). Please note, it may be faster to work down the columns, answering all questions for one

6	7	8	9	10	11	12
4 = TWICE A MONTH		**5 = ONCE A WEEK**		**6 = TWICE A WEEK**		**7 = DAILY**
1234567	1234567	1234567	1234567	1234567	1234567	1234567
USEFUL	**4 = USEFUL**	**5 = VERY USEFUL**		**6 = EXTREMELY USEFUL**		**7 = ESSENTIAL**
1234567	1234567	1234567	1234567	1234567	1234567	1234567
4 = NEUTRAL		**5 = SLIGHTLY AGREE**		**6 = AGREE**		**7 = STRONGLY AGREE**
1234567	1234567	1234567	1234567	1234567	1234567	1234567
1234567	1234567	1234567	1234567	1234567	1234567	1234567
1234567	1234567	1234567	1234567	1234567	1234567	1234567
1234567	1234567	1234567	1234567	1234567	1234567	1234567
Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N
_____	_____	_____	_____	_____	_____	_____

INSTRUCTIONS: For each of the statements below, please indicate to what extent the statement is characteristic of you by circling a number. If the statement is extremely uncharacteristic of you (not at all like you) please circle "1"; if the statement is extremely characteristics of you (very much like you) please circle "5". Of course, a statement may be neither extremely uncharacteristic nor extremely characteristic of you; if so, please use the number in the middle of the scale that describes the best fit. Please keep the following scale in mind as you rate each of the statements below: 1 = extremely uncharacteristic; 2 = somewhat uncharacteristic; 3 = uncertain; 4 = somewhat characteristic; 5 = extremely characteristic.

	EXTREMELY CHARACTERISTIC / SOMEWHAT CHARACTERISTIC / UNCERTAIN / SOMEWHAT UNCHARACTERISTIC / EXTREMELY UNCHARACTERISTIC				
I would prefer complex to simple problems	1	2	3	4	5
I like to have the responsibility of handling a situation that requires a lot of thinking	1	2	3	4	5
Thinking is not my idea of fun	1	2	3	4	5
I would rather do something that requires little thought than something that is sure to challenge my thinking abilities	1	2	3	4	5
I try to anticipate and avoid situations where there is likely a chance I will have to think in depth about something	1	2	3	4	5
I find satisfaction in deliberating hard and for long hours	1	2	3	4	5
I only think as hard as I have to	1	2	3	4	5
I prefer to think about small, daily projects to long-term ones	1	2	3	4	5
I like tasks that require little thought once I've learned them	1	2	3	4	5
The idea of relying on thought to make my way to the top appeals to me	1	2	3	4	5
I really enjoy a task that involves coming up with new solutions to problems	1	2	3	4	5
Learning new ways to think doesn't excite me very much	1	2	3	4	5
I prefer my life to be filled with puzzles that I must solve	1	2	3	4	5
The notion of thinking abstractly is appealing to me	1	2	3	4	5
I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought	1	2	3	4	5
I feel relief rather than satisfaction after completing a task that required a lot of mental effort	1	2	3	4	5
It's enough for me that something gets the job done; I don't care how or why it works	1	2	3	4	5
I usually end up deliberating about issues even when they do not affect me personally	1	2	3	4	5

INSTRUCTIONS: Please do not spend too much time on the following items. There are no right or wrong answers and therefore your first response is important. Circle your answers and please be sure to answer every question.

A problem has little attraction for me if I don't think it has a solution.	TRUE	FALSE
I am just a little uncomfortable with people unless I feel that I can understand their behavior.	TRUE	FALSE
There's a right way and a wrong way to do almost everything.	TRUE	FALSE
I would rather bet 1 to 6 on a long shot than 3 to 1 on a probable winner.	TRUE	FALSE
The way to understand complex problems is to be concerned with their larger aspects instead of breaking them into smaller pieces.	TRUE	FALSE
I get pretty anxious when I'm in a social situation over which I have no control.	TRUE	FALSE
Practically every problem has a solution.	TRUE	FALSE
It bothers me when I am unable to follow another person's train of thought.	TRUE	FALSE
I have always felt that there is a clear difference between right and wrong.	TRUE	FALSE
It bothers me when I don't know how other people react to me.	TRUE	FALSE
Nothing gets accomplished in this world unless you stick to some basic rules.	TRUE	FALSE
If I were a doctor, I would prefer the uncertainties of a psychiatrist to the clear and definite work of someone like a surgeon or X-ray specialist.	TRUE	FALSE
Vague and impressionistic pictures really have little appeal for me.	TRUE	FALSE
If I were a scientist, it would bother me that my work would never be completed (because science will always make new discoveries).	TRUE	FALSE
Before an examination, I feel much less anxious if I know how many questions there will be.	TRUE	FALSE
The best part of working a jigsaw puzzle is putting in that last piece.	TRUE	FALSE
Sometimes I rather enjoy going against the rules and doing things I'm not supposed to do.	TRUE	FALSE
I don't like to work on a problem unless there is a possibility of coming out with a clear-cut and unambiguous answer.	TRUE	FALSE
I like to fool around with new ideas, even if they turn out later to be a total waste of time.	TRUE	FALSE
Perfect balance is the essence of all good composition.	TRUE	FALSE

INSTRUCTIONS: Below are some statements people have made as their opinion on several topics. You may find yourself agreeing strongly with some of the statements ... disagreeing just as strongly with others ... and perhaps uncertain about others. Whether you agree or disagree with any statement, you can be sure that many other people feel the same as you do.

