ABSTRACT

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| Title of dissertation proposal: | Electronic Mediation, Transformation, and Business Value: Three Essays in the Retail Auto Industry |
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This dissertation seeks to answer the following research questions: *(1) what properties enable some organizations to generate more value from information technology (IT) than others?* and *(2) through what mechanisms do organizations generate value through IT?* It examines the role of technology in value creation through three essays using three different aspects of organizational performance.

*Chapter 1: Responding to Technology-Enabled Organizational Transformation: The Role of Strategic Change Orientation*
Essay one examines the role of strategic change orientation and three change enablers—IT capabilities, climate for IT use, and mindfulness of IT adoption—in influencing business process performance during a period of IT-enabled transformation. The data source for this essay is a survey of auto retailers facilitated by a leading online infomediary.

*Chapter 2: Profiting From the Internet Channel: The Complementarity of Electronic Commerce Capabilities and Business Process Change*
Essay two accesses the joint role of electronic commerce capabilities and business process change in a model that examines the value firms derive from the Internet channel. The data source for this essay is a survey of auto retailers conducted by a leading market research firm.

*Chapter 3: Understanding Retailer Use of Online Auction Channels: Strategies In Repeated Search Processes*
Essay three examines sellers' use of the online auction market and the resulting value obtained for a given product through the theoretical lens of search theory. We model sellers' repeated listing of unsold products and adjustment of reserve price as a process of searching for high valuation customers. The data source for this essay is transactional data from a leading online auction site specializing in automobiles.

ELECTRONIC MEDIATION, TRANSFORMATION, AND BUSINESS VALUE:
THREE ESSAYS IN THE RETAIL AUTO INDUSTRY


by

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# OVERVIEW: ELECTRONIC MEDIATION, TRANSFORMATION, AND BUSINESS VALUE: THREE ESSAYS IN THE RETAIL AUTO INDUSTRY

The study of the value generated through the use of information technology (IT) has been a central theme within the information systems (IS) literature nearly since its inception. This dissertation adds to this stream by seeking to answer the following research questions: *(1) what properties enable some organizations to generate more value from IT than others?* and *(2) through what mechanisms do organizations generate value through IT?* We study the process of value creation in the context of the retail auto industry using three different aspects of organizational performance. Essay one takes the broadest view, examining the role of strategic change orientation and three change enablers—IT capabilities, climate for IT use, and mindfulness of IT adoption—in influencing organizational performance during a period of IT-enabled transformation. Essay two focuses more specifically on the Internet channel, examining the complementarities between electronic commerce capabilities and business process change in influencing the business value obtained from the Internet channel. Essay three examines sellers' use of the online auction market and the resulting value obtained for a product through the theoretical lens of search theory—modeling sellers' repeated listing of unsold products and adjustment of reserve price as a process of searching for high valuation customers. Collectively, these three essays represent an important contribution to the IS field by identifying critical organizational characteristics that influence the value creation process. In doing so, they also provide a detailed examination of the specific mediating mechanisms through which this value creation process occurs.

# CHAPTER 1: RESPONDING TO TECHNOLOGY-ENABLED ORGANIZATIONAL TRANSFORMATION: THE ROLE OF STRATEGIC CHANGE ORIENTATION

## 1.1 ABSTRACT

As a result of the emergence of the Internet and net-enabled business processes, many industries have experienced a period of *IT-enabled transformation* in which organizations and business operations changed very rapidly.  A natural question that arises is *how can firms survive and even thrive during such transformations?*  In addressing this question, we show how a firm's *strategic change orientation*—a meta-construct consisting of *technological opportunism, market orientation,* and *entrepreneurial orientation*—can influence the assimilation of IT and the resulting performance of business processes.  We identify and examine three separate change enablers through which this influence occurs: (1) through the development of *IT capabilities;* (2) through the creation of a positive *climate for IT use*; and (3) through *mindfulness of IT adoption.*  These three change enablers influence the assimilation of technology within the organization and the resulting business process performance.  We test the proposed model using a survey capturing the level of assimilation and the benefits from customer-focused information systems for 153 organizations in the retail auto industry, a compelling example of an industry that has undergone an IT-enabled transformation.  Results provide significant support for the proposed relationships, explaining nearly 47% of the variance in IT assimilation, 34% of the variance in process performance, and 31% of the variance in financial performance.

## 1.2 INTRODUCTION

*"The information superhighway, it turns out, goes right past a car dealership. A long-overdue revolution in auto retailing has arrived."*

*-Fortune Magazine, March 4, 1996*

The emergence of the Internet and net-enhanced business processes has had a transformational impact on many industries, meaning that they have substantially altered business processes and the nature of competition.  In response to these IT-enabled transformations, organizations have had to develop new ways to interact with and provide value to customers while facing both new online competitors and new arenas for competition.  These transformations have thus created opportunities and challenges for organizations, placing otherwise stable industries into periods of extensive operational change and intense competition (Crowston and Myers 2004).  The concept of technology as a transforming force in the competitive relationships among firms is by no means new, but rather can be traced back to the Schumpeterian idea of creative destruction (Shumpeter 1942).  However, with the increasing prominence of IT in firm business processes and as a force in many industries, there is a need for researchers to better understand how organizations can effectively navigate an IT-enabled industry transformation (Agarwal and Lucas 2005).

Existing research has identified the transformational aspects of radical IT innovations on individuals (e.g., Barrett and Walsham 1999; Robey and Sahay 1996; Winter and Taylor 1996), organizations (e.g., Cross and Earl 1997; Markus and Benjamin 1997; Straub and Watson 2001; Yates and VanMaanen 1996), and society (e.g., Aupperle

1996; Campbell-Kelly 1996; Davenport and Stoddard 1994; El Sawy et al. 1999). Although this research provides useful insights into the characteristics and impacts of transformational technologies, much less is known about the general organizational properties that enable effective responses to the competitive challenges posed by IT-enabled transformations. In addition, as effective responses to IT-enabled transformations are those which create value for organizations, there is a need to incorporate our understanding of how organizations respond to IT-enabled transformations into the broader IT-value literature while providing actionable recommendations to managers and organizations.

This research examines the role of *strategic change orientation (SCO)*—a meta-construct consisting of *entrepreneurial orientation*, *technological opportunism,* and *market orientation*—in influencing the ability of the organization to respond to periods of IT-enabled transformation. Specifically, we argue that strategic change orientation influences IT assimilation and the resulting value the organization obtains through three different *change enablers*. These three change enablers—*IT capabilities, climate for IT use,* and *mindfulness of IT adoption*—provide a way to understand the theoretical mechanisms through which SCO can enable an effective response to the challenges posed by IT-enabled transformations. The overall conceptual framework describing the link between SCO and performance is shown in Figure 1.1.

We test the proposed model in the context of the retail auto industry, a compelling example of an industry that has undergone an IT-enabled transformation, examining the assimilation of customer management systems across 153 dealerships and two business units (sales and service). While the transformation of the industry has been initiated by a

variety of technologies—including the Internet, online infomediaries, and dealer websites—we argue the customer management systems represent a key technology which helps organizations to manage the transformation. Overall, findings indicate that an organization's strategic change orientation can be an important determinant of how the organization assimilates technology into business processes and generates value. In developing this understanding, we integrate several different streams of research to explain differences in organizational assimilation and benefits from customer-focused information systems.

The rest of the paper is organized as follows. The next section reviews the literature associated with transformation and the other constructs associated with the model, providing the primary theoretical foundation for this work. We then argue for the specific hypotheses shown in Figure 1.2. Next, we describe the details related to the testing of the model, including the measures and analysis techniques used. Finally we discuss both the limitations and the implications of the findings.

### 1.3 LITERATURE REVIEW

In this section, we first fully define and review the relevant research on IT-enabled transformation and then substantiate our claim that the retail auto industry in particular has experienced such a transformation. Next, we provide a foundation for the different streams of research integrated through this work. In doing this, we first examine three types of strategic orientation—technological opportunism, market orientation, and entrepreneurial orientation—and discuss how each influences an organization's *willingness* to respond to technological change. We then examine the literature related to three change enablers—IT capabilities, climate for IT use, and mindfulness of IT

adoption—which provide organizations with the *ability* to effectively deal with technological change. Finally, we discuss the role of IT assimilation as an important mediator to value creation. With this as a foundation, in the following section we discuss the specific hypotheses related to the model shown in Figure 1.2.

### IT-Enabled Transformation

Change and IT innovations are necessarily very closely linked, and have been since Leavitt and Whisler's (1958) seminal article "Management in the 1980's" projected an overall change in the size of middle management as a result of IT innovations. The term "transformation" has been used frequently to describe substantial organizational changes resulting from the presence of a radical IT innovation (e.g., Cross and Earl 1997; Crowston and Myers 2004; Daniel and Wilson 2003; Jarvenpaa and Ives 1996; King 1996; Robey and Sahay 1996; Scott Morton 1991; Uhlenbruck 2003; Yates and VanMaanen 1996). Although IT is an important initiator of organizational transformation, the stream of research examining organizational transformation is much broader than just that related to IT innovation and draws from the fields of economics, strategy, and sociology (for reviews, see Pettigrew 1985; Wilson 1992).

Two frequently cited theoretical foundations addressing transformation include creative destruction (Shumpeter 1942) and punctuated equilibrium (Gersick 1991; Tushman and Romanelli 1985). Creative destruction refers to the process through which organizations attempt to gain competitive advantage through innovation. This competitive advantage, however, is necessarily temporary as market entrance or imitation by competitors erodes (destroys) profits and forces the firm to continue to innovate.

The paradigm of punctuated equilibrium provides a separate though closely related perspective of change, suggesting that there are longer periods of incremental changes that are punctuated with periods of radical change (Gersick 1991; Tushman and Romanelli 1985). These periods of radical change may alter the nature of competition, the domain of direct competitors, the value of firm assets, or the nature of interactions between customers and suppliers. Thus, the emergence of new technology and the radical changes associated with it have important implications for organizations.

A third view of transformation has emerged directly from the IS literature. The situated change perspective (Orlikowski 1996) provides an alternative lens for transformation that stresses the ongoing and incremental nature of organizational change. In addition, this perspective identifies the joint role of both social actors and technology in determining the organizational outcomes from transformation. Another characteristic of this perspective is that substantial transformations may actually be composed of a series of smaller changes—suggesting that several incremental IT innovations and social actors may interact over a period of time to lead to a more discernible transformation.

In order to further our understanding of the characteristics which enable organizations to thrive during an IT-enabled transformation, we do not have to adopt a specific perspective on transformation which is exclusive of any one of the three perspectives reviewed above. Organizational responses to these transformations are likely to be concentrated in particular periods of more and less change (as in the creative destruction and punctuated equilibrium models) and also involve ongoing change (as in the situated change perspective). We do, however, need to argue that the specific context of transformation meets the basic criteria for a transformation set forth in prior research.

Prior research has defined transformation in different ways. In their discussion of general organizational transformation, Romanelli and Tushman (1994) argued that a transformation occurred when firms had substantial changes in strategy, structure, and power over a period of two years. In the context of IT-specific investments, Dehning et al. (2003) argued that transformational technology investments: (1) redefine business processes or relationships; (2) involve acquisitions or entry into new markets; or (3) dramatically change how tasks are carried out. While the specific criteria for determining whether a transformation has occurred may be difficult to fully justify, the general theme is that there is a substantial change in the competitive environment to which the firm must respond.

**IT-Enabled Transformation in the Retail Auto Industry**

In examining the context of the retail auto industry, we adopt similar criteria as Dehning et al. (2003) and argue that a number of technologies have emerged over time to constitute an IT-enabled transformation. We describe three closely related but distinct changes specifically impacting the business processes, relationships with customers, and the creation of new markets—which together, we suggest, contribute to the overall industry transformation.

*Business Processes:* The process of purchasing vehicles has changed substantially in the last decade (Ratchford et al. 2003). The presence of the Internet and online infomediaries enable individuals to communicate with multiple dealers, placing significant new demands on traditional salespeople in terms of their workload and work tasks. While in the past salespeople may have only interacted with individuals face-to-face, many customers are now likely to expect to be able to negotiate through electronic channels.

This substantially changes the business process through which dealerships initiate, manage, and close transactions. In addition, as individuals wanting a particular vehicle can more easily contact and negotiate with multiple dealerships, dealerships must adjust their business process to actively manage a larger number of relationships.

*Relationships with Consumers:* Both the lowered search costs provided by the Internet and the emergence of online infomediaries offering information and transactional services have contributed to changes in the negotiations with customers. With the emergence of the Internet, consumers rapidly began utilizing the web as a source of information, and in 2004 over 64 percent of new vehicle purchasers used the web in some way as part of the purchase process (Power 2004). This has significantly reduced the level of information asymmetry, shifting the advantage in negotiations away from the dealership. Purchasing through an online infomediary has been shown to result in a savings of approximately 2% when compared to individuals who negotiate directly with the dealership (Scott-Morton et al. 2001). This demonstrates the important financial impact resulting from this change in the relationships with customers.

*Creation of New Markets:* By reducing the search costs of obtaining a price quote, the lowered search costs of the Internet have reduced the overall importance of location for competing dealerships (Bakos 1997). Dealerships have the opportunity to compete for customers that they would have had little access to before the emergence of the Internet, online infomediaries, and online auctions. As a large scale and vivid example of this, the eBay Motors market represents a national auction market where dealers can sell to consumers from around the country. This has been facilitated by the emergence of shipping services which facilitate the transport of vehicles from dealerships to consumers

residing in different areas of the country.  Overall, this and other online markets for

vehicles provide dealers with substantial new opportunities to reach customers.

**Customer Management Systems**

Customer management systems have features which provide auto-retailers with

the ability to manage many of the challenges of IT-enabled transformation described

above.  These features can be generally categorized into three types:

*workflow/messaging, information management,* and *analysis.*

*Workflow/Messaging:* A key feature of customer focused systems is workflow

automation.  As dealers may receive leads from many different sources.  Customer

management systems provided an integrated way of centralizing these leads and routing

them to the individuals responsible.  This can also enable such things as automated

scheduling of follow-up calls and messaging features which maintain contact with a

customer both before and after the purchase.  Maintaining constant contact through email

may help the sales and service area to improve overall performance by increasing

customer loyalty.

*Information Management:* As the Internet enables dealerships to more easily access

customers from a variety of sources, managing information related to the preferences and

status of customers is more important than ever.  Following-up with customers with

appropriate information allows the salesperson to meet the needs of the customer more

quickly and appropriately.  Much of the usefulness of customer management systems as

an information tool requires that employees actually use the system to record interactions

with customers

*Analysis:* Customer management systems also enable dealerships to conduct detailed analyses on work processes and customers. Customer management systems enable dealerships to obtain detailed information on outcomes such as the conversion rate of leads and the overall return on the investment of infomediary partnerships. Detailed analyses may also be directly linked with marketing, providing a way to target offers and mailings to meet the needs of specific customer profiles. In the face of increased competition, targeted actions can help dealerships to increase the efficiency of their advertising spending for both sales an service functions.