AGREE VERY MUCH
AGREE TO SOME EXTENT
AGREE A LITTLE
UNCERTAIN
DISAGREE A LITTLE
DISAGREE TO SOME EXTENT
DISAGREE VERY MUCH

In this complicated world of ours the only way we can know what's going on is to rely on leaders or experts who can be trusted.	1	2	3	4	5	6	7
My blood boils whenever a person stubbornly refuses to admit he's wrong.	1	2	3	4	5	6	7
There are two kinds of people in this world: those who are for the truth and those who are against the truth.	1	2	3	4	5	6	7
Most people just don't know what's good for them.	1	2	3	4	5	6	7
Of all the different philosophies which exist in this world there is probably only one which is correct.	1	2	3	4	5	6	7
The highest form of government is a democracy and the highest form of democracy is a government run by those who are most intelligent.	1	2	3	4	5	6	7
The main thing in life is for a person to want to do something important.	1	2	3	4	5	6	7
I'd like it if I could find someone who would tell me how to solve my personal problems.	1	2	3	4	5	6	7
Most of the ideas which get printed nowadays aren't worth the paper they are printed on.	1	2	3	4	5	6	7
Man on his own is a helpless and miserable creature.	1	2	3	4	5	6	7
It is only when a person devotes himself to an ideal or cause that life becomes meaningful.	1	2	3	4	5	6	7
Most people just don't give a "damn" for others.	1	2	3	4	5	6	7
To compromise with our political opponents is dangerous because it usually leads to the betrayal of our own side.	1	2	3	4	5	6	7
It is often desirable to reserve judgment about what's going on until one has had a chance to hear the opinions of those one respects.	1	2	3	4	5	6	7
The *present* is all too often full of unhappiness. It is only the *future* that counts.	1	2	3	4	5	6	7
The United States and Russia have just about nothing in common.	1	2	3	4	5	6	7
In a discussion I often find it necessary to repeat myself several times to make sure I am being understood.	1	2	3	4	5	6	7
While I don't like to admit this even to myself, my secret ambition is to become a great man, like Einstein, or Beethoven, or Shakespeare.	1	2	3	4	5	6	7
Even though freedom of speech for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedom of certain political groups.	1	2	3	4	5	6	7
It is better to be a dead hero than to be a live coward.	1	2	3	4	5	6	7

Finally, I would like to know something about you and about your job.

1. Name: _____
2. What is your current title? _____
3. Age and experience
   a. Your age _____ years
   b. Years of work experience in the industry _____ years
   c. Years of work experience in the company _____ years
   d. Years of work experience in your current position _____ years
4. How many firms have you worked for in your career? _____ firms
5. How many transfers have you had within your firm? _____ transfers
6. How many business functions have you worked in during your career? _____ functions
7. What is your business's primary product or service? _____
8. What industry does your business primarily compete in? _____
9. Which function do you most identify with in your current position? (please circle)

   Accounting Finance Marketing Human Resources General Management

   Operations Engineering Public Relations Other: (please write) _____
10. Which of the following best describes your highest level of education? (please check)

    High school degree ___ Undergraduate degree ___ Master's degree ___ Doctoral degree ___
11. What was your undergraduate major? (if applicable) _____
12. Gender ____ Male ____ Female

13. Which of the following best describes the level of experience and knowledge you possess about information technology in general? (Please circle)

1 None at all	2 A slight amount	3 Some	4 A moderate amount	5 Quite a bit	6 A great amount	7 An extraordinary amount

14. Which of the following best describes the level of experience and knowledge you possess about e-commerce related issues?

1 None at all	2 A slight amount	3 Some	4 A moderate amount	5 Quite a bit	6 A great amount	7 An extraordinary amount

15. Which of the following best describes the extent to which your business is currently involved with e-commerce?

1 Not at all	2 Only slightly	3 Somewhat	4 Moderate amount	5 Quite a bit	6 A great amount	7 An extraordinary amount

APPENDIX 2b:

Survey 2

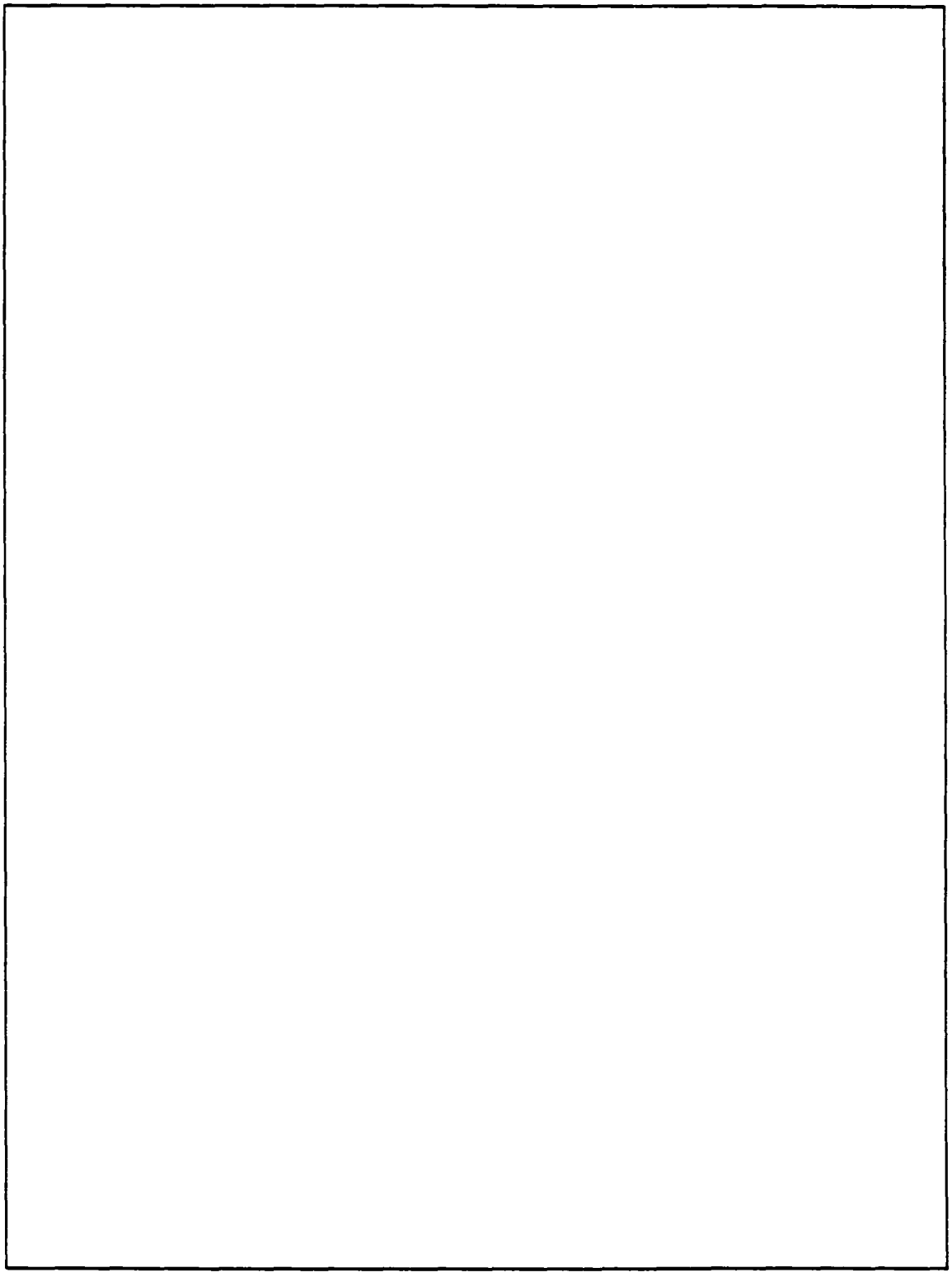
CARLSON SCHOOL OF MANAGEMENT
UNIVERSITY OF MINNESOTA