## Strategic Orientation

The ability to identify and respond to changes initiated by technology is critical to the performance and often even to the survival of firms—especially for firms located in industries undergoing IT-enabled transformation. While the dominant paradigm of IT investment suggests that IT adoption is necessarily a positive thing (Fichman 2004), we acknowledge that this is not always the case with all technologies and situations. However, we argue that when a transforming technology emerges, it becomes necessary for firms to take action. Often, this action may involve the direct adoption of technology associated with the transformation or technology which helps the firm to manage the challenges of the transformation. In this case, as each of the three transformational factors related to the used car industry involves some change in their interactions with customers, we argue that customer-focused information systems represents a technology likely to make an important difference in overall performance by enabling firms to deal with the challenges created by the Internet and infomediaries. The willingness of a firm

to implement and use customer-focused systems is therefore expected to be associated with performance outcomes of the related business processes.

The strategic orientation of the firm is one way to capture the willingness of an organization to adopt technologies. The characterization of strategic orientation has taken two different general strategies: (1) the characterization of different strategic types and (2) the identification of strategic characteristics. The first method argues that there are general ways of characterizing organizations which are essentially value neutral—i.e., neither good nor bad—and performance results from the alignment between the different parts of the organization or between the organization and the environment. Miles and Snow's (1978) topology of Defenders, Analyzers, and Prospectors is an example of this method of characterizing strategic orientation. This view of strategic orientation has been used as a way to understand the alignment with respect to both the IT (Sabherwal and Chan 2001) and the marketing function (Vorhies and Morgan 2003).

The second method of conceptualizing strategic orientation is to measure it across different specific constructs. In this case, rather than being of a strategic type (i.e., defender, prospector, etc.) organizations are either high or low in a trait used to conceptualize aspects of the strategy of the organization. Work by Venkatraman (1989) developed six general measures of strategic orientation capturing dimensions: (1) aggressiveness, (2) analysis, (3) defensiveness, (4) futurity, (5) proactiveness, and (6) riskiness. These general dimensions of strategic orientation, however, are limited in some cases because of their generality. By attempting to capture all aspects of an organization's strategy, they may be unduly complex in addressing specific contextual challenges the organization may face. As an alternative, researchers have developed

constructs capturing specific organizational traits that lead to performance for such things as innovation (Hurley and Hult 1998; Lukas and Ferrell 2000) and entrepreneurship (Dess and Lumpkin 2005; Jambulingam et al. 2005; Wiklund and Shepherd 2005).

As the objective of this work is to identify those characteristics which enable organizations to perform well during an IT-enabled transformation, we chose to capture the strategic orientation of the organization using specific rather than general dimensions of strategic orientation. In reviewing the extant literature on the various concepts researchers have used to describe an organization's orientation toward the types of challenges most prominent in IT-enabled transformations, we identified three relevant constructs: (1) technological opportunism, (2) market orientation, and (3) entrepreneurial orientation. Each of these constructs represent organizational characteristics which enable a response to challenges faced by the organization during an IT-enabled transformation, as are further discussed below.

**Technological Opportunism**

*Technological opportunism* refers to the willingness of the organization to identify, understand, evaluate, and respond to new technologies (Srinivasan et al. 2002). Technological opportunism is consistent with several other streams of research examining firm processes as they relate to new technologies, such as Wheeler's (2002) Net-Enabled Business Innovation Cycle (NEBIC). From a strategic perspective, technological opportunism is an organizational characteristic similar to what is identified in the Miles and Snow (1978) typology as a prospector firm, but with specific orientation toward technology (Srinivasan et al. 2002). Thus, technological opportunism is expected

to be an important factor in capturing a firm's willingness to respond to the technological changes associated with an IT-enabled transformation.

**Market Orientation**

Within the marketing field there has been a long history of focus on the importance of the customer relationship (Kotler 1967), and market orientation is a critical construct which researchers have extensively used to understand a firm's strategic orientation toward its customers. Market orientation identifies the degree to which a firm engages in behaviors associated with the identifying and satisfying of customer needs, behaviors found to have many positive outcomes for firms (for a review, see Kirca et al. 2005). Research has identified the positive relationship between market orientation and customer and employee outcomes, innovation, and organizational performance (Jaworski and Kohli 1993; Navar and Slater 1990). As a result, market orientation provides a way of assessing the willingness of the firms to respond to the needs of their customers through the application of technology.

**Entrepreneurial Orientation**

The organizational literature has addressed the overall importance of taking risks and making the changes necessary to take advantage of new opportunities. *Entrepreneurial orientation* captures the degree to which firms engage in processes, practices, and decision-making styles that involve risk taking and may lead to entry in new markets (Covin and Slevin 1989; Lumpkin and Dess 1996; Miller and Barbosa 1983). Entrepreneurial orientation has also been found to be an importation factor in firm performance and innovation (Attuahene-Gima and Ko 2001; Lee et al. 2001; Lumpkin and Dess 1996; Zhou et al. 2005). In the context of an IT-enabled transformation,

entrepreneurial orientation captures important characteristics which may cause firms to have a willingness to enter newly-created markets provided by the Internet and electronic commerce.

<div align="center">**Change Enablers**</div>

In this section we integrate several streams of literature to identify firm characteristics which facilitate and enable change. These include IT capabilities, climate for IT use, and mindfulness of IT adoption.

**IT Capabilities**

*IT capabilities* refer to the ability of the organization to implement and manage technologies and are based on the resource based view (RBV) of the firm. Originating in the field of strategic management, the RBV of the firm (Barney 1986; Barney 1991; Penrose 1959; Wernerfelt 1984) has become a critical lens through which researchers have examined the drivers of firm performance and competitive advantage. The RBV suggests that firms compete on the basis of VRIN resources—those that are valuable, rare, inimitable, and non-substitutable—and argues that the possession of VRIN resources can lead to a strategic competitive advantage (Barney 1991; Conner 1991). While some have noted that defining a resource as something which leads to competitive advantage is tautological (Priem and Butler 2001a, b), the RBV has been a useful lens for organizational researchers from strategy (Brush and Artz 1999; Mahoney and Pandian 1992; Peteraf 1993; Tippins and Sohi 2003), marketing (Hunt and Morgan 1996; Slater 1997; Slotegraaf et al. 2003; Vorhies and Morgan 2005), human resources (Becker and Gerhart 1996; Bowen and Ostroff 2004; Colbert 2004; Delaney and Huselid 1996), and

IS (Bharadwaj 2000; Santhanam and Hartono 2003; Zhu and Kraemer 2002) to explain both organizational performance and business process performance.

Although there are numerous dimensions of IT capabilities that have been identified (for a review, see Wade and Hulland 2004), IT management capabilities and IT infrastructure represent two of the most critical. IT management capabilities reflect an organization's ability to manage IT implementation projects and implement new systems, and they have been argued to be the only IT-related capabilities which lead to sustained competitive advantage (Clemons and Row 1991). IT infrastructure is a more fundamental enabler, providing organizations with a foundation of technology on which to build new IT innovations (Zhu 2004). Together the ability to manage technology and the infrastructure on which to build new technology applications provide an important way to characterize the overall IT capabilities of an organization.

**Climate for IT Use**

Numerous individual-level studies have identified the importance of social influence on IT adoption and use (for a review, see Venkatesh et al. 2003). In this research we introduce c*limate for IT use* as employees' shared perceptions of the importance of IT use within the organization. Climate has been defined generally as the message employees get about the values which are important to the organization (Schneider and Bowen 1995), and climate has been used to understand technology implementations (Klein et al. 2001), service outcomes (Glisson and James 2002; Schneider et al. 1998) and product innovation (Wei and Morgan 2004). In its essence, climate provides a way to understand how the collective policies and practices of the organization influence the willingness of individuals to behave in specific ways—here,

related to the use of new IT.  Climate for IT use is expected to be an important factor in understanding how organizations implement necessary change related to the assimilation of IT innovations.

**Mindfulness of IT adoption**

The dominant paradigm within the IT literature has emphasized the positive aspects of IT adoption and investment.  However, recent work has highlighted the important role of *mindfulness of IT adoption* in making IT-related decisions (Butler and Gray 2006; Fichman 2004; Swanson and Ramiller 2004).  Organizational mindfulness originates in the study of high reliability organizations, such as aircraft carriers and nuclear power-generation stations, where failure and experimentation are untenable (Weick et al. 1999).  In studying IT adoption, mindfulness provides a way of understanding how organizations address adoption decisions related to new technologies (Butler and Gray 2006; Fichman 2004; Swanson and Ramiller 2004).  Not all technologies may be valuable, and the mindful organization is cognizant of that.  Thus, mindfulness influences the resulting value gained from technology adoption through the improvement of decisions related to the adoption itself—i.e., mindful organizations adopt IT only when it makes business sense and fits the needs of the organization within the specific competitive environment.  In addition to influencing technology adoption choices, mindfulness is also expected to play an important role in what an organization does with a technology once it is adopted.

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**Assimilation, Use, and IT Value**

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An extensive literature exists on the adoption, assimilation, and use of IT innovations, and a thorough review is beyond the scope of this work.  However, in

reviewing relevant points from this literature, two important observations can be made: (1) technology assimilation is a critical mediator in generating value from technology, and (2) understanding the specific conceptualization of assimilation is important to understanding the value created by a given technology.

The assimilation of IT has been characterized as a series of key events, the most significant being the acquisition of the system, (i.e., the technology is purchased by the organization) and the deployment of the technology throughout the organization (i.e., the organization implements and begins to use the system). Information technology cannot create value for an organization unless it is both acquired and deployed in the organization. The conceptualization of assimilation as an event or series of events, however, is very limited in helping to develop an understanding of how organizations obtain value from technology. In other words, the treatment of assimilation as binary (yes/no) provides very little insight into how characteristics of the implementation itself may influence performance outcomes. As an alternative, many researchers have instead opted for technology *use* as a key way to capture the assimilation of information technology within organizations (e.g., Armstrong and Sambamurthy 1999; Devaraj and Kohli 2003; Massetti and Zmud 1996; Zhu and Kraemer 2005). Generally, those organizations which use a system more extensively are argued to obtain more value from it, and empirical studies have largely supported this assertion (Armstrong and Sambamurthy 1999; Devaraj and Kohli 2003). This is the same underlying assumption that has driven much of the focus on use as a key measure of success at the individual level (DeLone and McLean 2003; DeLone and McLean 1992).

While use provides a way of characterizing how a technology has been assimilated within an organization, it has some limitations. The one-dimensional characterization loses potential richness in how the assimilation occurs. For example, use as characterized by employee interactions with a technology (e.g., Zhu and Kraemer 2002) may be much different than measures of actual use (e.g., Devaraj and Kohli 2003). Although issues related to differences in the objective and subjective measures of use have been extensively examined in the study of use on the individual level (Ettema 1985; Straub et al. 1995), these differences are likely to be exacerbated in the study of use at the organizational level, as organizational level use may include both the employees which use the technology and the automated processes which are configured as part of the technology implementation.

As an alternative to the single dimensional conceptualization of use, in this research we conceptualize assimilation as a second-order construct consisting of the *use* of employees and the *automation* of the technology implementation itself. *Use* captures the extent to which individuals within the organization look to the technology as an effective solution to tasks. *Automation* instead captures the extent to which different parts of the business process have been automated as part of the IT implementation. By capturing separately use originating from the employees (use) and the implemented technology itself (automation) through a second-order construct, we provide a richer treatment of the understanding of assimilation and thereby extend theory focusing directly on the technology artifact (Benbasat and Zmud 2003; Orlikowski and Iacono 2001).

## 1.4 RESEARCH MODEL AND HYPOTHESES

This section provides the theoretical background and justification for the model outlined in Figure 1.2. In supporting this model, we integrate the streams of research outlined earlier to predict both the overall level of assimilation and the resulting business process performance.

### Strategic Change Orientation

Each of the three dimensions of SCO—technological opportunism, market orientation, and entrepreneurial orientation—are associated with specific organizational motivations and have associated organizational processes involved in the fulfillment of these motivations. Organizations high in technological opportunism have an underlying motivation and the processes to identify technologies relevant to business (Srinivasan et al. 2002). Likewise, organizations high in market orientation have underlying motivations to meet the needs of customers and the processes in which to identify when actions are necessary in order to meet those customer needs (Day 1994; Kirca et al. 2005). Finally, organizations high in entrepreneurship orientation have motivation to identify new markets in which to compete and the processes in place to identify those market opportunities (Attuahene-Gima and Ko 2001; Zhou et al. 2005). Thus, though three organizations, each high in only one of the dimensions of SCO, may react to different stimuli of an IT-enabled transformation, they may each enable a comparable response.

*SCO and IT Capabilities*

SCO is expected to positively influence the level of IT capabilities. The primary theoretical understanding of how organizations develop capabilities is through the

concept of dynamic capabilities. Dynamic capabilities refer to those firm capabilities that enable organizations to integrate, build, and reconfigure to address changes in the competitive environment (Teece et al. 1997). This perspective has provided an important way for researchers to understand how firms develop IT-related capabilities in the midst of continually changing technologies (Daniel and Wilson 2003; Sambamurthy et al. 2003; Wheeler 2002; Zhu and Kraemer 2002).

While the conceptualization of dynamic capabilities as a mechanism through which organizations develop capabilities has been extensively utilized, limited research has identified specific constructs which constitute dynamic capabilities. Here, we argue that SCO constitutes a dynamic capability because of its role in initiating changes. The presence of stimuli associated with the IT-enabled transformation will enable firms high in SCO to develop IT capabilities. In other words, the strategic processes associated with SCO will lead organizations to build the IT capabilities necessary to meet the challenges and opportunities of the competitive environment. As a result, we hypothesize:

*H1: Strategic change orientation is positively associated with IT-capabilities.*

*SCO and Climate for IT Use*

Climate, as noted earlier, can be generally characterized as the message the employees receive from the organization. When introducing IT to a particular situation, research has found that contextual factors can make a tremendous difference in both how the technology is perceived and how it is appropriated by members of the organization (Barely 1990; DeSanctis and Poole 1994; Fulk 1993). As a result, when technology becomes prevalent in a new context, the messages the members of the organization receive about this technology, which form the climate for IT use, can be expected to

originate from other more fundamental organizational characteristics captured by SCO. For example, if an organization high in market orientation had already established the importance of meeting customer needs, a CRM software package identified as a way to meet customer needs would more likely lead to a positive climate. Similar arguments would hold for both technological opportunism and entrepreneurial orientation. Therefore, we expect:

> *H2: Strategic change orientation is positively associated with the climate for IT*
> *use.*

*SCO and Mindfulness of IT Adoption*

Like the various components of SCO, mindfulness implies a distinct and measured process of issue identification, consideration, and response. This process involves matching the needs of the organization with the offerings of the technology. The opposite of mindfulness—i.e., mindlessness—implies that decisions are made as a result of trends and fads without consideration of the objective business case (Fiol and O'Connor 2003; Krieger 2005). SCO is expected to increase mindfulness through the increased sophistication of the decision making process. Thus, organizations high in SCO may be expected to more easily adopt mindful practices. It follows that:

> *H3: Strategic change orientation is positively associated with the mindfulness of*
> *IT adoption.*

*IT Capabilities and IT Assimilation*

IT capabilities and the broader theoretical lens of the RBV have provided researchers with an important way to understand how the effective management of technology can lead to improved business performance (Bharadwaj 2000). IT

capabilities have been argued to be multidimensional (for a review, see Wade and Hulland 2004), and the two dimensions examined here—IT management capabilities and IT infrastructure—influence assimilation in different ways. IT management capabilities may improve assimilation of the technology through improved system planning or implementation (Clemons and Row 1991; Mata et al. 1995). These capabilities allow organizations to more effectively bring IT-related innovations from the decision to adopt the technology through to full organizational assimilation.