SURVEY OF INFORMATION USE BY MANAGERS

Part II

January, 2000

Please write a paragraph in the space below discussing what you understand e-commerce to mean and how e-commerce is impacting your business.



INSTRUCTIONS: Using the scale provided, please circle the number that is the best indicator of how you generally perceive the implications of *the emergence of e-commerce* for your business: (1 = to a small extent, 4 = to a moderate extent, 7 = to a great extent). In the questions below, "the situation" refers to the emergence of e-commerce.

To what extent do you...

	To a Small Extent			To a Moderate Extent			To a Great Extent
Perceive that benefits will come from the situation for your business?	1	2	3	4	5	6	7
Label the situation as something negative for your business?	1	2	3	4	5	6	7
See your business as having a choice about whether or not to address the situation?	1	2	3	4	5	6	7
Feel the future will be better for your business because of the situation?	1	2	3	4	5	6	7
Label the situation as a potential gain for your business?	1	2	3	4	5	6	7
Feel your business has the capability to address the situation?	1	2	3	4	5	6	7
See the situation as having positive implications for the future of your business?	1	2	3	4	5	6	7
Feel that there is a high probability of your business losing a great deal?	1	2	3	4	5	6	7
Feel your business can manage the situation instead of the situation managing it?	1	2	3	4	5	6	7
See your business as constrained in how it could interpret the situation?	1	2	3	4	5	6	7
Feel that how the situation is resolved by your business will be a matter of chance?	1	2	3	4	5	6	7
Feel that there is a high probability of your business gaining a great deal?	1	2	3	4	5	6	7
Label the situation as a potential loss for your business?	1	2	3	4	5	6	7
Label the situation as something positive for your business?	1	2	3	4	5	6	7
See the situation as having negative implications for the future of your business?	1	2	3	4	5	6	7

YOUR NAME: _____

APPENDIX 2c:

Survey 3

CARLSON SCHOOL OF MANAGEMENT
UNIVERSITY OF MINNESOTA

CARLSON
SCHOOL

SURVEY OF INFORMATION USE BY MANAGERS

Part III

March, 2000

INSTRUCTIONS: Using the scale provided, please circle the number that is the best indicator of how you generally perceive the implications of *the emergence of e-commerce* for your business: (1 = to a small extent, 4 = to a moderate extent, 7 = to a great extent). In the questions below, "the situation" refers to the emergence of e-commerce.

To what extent do you...

	To a Small Extent			To a Moderate Extent			To a Great Extent
Perceive that benefits will come from the situation for your business?	1	2	3	4	5	6	7
Label the situation as something negative for your business?	1	2	3	4	5	6	7
See your business as having a choice about whether or not to address the situation?	1	2	3	4	5	6	7
Feel the future will be better for your business because of the situation?	1	2	3	4	5	6	7
Label the situation as a potential gain for your business?	1	2	3	4	5	6	7
Feel your business has the capability to address the situation?	1	2	3	4	5	6	7
See the situation as having positive implications for the future of your business?	1	2	3	4	5	6	7
Feel that there is a high probability of your business losing a great deal?	1	2	3	4	5	6	7
Feel your business can manage the situation instead of the situation managing it?	1	2	3	4	5	6	7
See your business as constrained in how it could interpret the situation?	1	2	3	4	5	6	7
Feel that how the situation is resolved by your business will be a matter of chance?	1	2	3	4	5	6	7
Feel that there is a high probability of your business gaining a great deal?	1	2	3	4	5	6	7
Label the situation as a potential loss for your business?	1	2	3	4	5	6	7
Label the situation as something positive for your business?	1	2	3	4	5	6	7
See the situation as having negative implications for the future of your business?	1	2	3	4	5	6	7

To what extent do you believe the emergence of e-commerce represents a THREAT to your business? (please circle below)

1	2	3	4	5	6	7
Not at all a threat	A slight threat	Somewhat of a threat	An average threat	An above average threat	Very much a threat	An extreme threat

To what extent do you believe the emergence of e-commerce represents an OPPORTUNITY for your business? (please circle below)