IT infrastructure has also been found to be a critical firm capability necessary to fully take advantage of new technologies (Armstrong and Sambamurthy 1999; Keen 1991; Weill and Broadbent 1998). IT infrastructure can be categorized as a strategic option or real option (Bowman and Hurry 1993). The options lens provides a way for managers to view IT investments when the level of uncertainty is high, investments are irreversible, and projects are flexible in nature (Dixit and Pindyck 1994). The option enabled by infrastructure technology is the option to implement more complex technologies in the future, such as customer-focused information systems. A strong infrastructure may also enable the organizations to assimilate complex technologies more rapidly and at lower cost. Infrastructure may enable greater integration between systems and fewer user problems related to system failure and or unavailability. Together, IT management capabilities and IT infrastructure provide an important way of characterizing the IT capabilities of an organization and are expected to influence the level of IT assimilation that occurs. As a result, we hypothesize:

*H4: IT capabilities are positively associated with IT assimilation.*

*Climate for IT Use and Assimilation*

As indicated, climate originated as a way to conceptualize the message those in the organization receive relative to a specific action. A positive climate for IT use will improve assimilation in two key ways. First, because the general attitude of the organization toward a given technology improves with a more positive climate, the degree to which the individuals within that organization will use the systems involved will increase. Research on individual-level IT adoption has consistently shown subjective norm to be an important influence of an individual's use of the technology (Agarwal 2000; Karahanna and Limayem 2000; Venkatesh et al. 2003). This collective effect, captured on the organizational level through climate for IT use, is expected to influence overall assimilation levels. Second, as much of the investment in configuration, integration, and automation will only provide payback to the organization if associated systems are used by individuals, a positive climate for IT use will lead organizations to increase their investment in automated processes with the expectations of greater returns from use. In other words, organizations with more positive climates for IT use will invest more in assimilation because they expect the technology to be used and provide value. For these reasons, we hypothesize:

*H5: Climate for IT use is positively associated with IT assimilation.*

*Mindfulness of IT Adoption and Assimilation*

Mindfulness of IT adoption is also expected to be positively related to the level of IT assimilation. The importance of mindfulness in the adoption and appropriation of technology rests on the belief that engaging in systemic processes will lead to better decisions in evaluating a technology (Swanson and Ramiller 2004). In other words, sense-making processes involving the business implications of a new technology may be

necessary in order to effectively assimilate that technology into the organization (Anand and Peterson 2000). Mindful organizations will adopt the technologies that will be the most beneficial and pass on those technologies that involve a fad or bandwagon effect. The overall effect is that for a given group of organizations which have adopted a technology, those which engaged in mindful processes will be more likely to have a good fit between the technology and the organization. This fit can be expected to improve the overall assimilation within the organization, as the IT can be more easily integrated into business processes. In addition, as the process of mindful adoption is likely to inform the assimilation process more than mindless processes, mindful organizations will be more likely to take the implementation steps necessary to promote assimilation. Thus, we hypothesize:

*H6: Mindfulness of IT adoption is positively associated with IT assimilation.*

*Assimilation and Performance*

The extent of assimilation is also expected to be positively associated with performance. This general point has been made in the study of individual use of IT (Davis 1989; Venkatesh and Davis 2000; Venkatesh et al. 2003), IT appropriation or structuration (DeSanctis and Poole 1994; Orlikowski 1992, 2000), and technology assimilation (Armstrong and Sambamurthy 1999; Chatterjee et al. 2002; Fichman and Kemerer 1999; Gallivan 2001). Individuals, groups, and organizations must use technology in order for the technology to have an impact on organizations. As noted by Orlikowski (1992, p. 410), "On its own technology is of no import; it plays no meaningful role in human affairs. It is only through the appropriation of technology by humans (whether for productive or symbolic ends) that it plays a significant role and

exerts influence." Further, empirical studies have found the extent of IT assimilation and use to be an important mediator in the value generated by an IT system (Devaraj and Kohli 2003; Zhu and Kraemer 2005). Therefore, we hypothesize:

*H7: Assimilation is positively associated with process performance.*

*H8: Assimilation is positively associated with financial performance.*

An additional relationship between business process performance and financial performance is expected. Process performance benefits the organization in terms of operational benefits associated with productivity and inventory management. These intermediate process-related outcomes also have a relationship to financial performance, as improved productivity and lower inventory costs are also likely to result in improved financial performance. As a result, we hypothesize:

*H9: Process performance is positively associated with financial performance.*

## 1.5 RESEARCH METHODOLOGY

### Sampling and Data Collection

To facilitate the execution of this study, we partnered with a large online infomediary and CRM software provider for the retail auto industry, which we refer to hereafter as NetAuto. This partnership allowed access to senior level individuals within organizations which had implemented CRM software packages, and the organization had an existing mechanism to distribute and collect surveys. The subject pool included the sales, service, and general managers of auto retailers, identified from a listing of NetAuto's customers and public listings of auto retailers. Analysis was conducted on the level of the business unit, with sales and service business units measured separately. The population of dealerships selected with validated contact information was 893. An email

was sent to each individual asking them to participate in the study. In the email, we included a brief description of the study, informed them that the survey will take approximately 15-20 minutes to complete, and provided the hyperlink to the online survey. The first thing the respondent saw when directed to the survey was the informed consent form. After reading the consent form and selecting "I Agree," the dealership general manager, sales manager, or service manager began the survey. In an effort to improve the response to the survey, participants were offered a chance to be randomly selected for a prize of an IPOD Nano (4 were given away) and offered a summary of the results of the survey when completed. In addition, reminder letters were sent 2 weeks and 4 weeks after the initial contact, and follow-up phone calls were conducted during the 3 months following the initial contact.

**Measures**

Constructs were measured using scales that have been validated in previous research or developed in conjunction with industry professionals in order to ensure content validity. Unless specifically indicated otherwise, we measured items on a 7-point Likert scale with anchors 1 = "strongly disagree" and 7 = "strongly agree."
A full listing of the survey items is found in Appendix A.

Technological opportunism was measured using an abbreviated version of the scale developed by Srinivasan et al. (2002). A sample item for technological opportunism is "we actively seek intelligence on technological changes in the environment that are likely to affect our business." Measures of market orientation capture the degree to which the firm places customer needs at the top of its organizational chart, but the debate of how to measure market orientation has been extensive in the

marketing literature (Homburg and Pflesser 2000). The main division in the measurement of market orientation is whether market orientation is a series of organizational processes (Kohli and Jaworski 1990) or whether it is a type of culture (Navar and Slater 1990). The Navar and Slater scale was selected because it exhibited a high level of efficiency—i.e., it used fewer items to obtain a consistent measurement (Matsunoa et al. 2005). Because of the differing features of customer interactions in different industries, market orientation scales are frequently updated and adapted to the specific context in which they occur (Attuahene-Gima and Ko 2001; Dobni and Luffman 2003; Zhou et al. 2005). As a result, measures were adapted to conform to the retail auto industry. A sample item from the market orientation scale includes "We closely monitor and asses our level of commitment in serving customers' needs." Measures for entrepreneurial orientation capture the degree to which the organization engages in risk-taking and proactive behaviors and were based on Covin and Slevin (1989). A sample item for entrepreneurship orientation is "We are very often the first business to introduce new services to customers."

Measures of IT management capabilities and IT infrastructure were adopted from Bharadwaj et al. (1998). IT management capabilities capture the extent to which the organization effectively manages the IT function, including processes associated with the delivery, operation, and maintenance of systems. A sample item for IT management capabilities is "Our IT management team has established an effective system for IT planning." IT infrastructure captures the extent to which the organization has a foundation of networks, system architectures, and computers necessary for ensuring adequate processing capabilities. A sample item for IT infrastructure is "Our corporate

infrastructure (computers, networks, etc.) has appropriate network architecture to meet business needs."

Measures for *climate for IT use* were adopted from Schneider et al. (1998)'s measures of service climate and capture the extent to which employees within the organization receive a positive message about the use of IT. A sample item for climate for IT use is "How would you rate…the recognition and rewards employees receive for using the customer management system(s)?" The anchors low (1) to high (7) were used.

Measures for *mindfulness of IT adoption* were adapted from Knight's (2004) development of measures of collective mindfulness. These measures incorporated organizational qualities such as preoccupation with failure and reluctance to simplify interpretations (Weick et al. 1999). A sample item for mindfulness is "Our senior managers...take choices of whether we adopt a new technology very seriously."

Measures for the assimilation of systems are typically context-specific. As described earlier, our assimilation measures separately captured the degree to which the systems were used by individuals within the organization and the degree to which the systems were automated. In addition, we developed separate measures for assimilation in sales and service business units. These measures were developed through an examination of customer-focused systems and extensive consultations with industry experts and actual dealers. Measures for use captured the degree to which the systems were utilized by individuals within the organization to both store and gather information and analyze business processes. A sample item for use in the sales area included "Our dealership uses customer management system(s) to...record interactions with customers (i.e., phone calls, customer needs)." A sample item for use in the service area included "Our dealership

uses customer management system(s) to...record interactions with customers (i.e., service visits, direct marketing materials)." The measure for automation captured the degree to which systems had business and work tasks configured to run automatically. A sample item for automation in the sales area was, "Automated scheduling of tasks for members of the sales force." A sample item for automation in the service area was, "Automated creation of personalized service reminders." Scales for automation were adopted from Ray et al. (2005) and included the anchors: 0=Don't Intend to Implement, 1= Not yet begun, 3 = Standard Implementation, 5 = Advanced Implementation.

Objective performance data is often very difficult to obtain for privately-held firms and when data is needed on the level of the strategic business unit (SBU). As a result, researchers frequently collect performance data through survey measures. Prior research has found a high degree of correlation between subjective and objective measures of performance (Dess and Robinson 1984; Gerhart et al. 2000; Wall et al. 2004), and subjective measures of performance have frequently been utilized in organizational research (Barua et al. 2004; Guthrie 2001; Youndt et al. 1996; Zhou et al. 2005). With regard to the performance of firms, we are interested in both the process and financial measurements of performance at the level of the business unit. In addition, as different business units have different performance measures, we utilized business unit specific measures of process performance to capture operational improvements. A sample item for process performance in the sales area was "Please describe the extent customer management systems have affected…the level of service provided to customers." A sample item for process performance in the service area was "Please describe…the utilization of the service area (i.e., the percentage of capacity used)."

Financial performance captured the sales growth and profit level for both the period 1994-1996 (i.e., before the transformation) as well as the period 2002-2004 (i.e., after the transformation). Answers were captured using a 7-point Likert scale with anchors 1 = "much worse than competitors" and 7 = "much better than competitors."

From the original 893 individuals contacted, 153 useable responses were received, representing a response rate of 17%. Of the respondents, 106 answered questions related to the performance of the sales area and 47 related to the service area. The average number of employees among the respondent organization was 70.1 (SD=58.9). To address concerns of non-response bias (Armstrong and Overton 1977), we compared the responses of those individuals who responded after the initial email to those who had responded after the phone follow-up. We did not find a statistical difference between these two groups.

<div align="center">

**Analysis**

</div>

To establish the convergent and divergent validity of the constructs and to examine the statistical significance of the proposed relationships, we used PLS. PLS has advantages over traditional regression-based analysis and covariance-based structural models because it has minimal requirements for sample size and makes few normality assumptions (Chin 1998). Our analysis involved two stages. We first examined the convergent and discriminant validity of the constructs through the measurement model and then examined the full set of structural relationships.

**Measurement Model**

Descriptive statistics for the constructs are shown in Table 1.1. Construct validity analysis with PLS was completed in accordance with the recommendations of Gefen and

Straub (2005). Convergent validity accesses the degree to which the item measures

represent a single construct. Outer model loadings greater than 0.70 are considered to

indicate adequate convergent validity (Fornell and Larcker 1981). As shown in Table

1.4, outer model loadings for each item were greater than 0.7, with most greater than 0.8.

Additional measures of convergent validity shown in Table 1.1 include Cronbach's alpha

and the reliability coefficient ($P_c$), each further supporting the convergent validity of the

item measures.

Discriminant validity assesses the degree to which item measures represent

unique constructs. Using PLS, discriminant validity is assessed through two criteria

(Chin 1998; Gefen and Straub 2005): (1) cross loadings for the item-factor correlation

table should be small and (2) the square root of the average variance extracted should be

larger than the inter-construct correlations. As is shown by the item-factor correlations in

Table 1.2 and the correlations matrix in Table 1.3, the measures show a high level of

discriminant validity. In sum, the results of the measurement model display an adequate

level of convergent and discriminant validity.

**Structural Model**

In the PLS structural model, path coefficients can be interpreted in the same way

as beta coefficients for regression analysis. As SCO, IT capabilities, and assimilation

each included second order constructs, the overall structural model was completed using

the factor scores from the confirmatory factor analysis, and all first order factors were

modeled as reflective. SCO was measured as a formative construct while IT capabilities

and assimilation were each measured with reflective indicators. As mentioned in the

theory, SCO can originate in any of the three strategic orientations, leading to a

conceptualization that is formative in nature. Dimensions of IT capabilities and assimilation, on the other hand, are expected to capture underlying qualities of the organization and are thus modeled as reflective.

All path coefficients and significance levels are shown in Figure 1.3. Strategic change orientation was highly related to IT capabilities (48% of variance explained), climate for IT use (47% of variance explained), and mindfulness of IT adoption (51% of variance explained). IT capabilities, climate, and mindfulness of IT adoption were slightly more weakly related to assimilation, jointly explaining nearly 47% of the variance in IT assimilation. IT assimilation was more strongly related to process performance (34% of variance explained) than financial performance (31% of variance explained), though both relationships were significant. The relationship between process performance and financial performance was in the hypothesized direction but not significant. Controls for sales vs. service were significant for the prediction of assimilation but not for performance. Overall, with the exception of H6 all hypotheses were supported.

## 1.6 DISCUSSION

A great deal of research has established the positive link between IT investment and firm performance (for a review, see Kohli and Devaraj 2003). However, the mechanisms through which value gets created and the organizational characteristics which enable some organizations to obtain more value than others are still topics of open interest for researchers and practitioners alike. In this work, we have integrated research from multiple theoretical foundations as a way to understand how organizations effectively respond to an IT-enabled transformation. Within a general theoretical

framework linking strategic orientation, change enablers, assimilation, and performance, we are able to identify theoretical mechanisms through which strategic orientation can have a performance impact. In doing so, we also identify and empirically measure organizational traits which improve the assimilation and resulting benefits from a given technology investment.

Strategic change orientation has provided a useful construct through which to understand how strategic characteristics of the organization may influence performance during an IT-enabled transformation. Technological opportunism, market orientation, and entrepreneurial orientations are highly related constructs that capture aspects of how organizations respond to change. Though organizations may respond for different reasons when faced with a competitive challenge, jointly understanding those characteristics which provide the underlying motivation to change is important to both manage change and understand the relevant benefits and challenges.

**Implications for Theory**

In addition to providing a look into those organizational characteristics which promote performance during an IT-enabled transformation, this work may also provide an integrated way of understanding the assimilation of different technologies within organizations. This can also be understood as an organizational-level model of IT use. The likely progression of an organizational-level model of IT use can be understood through the extensive work on technology adoption and use at the individual level. The technology acceptance mode (TAM) was integrated with social aspects of the theory of reasoned action (TRA), the performance aspects of social cognitive theory (SCT), and other contributing research to eventually emerge as the Unified Theory of Acceptance

and Use of Technology (UTAUT, Venkatesh et al. 2003). Similarly, a unified model

explaining why organizations use IT—i.e., an organizational level model of use—will

likely incorporate many of the constructs identified here. In sum, we argue that this

research provides an important extension to the understanding of IT use as an

organizational-level construct.