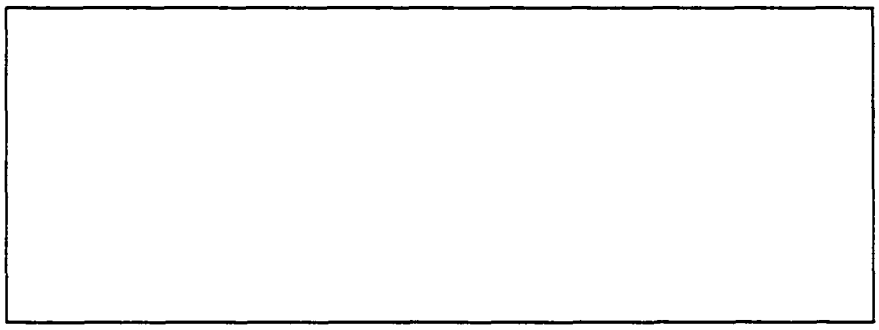
1	2	3	4	5	6	7
Not at all an opportunity	A slight opportunity	Somewhat of an opportunity	An average opportunity	An above average opportunity	Very much an opportunity	An extreme opportunity

Please list the reasons why you believe the emergence of e-commerce might represent a THREAT to your business (in the space below).

Please list the reasons why you believe the emergence of e-commerce might represent an OPPORTUNITY for your business (in the space below).

YOUR NAME: _____

To thank you for participating in this research, I'd be happy to send you an executive summary of the findings. If you would like this executive summary, please fill in your address below.



It may be useful for me to do some follow-up interviewing with individuals on the topics of information use and e-commerce. If so, could I call you in the next few weeks to schedule a short interview by phone or in person?

YES / NO

Phone # _____

THANK YOU VERY MUCH FOR YOUR PARTICIPATION IN MY DISSERTATION RESEARCH!

Marc H. Anderson

APPENDIX 3:
Information Log

INFORMATION SEARCH BOOKLET for E-COMMERCE ASSESSMENT

Please use this booklet to record the sources of information you use in completing your e-commerce organizational assessment. These sources could be public or published sources (e.g., websites, books, reports, newsletters, etc.) or personal communications (with coworkers, colleagues, friends, etc.). As you gather the information necessary to complete the assessment, please note each of the following for each source:

1. The date that you find or receive information relevant to the project.
2. How much time you spend receiving information from each source (in minutes).
3. The type of source (please name the source: *initials of the person* if it is a personal communication; *title* if the source is a report or website). Please also note whether the source was from inside your firm by circling Y if it was an internal source and N otherwise.
4. For each information source, please list the topics you discuss or find information on.
5. In addition to recording the sources of information you use, please rate the amount of information you get from each source (by circling the appropriate number).
6. The usefulness of that information (by circling the appropriate number).
7. The extent to which the information was similar or different from information you already had (by circling the appropriate number).
8. Finally, in the last column please note whether this information source identified another source and briefly describe the source (e.g., if in the course of a conversation a coworker told you to talk to Mary in the IT department, you would write "Mary in IT" in the last column).

If you seek information from someone or somewhere, and that information source turns out to not be useful, please still fill out a row for that source.

It is important that you complete this log *as you gather information* to complete the organizational assessment. Please do not fill this in at the end of your project.

There is room in this booklet to list 30 sources. If you need another booklet, please call or email Marc (612-934-3788; manderson1@csom.umn.edu) and he will send another booklet to you by mail or email.

YOUR NAME: _____

DATE	TIME SPENT gathering information (# of minutes)	SOURCE (Please name the source. E.g., initials of a person, title of article, website, report, etc.)	TOPICS DISCUSSED OR LOCATED (please briefly list the topics below)
		INSIDE FIRM? Y / N	
		INSIDE FIRM? Y / N	
		INSIDE FIRM? Y / N	
		INSIDE FIRM? Y / N	
		INSIDE FIRM? Y / N	
		INSIDE FIRM? Y / N	

AMOUNT How *much* information relevant to the assignment would you say you received from this source?	USEFULNESS How *useful* was the information you received from this source to completing the assignment?	NOVELTY To what extent was the information you received from this source *different* from the information you already had?	IDENTIFIED ANOTHER SOURCE OF INFORMATION? (Please describe other source)
None Some A Great Amount	Not at All Some Very	Not at All Some Very	
1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	
1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	
1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	
1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	
1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	
1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	

APPENDIX 4:

Scale items for Threat/Opportunity (and Subscales)

INSTRUCTIONS: Using the scale provided, circle the number that is the best indicator of how your business would generally perceive *the implications of e-commerce*: (1 = to a small extent, 7 = to a great extent)

To what extent would your business...

	To a Small Extent						To a Great Extent
Perceive that benefits will come from the situation? (PG)	1	2	3	4	5	6	7
Label the situation as something negative? (NL)	1	2	3	4	5	6	7
Have a choice about whether or not to address the situation? (C)	1	2	3	4	5	6	7
Feel the future will be better because of the situation? (PG)	1	2	3	4	5	6	7
Label the situation as a potential gain? (PG)	1	2	3	4	5	6	7
Feel it has the capability to address the situation? (C)	1	2	3	4	5	6	7
See the situation as having positive implications for the future? (PG)	1	2	3	4	5	6	7
Feel that there is a high probability of losing a great deal? (NL)	1	2	3	4	5	6	7
Feel it can manage the situation instead of the situation managing it? (C)	1	2	3	4	5	6	7
Be constrained in how it could interpret the situation? (C)	1	2	3	4	5	6	7
Feel that how the situation is resolved will be a matter of chance? (C)	1	2	3	4	5	6	7
Feel that there is a high probability of gaining a great deal? (PG)	1	2	3	4	5	6	7
Label the situation as a potential loss? (NL)	1	2	3	4	5	6	7
Label the situation as something positive? (PG)	1	2	3	4	5	6	7
See the situation as having negative implications for the future? (NL)	1	2	3	4	5	6	7

[NOTE: The three subscales are marked by the code following each item in the scale above: (C = controllability subscale; PG = positive/gain subscale; NL = negative/loss subscale). These codes are not on the survey].