**Implications for Practice**

A key implication for practice is that organizations may influence the benefits

they obtain from IT investments as a result of their strategic orientation. This could have

both positive and negative feedback loops which may accentuate the effects on the

organization. Organizations with high levels of strategic change orientation may obtain

benefits which further support the ability to both use technology and to change

organizational practices. Similarly, organizations with low levels of strategic change

orientation may have little success with the assimilation of technology, further pushing

them towards both the avoidance of technology and change. In addition, this research

stresses the importance of establishing both technology use and automation as part of any

IT implementation.

**Limitations**

Prior to concluding, the limitations of the work must be acknowledged. External

validity can be assessed by considering the context in which the research took place. In

this research, we surveyed managers within a single industry—auto retailing. One

concern is that a single industry study may result in theory which is not generalizable to

other industries and contexts. While the fact that this work incorporated data from two

business units (sales and service) helps to mitigate this concern, future work should

examine the identified relationships within additional industries and technologies to access to what extent the findings are generalizable.

An additional limitation of the work is that independent and dependant measures were each gathered through survey techniques, thereby introducing the possibility of common method bias.  While a Harmon-single factor test for common method bias indicated that no more than 34% of the variance could be explained by any one factor, consistent with other works utilizing surveys, future work should assess to what extent the model adequately predicts objective financial performance measures.

A third potential source of bias is related to the use of a single key informant to obtain information about the organization.  While key informants are frequently used within the organizational literature, there is a great potential of measurement error when organizational properties are identified by only one person.  Individuals may answer questions in which they have limited knowledge of the specific domain, leading to assessments which do not specifically relate to the dependant variables.

A fourth potential source of bias is related to the use of the customers from a single organization—i.e., NetAuto.  While this enabled us to examine the role of organization factors in a situation in which the technology is held constant, this introduces a selection bias.  If there were specific organizational traits which caused the organization to adopt the CRM system in the first place, it may be that this research could under or over estimate the magnitude of the relationships for the industry in general.  However, in conversations which numbers dealerships we found that the there were no reasons to believe that the dealers surveyed differed systematically from the overall population of dealerships.

## 1.7 SUMMARY

Information technology can have an important influence on competition in many industries, and effectively responding to IT-enabled transformations can be critical to firm performance.  By understanding better how organizations can respond to IT-enabled transformations, we can provide both practical recommendations to managers and technology vendors while improving the value organizations derive from IT.  This research integrates theoretical perspectives which capture both the willingness and the ability of the organization to respond to change.

# 1.8 FIGURES

## FIGURE 1.1 - CONCEPTUAL FRAMEWORK

```
Strategic          Change        IT            Business         Organizational
Change     →       Enablers  →   Assimilation →Process     →    Performance
Orientation                                    Performance

                        Research Focus
                    IT-Enabled Transformation
```
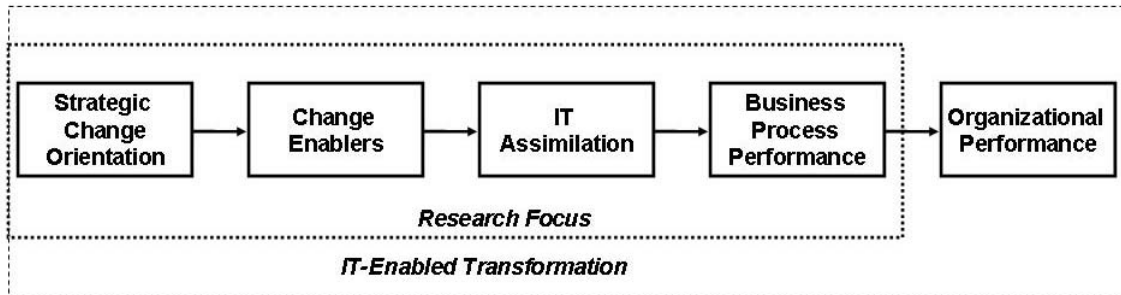
## FIGURE 1.2 – RESEARCH MODEL

```
                    IT Capabilities                          Financial
                                                             Performance

Strategic Change →  Climate for    →  Assimilation
Orientation         IT Use

                    Mindfulness of                           Process
                    IT Adoption                              Performance
```
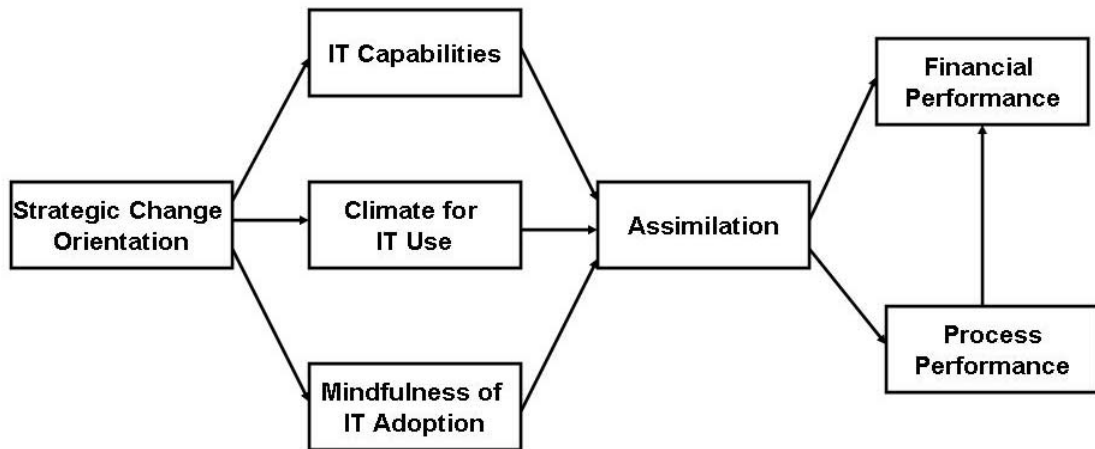
## 1.8.3 FIGURE 1.3 - PLS RESULTS
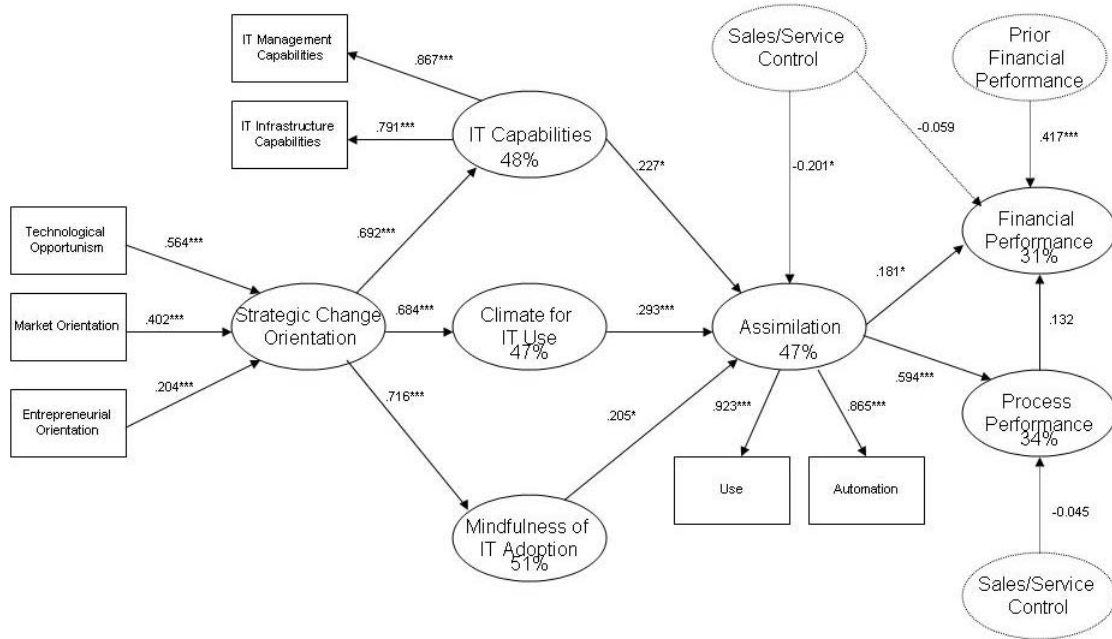