APPENDIX 5:

Coding Information for Integrative Complexity

Tetlock, Peterson, & Berry (1993: 504) explain the coding of integrative complexity as follows:

> "The assessment of integrative complexity proceeds on a 1-7 scale in which scores of one signify low levels of both differentiation and integration, scores of 3 signify the presence of differentiation but the absence of any integration, scores of 5 indicate the presence of both differentiation and conceptual integration, and scores of 7 indicate differentiation plus the specification of higher order integrative principles."

Scores of 2,4, and 6 represent transition points between the levels discussed in the above paragraph. The specific coding scheme that will be used to code this variable in my research is discussed in elaborate detail in Baker-Brown, Ballard, Bluck, De Vries, Suedfeld, and Tetlock (1992). This approach involves first establishing coder reliability by coding practice materials and reaching a percentage agreement of 80% (these practice materials are included in the Smith [1992] book that includes the Baker-Brown, Ballard, Bluck, De Vries, Suedfeld, and Tetlock chapter). Then, five paragraphs are chosen from the potential scoring material and are scored. An individual's integrative complexity score is the average of the scores for the five paragraphs.

The Baker-Brown, Ballard, Bluck, De Vries, Suedfeld, and Tetlock (1992) scoring manual includes detailed discussions of what each number (from 1-7) represents, including specific indicators that typify certain scores. I will use this scoring manual to score the material.

More specific information for each score is given below:

SCORE OF 1

Does the statement place events into value-laden (good-bad) categories with a high degree of certainty? Does the statement imply that absolute solutions to policy problems can be found? Does the statement deny the existence of value trade-offs? Does the statement provide a unicausal account of events? It should be noted that more than one perspective can be voiced; the crucial criterion then is that only one is accepted as legitimate (Tetlock & Suedfeld, 1988).

SCORE OF 2

A score of 2 reflects implicit evaluative differentiation (partial, veiled, or cryptic recognition of legitimate counterarguments) (Tetlock, Armor, & Peterson, 1994). The critical indicator for a score of 2 is the potential or conditional acceptance of different perspectives or dimensions. The author does not explicitly

develop the alternative dimension or perspective; nor is it necessary that it be explicitly stated or named. Simple qualification, without elaboration, is sufficient.

SCORE OF 3

For scores of 3, the coder must decide that the response indicates both awareness and tolerance of two different interpretations or perspectives on an issue. These statements typically have three features. Firstly, they recognize that reasonable people view the same problem in different ways. Secondly, they distinguish two or more causes for events but fail to recognize interaction between (among) causes. Thirdly, they acknowledge that decision-making involves making difficult choices in which no option is better than its alternatives on all possible criteria.

SCORE OF 4

A score of 4 must should show two features. First, there must be a clear representation of alternatives. Second, there must be an implicit recognition of a dynamic relationship between or among them. The recognition of this relationship signifies the emergence of integration, although at this level it is expressed in a tentative and often uncertain manner. The clear description of the relationship is often withheld until further information is received. In summary, there is only a suggestion that interaction exists between the alternatives; there is no overt statement specifying the nature of this interaction.

SCORE OF 5

Not only does the response indicates awareness of alternative interpretations or perspectives on an issue, but the response clearly indicates the use of integrative rules for understanding the underlying sources of these different ways of looking at the world or for understanding the conditions under which one or another way of looking at the world is more appropriate. Integration could take the form of mutual influence, synthesis, and negotiation or compromise. Three typical specific indications that a score of 5 should be assigned are as follows. Firstly, there are explicit attempts to explain why reasonable persons view an issue in different ways. Secondly, there is recognition that one needs to take into account the interactive and not just the separate effects of the causes of events. Thirdly, there is recognition that decision-making involves trade-offs in which one must assess the relative importance of competing values (how much of value x I am willing to give up for this amount of value y) (Tetlock & Suedfeld, 1988).

SCORE OF 6

For a paragraph to be given a score of 6, the author must be working across several levels of schemata and at least one of the indicators noted previously must be explicitly delineated. Thus, there may be an explicitly presented global overview with only an implicit indication of the specific dynamics of the alternatives. Conversely, there may be explicitly stated details about the dynamic interaction between alternatives and only an implicit communication of the global overview. The author is aware of two alternative courses of action and is able to compare their outcomes with regard to long-term implications. In comparing alternatives, the author may favor one over the other, but each is reasonably considered. Alternatives and outcomes may be actual or hypothetical.

SCORE OF 7

The unique characteristic of a score of 7 is the presence of an overarching viewpoint pertaining to the nature (not merely the existence) of the relationship or connectedness between alternatives. In a score of 7, these alternatives are clearly delineated and are described in reasonable detail. How each alternative may be seen to be part of some overarching view, or how some overarching view encompasses these alternatives, is made evident. There are two critical indicators. First, an overarching viewpoint is presented, which contains an explanation of the organizing principles (e.g., temporal, causal, theoretical) of the problem or concept. Second, there is a discussion of the ways in which levels of the problem or concept interact and thus demonstrate the validity of the overarching viewpoint. The description of the ways in which levels of the system interact must be both specific and dynamic, demonstrating how each level is affected by the other. Although these indicators are distinct, they are inextricably linked. The overarching view encompasses the components of a system, and in fact may have developed as a result of the author's simultaneous consideration of these levels or components.

APPENDIX 6:

Scale items for Need for Cognition

INSTRUCTIONS: For each of the statements below, please indicate to what extent the statement is characteristic of you by circling a number. If the statement is extremely uncharacteristic of you (not at all like you) please circle "1"; if the statement is extremely characteristics of you (very much like you) please circle "5". Of course, a statement may be neither extremely uncharacteristic nor extremely characteristic of you; if so, please use the number in the middle of the scale that describes the best fit. Please keep the following scale in mind as you rate each of the statements below: 1 = extremely uncharacteristic; 2 = somewhat uncharacteristic; 3 = uncertain; 4 = somewhat characteristic; 5 = extremely characteristic.

	EXTREMELY CHARACTERISTIC SOMEWHAT CHARACTERISTIC UNCERTAIN SOMEWHAT UNCHARACTERISTIC EXTREMELY UNCHARACTERISTIC				
I would prefer complex to simple problems	1	2	3	4	5
I like to have the responsibility of handling a situation that requires a lot of thinking	1	2	3	4	5
Thinking is not my idea of fun	1	2	3	4	5
I would rather do something that requires little thought than something that is sure to challenge my thinking abilities	1	2	3	4	5
I try to anticipate and avoid situations where there is likely a chance I will have to think in depth about something	1	2	3	4	5
I find satisfaction in deliberating hard and for long hours	1	2	3	4	5
I only think as hard as I have to	1	2	3	4	5
I prefer to think about small, daily projects to long-term ones	1	2	3	4	5
I like tasks that require little thought once I've learned them	1	2	3	4	5
The idea of relying on thought to make my way to the top appeals to me	1	2	3	4	5
I really enjoy a task that involves coming up with new solutions to problems	1	2	3	4	5
Learning new ways to think doesn't excite me very much	1	2	3	4	5
I prefer my life to be filled with puzzles that I must solve	1	2	3	4	5
The notion of thinking abstractly is appealing to me	1	2	3	4	5
I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought	1	2	3	4	5
I feel relief rather than satisfaction after completing a task that required a lot of mental effort	1	2	3	4	5
It's enough for me that something gets the job done; I don't care how or why it works	1	2	3	4	5
I usually end up deliberating about issues even when they do not affect me personally	1	2	3	4	5

APPENDIX 7:

Scale items for Tolerance for Ambiguity

INSTRUCTIONS: Please do not spend too much time on the following items. There are no right or wrong answers and therefore your first response is important. Circle your answers and please be sure to answer every question.

A problem has little attraction for me if I don't think it has a solution.	TRUE	FALSE
I am just a little uncomfortable with people unless I feel that I can understand their behavior.	TRUE	FALSE
There's a right way and a wrong way to do almost everything.	TRUE	FALSE
I would rather bet 1 to 6 on a long shot than 3 to 1 on a probable winner.	TRUE	FALSE
The way to understand complex problems is to be concerned with their larger aspects instead of breaking them into smaller pieces.	TRUE	FALSE
I get pretty anxious when I'm in a social situation over which I have no control.	TRUE	FALSE
Practically every problem has a solution.	TRUE	FALSE
It bothers me when I am unable to follow another person's train of thought.	TRUE	FALSE
I have always felt that there is a clear difference between right and wrong.	TRUE	FALSE
It bothers me when I don't know how other people react to me.	TRUE	FALSE
Nothing gets accomplished in this world unless you stick to some basic rules.	TRUE	FALSE
If I were a doctor, I would prefer the uncertainties of a psychiatrist to the clear and definite work of someone like a surgeon or X-ray specialist.	TRUE	FALSE
Vague and impressionistic pictures really have little appeal for me.	TRUE	FALSE
If I were a scientist, it would bother me that my work would never be completed (because science will always make new discoveries).	TRUE	FALSE
Before an examination, I feel much less anxious if I know how many questions there will be.	TRUE	FALSE
The best part of working a jigsaw puzzle is putting in that last piece.	TRUE	FALSE
Sometimes I rather enjoy going against the rules and doing things I'm not supposed to do.	TRUE	FALSE
I don't like to work on a problem unless there is a possibility of coming out with a clear-cut and unambiguous answer.	TRUE	FALSE
I like to fool around with new ideas, even if they turn out later to be a total waste of time.	TRUE	FALSE
Perfect balance is the essence of all good composition.	TRUE	FALSE

APPENDIX 8:

Scale items for Perceived Environmental Uncertainty

The next questions are concerned with how you monitor and learn about things in your business's external environment. By the external environment we mean all the factors and phenomena that exist outside your company. The external environment can be divided into the six sectors listed below. We would like to know how you would rate the *importance*, *rate of change*, and *complexity* of each sector in your business's external environment.

IMPORTANCE refers to how critical it is for your business to monitor this sector and search for information.
RATE OF CHANGE means the extent to which the important companies, agencies, problems, trends, issues, or opportunities change over time in your business's external environment. A low rate of change means things stay about the same from year to year, and a high rate of change means things change quickly and unpredictably from year to year.
COMPLEXITY refers to the diversity of external events that are relevant to your business. The larger the number and diversity of external events, the higher the complexity.

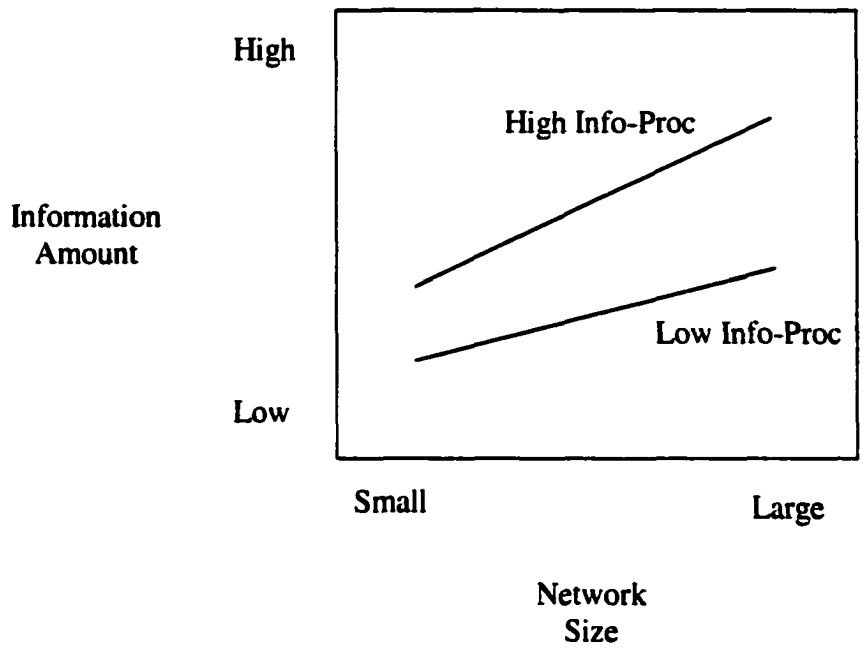
1 Low	2 Somewhat Low	3 Moderate	4 Somewhat High	5 High

THE COMPETITION SECTOR This sector includes the firms and products that compete with your company's products, and companies that make substitute products. It also refers to competitive tactics and actions between your firm and the other competing firms in this industry.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5
THE CUSTOMER SECTOR This sector refers to those companies or individuals that purchase the products made by your company. Customers include companies that acquire your products for resale, as well as final consumers.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5
THE TECHNOLOGICAL SECTOR This sector includes the development of new production techniques and methods, innovation in materials and products, and general trends in research and science relevant to your company.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5
THE REGULATORY SECTOR This sector includes federal and state legislation and regulations, city or community policies, and political developments at all levels of government.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5
THE ECONOMIC SECTOR This sector includes economic factors such as stock markets, rate of inflation, foreign trade balance, federal and state budgets, interest rates, unemployment, and economic growth rate.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5
THE SOCIOCULTURAL SECTOR This sector comprises social values in the general population, the work ethic, and demographic trends such as an increasing number of minorities in the workforce.	IMPORTANCE 1 2 3 4 5	RATE OF CHANGE 1 2 3 4 5	COMPLEXITY 1 2 3 4 5

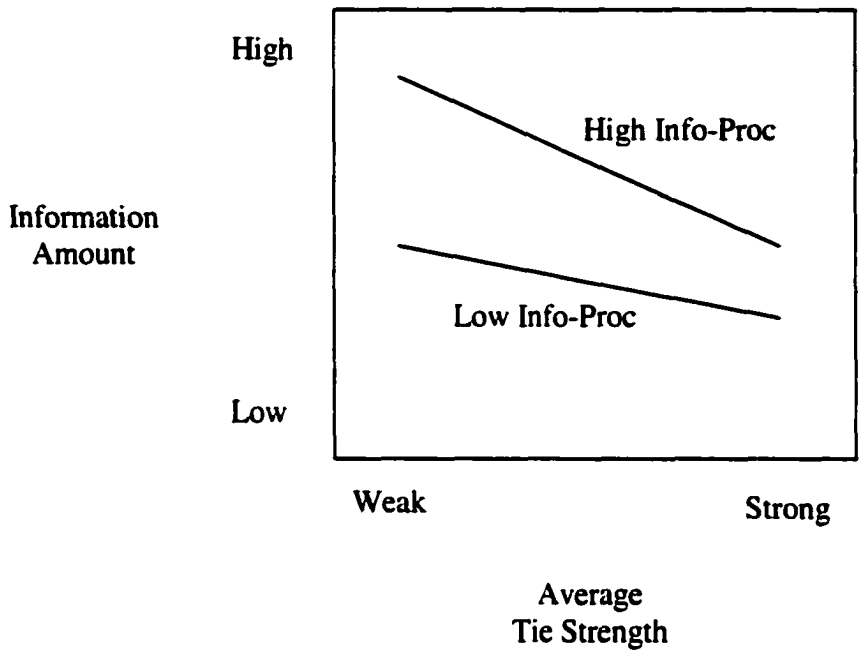
APPENDIX 9:

Graphs of predicted interaction effects for each interaction hypothesis

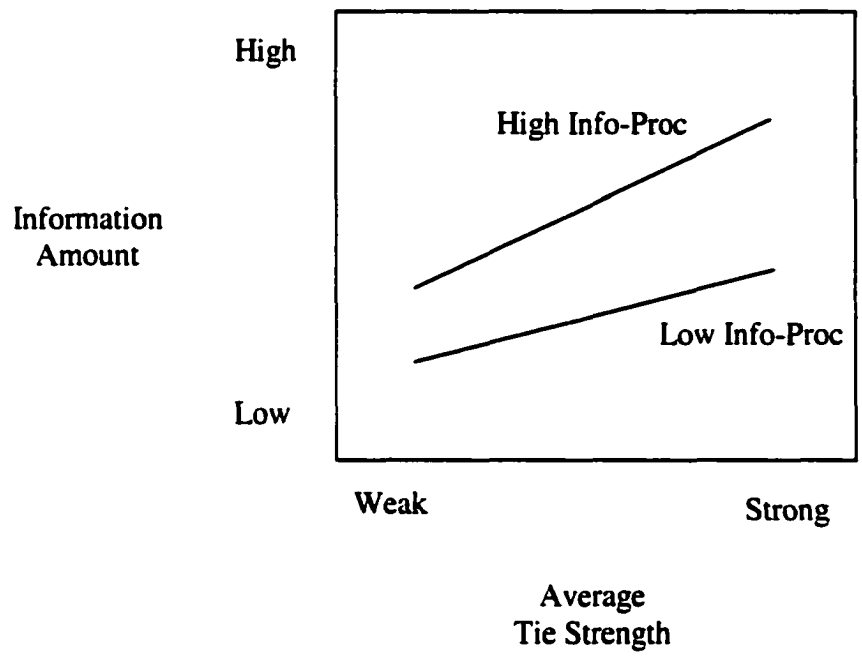
H13: There will be an interaction effect between network size and information processing personality traits on the amount of information an individual will gather, such that individuals with both large network sizes and high information processing personality traits will gather the most information.



H14a: There will be an interaction effect between average tie strength and information processing personality traits on the amount of information an individual will gather, such that individuals with a lower average tie strength and high information processing personality traits will gather the most information.



H14b: There will be an interaction effect between average tie strength and information processing personality traits on the amount of information an individual will gather, such that individuals with a higher average tie strength and high information processing personality traits will gather the most information.



APPENDIX 10:

Mediation Tests (Showing No Significant Results)

LIST OF TABLES IN APPENDIX 10

Table A10.1
Regression Analyses on Changes in Threat & Opportunity Variables
(using Degree and Need for Cognition)

	Dependent Variables				
Independent Variables	Change in Both (additive)	Change in Both (multiplicative)	Change in Threat	Change in Positive/Gain	Change in Controllability
Degree	-0.05	-0.08	-0.09	0.00	0.06
Average Tie Strength	-0.03	0.01	0.03	-0.04	-0.08
Need for Cognition	0.07	-0.06	-0.14	0.27	0.02
Perceived Strategic Uncertainty	-0.19	-0.08	-0.02	-0.19	-0.22
E-Commerce Expertise	0.08	-0.01	0.01	0.06	0.16
Class Dummy	-0.03	-0.07	-0.15	0.14	-0.05
F	0.19	0.12	0.24	0.70	0.32
Adjusted R-Square	-0.16	-0.17	-0.15	-0.05	-0.13
N	37	37	37	37	37
Values are standardized coefficients ^ *p<.10* * *p<.05* ** *p<.01* *** *p<.001*					

Table A10.2
Regression Analyses on Changes in Threat & Opportunity Variables
(using Effective Network Size and Need for Cognition)

	Dependent Variables				
Independent Variables	Change in Both (additive)	Change in Both (multiplicative)	Change in Threat	Change in Positive/Gain	Change in Controllability
Degree	-0.27	-0.32	-0.33	-0.11	0.04
Average Tie Strength	-0.02	0.00	0.02	-0.03	-0.07
Need for Cognition	0.08	-0.05	-0.13	0.28	0.03
Perceived Strategic Uncertainty	-0.16	-0.05	0.01	-0.18	-0.22
E-Commerce Expertise	0.14	0.06	0.08	0.08	0.15
Class Dummy	-0.13	-0.17	-0.25	0.09	-0.05
F	0.45	0.46	0.61	0.75	0.31
Adjusted R-Square	-0.10	-0.10	-0.07	-0.04	-0.13
N	37	37	37	37	37
Values are standardized coefficients ^ *p<.10* * *p<.05* ** *p<.01* *** *p<.001*					

Table A10.3
Regression Analyses on Changes in Threat & Opportunity Variables
(using Degree and Tolerance for Ambiguity)

	Dependent Variables				
Independent Variables	Change in Both (additive)	Change in Both (multiplicative)	Change in Threat	Change in Positive/Gain	Change in Controllability
Degree	-0.04	-0.11	-0.13	0.06	0.06
Average Tie Strength	-0.04	-0.01	0.01	-0.03	-0.09
Need for Cognition	0.10	0.09	0.04	0.09	0.08
Perceived Strategic Uncertainty	-0.18	-0.09	-0.04	-0.15	-0.22
E-Commerce Expertise	0.09	-0.02	-0.02	0.10	0.16
Class Dummy	-0.02	-0.08	-0.17	0.17	-0.05
F	0.22	0.15	0.15	0.38	0.35
Adjusted R-Square	-0.15	-0.17	-0.16	-0.12	-0.12
N	37	37	37	37	37
Values are standardized coefficients ^ *p<.10* * *p<.05* ** *p<.01* *** *p<.001*					

Table A10.4
Regression Analyses on Changes in Threat & Opportunity Variables
(using Effective Network Size and Tolerance for Ambiguity)

	Dependent Variables				
Independent Variables	Change in Both (additive)	Change in Both (multiplicative)	Change in Threat	Change in Positive/Gain	Change in Controllability
Degree	-0.25	-0.32	-0.34	-0.06	0.06
Average Tie Strength	-0.02	-0.01	0.00	0.00	-0.08
Need for Cognition	0.07	0.04	-0.01	0.09	0.09
Perceived Strategic Uncertainty	-0.15	-0.06	-0.01	-0.14	-0.22
E-Commerce Expertise	0.16	0.05	0.06	0.13	0.16
Class Dummy	-0.11	-0.18	-0.27	0.13	-0.04
F	0.44	0.46	0.51	0.38	0.35
Adjusted R-Square	-0.10	-0.10	-0.09	-0.12	-0.12
N	37	37	37	37	37
Values are standardized coefficients ^ *p<.10* * *p<.05* ** *p<.01* *** *p<.001*					

Table A10.5
Regression Analyses on Integrative Complexity
(using Degree, Effective Network Size, Need for Cognition, and Tolerance for Ambiguity)

	Dependent Variable = Integrative Complexity			
Independent Variables	**Model #1**	**Model #2**	**Model #3**	**Model #4**
Degree	-0.03		-0.02	
Effective Network Size		0.01		0.00
Average Tie Strength	-0.17	-0.18	-0.15	-0.16
Need for Cognition	-0.02	-0.03		
Tolerance for Ambiguity			-0.17	-0.17
Perceived Strategic Uncertainty	-0.13	-0.13	-0.11	-0.11
E-Commerce Expertise	0.10	0.09	0.11	0.11
Class Dummy	-0.09	-0.08	-0.04	-0.04
F	0.49	0.48	0.70	0.70
Adjusted R-Square	-0.06	-0.06	-0.04	-0.04
N	53	53	53	53
Values are standardized coefficients ^ *p<.10* * *p<.05* ** *p<.01* *** *p<.001*				