*Note: 1. \*\*\* significant at 0.001, \*\*significant at 0.01, \*significant at 0.05.*

**TABLE 1.1 - DESCRIPTIVE STATISTICS FOR SURVEY MEASURES**

| Variable | Mean | Std | Chronbach Alpha | $P_c$ |
|---|---|---|---|---|
| SCO: Technological Opportunism (TO) | 4.976 | 1.485 | 0.930 | 0.944 |
| SCO: Market Orientation (MO) | 6.215 | 0.941 | 0.824 | 0.876 |
| SCO: Entrepreneurial Orientation (EO) | 5.125 | 1.307 | 0.801 | 0.872 |
| ITCAP: IT Management Capabilities (ITMAN) | 5.186 | 1.342 | 0.907 | 0.934 |
| ITCAP: IT Infrastructure Capabilities (ITIN) | 5.567 | 1.324 | 0.943 | 0.958 |
| Climate for IT Use (CLIM) | 5.077 | 1.496 | 0.915 | 0.940 |
| Mindfulness of IT Adoption (MIND) | 5.622 | 1.205 | 0.947 | 0.956 |
| Assimilation: Automation (AUTO) | 3.394 | 1.187 | 0.846 | 0.897 |
| Assimilation: Use (USE) | 5.269 | 1.724 | 0.891 | 0.926 |
| Process Performance (PP) | 5.347 | 1.151 | 0.828 | 0.970 |
| Financial Performance Control (FPC) | 4.631 | 1.362 | 0.936 | 0.956 |
| Financial Performance (FP) | 5.308 | 1.289 | 0.910 | 0.901 |

Note: $P_c$ = Composite Reliability = $(\Sigma\lambda_i)^2/[(\Sigma\lambda_i)^2+\Sigma(1-\lambda_i^2)]$ where $\lambda_i$ is the factor loading.

## 1.9.2 TABLE 1.2 - CORRELATION MATRIX

| | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SCO: TO | **0.837** | | | | | | | | | | | |
| 2 | SCO: MO | 0.518 | **0.721** | | | | | | | | | | |
| 3 | SCO: EO | 0.621 | 0.519 | **0.717** | | | | | | | | | |
| 4 | ITCAP: ITMAN | 0.607 | 0.462 | 0.505 | **0.818** | | | | | | | | |
| 5 | ITCAP: ITFRA | 0.372 | 0.389 | 0.435 | 0.367 | **0.869** | | | | | | | |
| 6 | CLIM | 0.578 | 0.570 | 0.544 | 0.497 | 0.621 | **0.830** | | | | | | |
| 7 | MIND | 0.634 | 0.580 | 0.497 | 0.616 | 0.484 | 0.654 | **0.799** | | | | | |
| 8 | ASSIM: AUTO | 0.371 | 0.369 | 0.278 | 0.383 | 0.321 | 0.445 | 0.386 | **0.752** | | | | |
| 9 | ASSIM: USE | 0.511 | 0.471 | 0.392 | 0.529 | 0.460 | 0.562 | 0.578 | 0.610 | **0.802** | | | |
| 10 | FPC2 | 0.179 | 0.142 | 0.154 | 0.207 | 0.028 | 0.041 | 0.167 | 0.091 | 0.118 | **0.944** | | |
| 11 | FP2 | 0.389 | 0.290 | 0.298 | 0.387 | 0.226 | 0.255 | 0.298 | 0.201 | 0.353 | 0.469 | **0.922** | |
| 12 | PP | 0.363 | 0.358 | 0.350 | 0.543 | 0.378 | 0.500 | 0.376 | 0.497 | 0.539 | 0.186 | 0.307 | **0.803** |

Note: The bold values along the diagonal are the square root of the AVE (Average Variance Extracted). The off-diagonal variables are the correlations among the constructs. For discriminant validity, the square root of the AVE should be larger than the correlations (Gefen and Straub 2005).

**TABLE 1.3 - ITEM CORRELATION TABLE**

|        | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10    | 11   | 12   |
|--------|------|------|------|------|------|------|------|------|------|-------|------|------|
| TO1    | **0.92** | 0.49 | 0.55 | 0.53 | 0.35 | 0.54 | 0.63 | 0.37 | 0.48 | 0.21  | 0.35 | 0.31 |
| TO2    | **0.90** | 0.45 | 0.54 | 0.56 | 0.32 | 0.50 | 0.63 | 0.33 | 0.46 | 0.14  | 0.29 | 0.33 |
| TO3    | **0.87** | 0.48 | 0.58 | 0.49 | 0.33 | 0.51 | 0.53 | 0.30 | 0.50 | 0.11  | 0.39 | 0.27 |
| TO4    | **0.91** | 0.44 | 0.56 | 0.60 | 0.34 | 0.53 | 0.49 | 0.33 | 0.40 | 0.18  | 0.36 | 0.39 |
| MO1    | 0.44 | **0.80** | 0.36 | 0.45 | 0.37 | 0.46 | 0.50 | 0.24 | 0.46 | 0.14  | 0.29 | 0.25 |
| MO2    | 0.44 | **0.82** | 0.55 | 0.31 | 0.46 | 0.59 | 0.53 | 0.43 | 0.46 | 0.07  | 0.21 | 0.38 |
| MO3    | 0.40 | **0.77** | 0.27 | 0.40 | 0.09 | 0.31 | 0.42 | 0.24 | 0.34 | 0.21  | 0.30 | 0.23 |
| MO4    | 0.37 | **0.80** | 0.45 | 0.33 | 0.28 | 0.44 | 0.39 | 0.25 | 0.23 | 0.04  | 0.14 | 0.27 |
| EO1    | 0.53 | 0.47 | **0.84** | 0.46 | 0.35 | 0.41 | 0.44 | 0.24 | 0.29 | 0.16  | 0.28 | 0.32 |
| EO2    | 0.60 | 0.42 | **0.83** | 0.52 | 0.42 | 0.48 | 0.49 | 0.21 | 0.32 | 0.11  | 0.22 | 0.33 |
| EO3    | 0.32 | 0.37 | **0.74** | 0.23 | 0.34 | 0.40 | 0.26 | 0.17 | 0.31 | 0.13  | 0.20 | 0.16 |
| EO4    | 0.48 | 0.38 | **0.76** | 0.36 | 0.27 | 0.44 | 0.35 | 0.27 | 0.33 | 0.08  | 0.25 | 0.28 |
| ITMAN1 | 0.64 | 0.38 | 0.51 | **0.87** | 0.26 | 0.41 | 0.55 | 0.33 | 0.45 | 0.21  | 0.40 | 0.40 |
| ITMAN2 | 0.48 | 0.34 | 0.40 | **0.87** | 0.30 | 0.44 | 0.46 | 0.29 | 0.45 | 0.20  | 0.27 | 0.54 |
| ITMAN3 | 0.51 | 0.42 | 0.45 | **0.93** | 0.40 | 0.43 | 0.58 | 0.32 | 0.44 | 0.18  | 0.36 | 0.47 |
| ITMAN4 | 0.53 | 0.49 | 0.44 | **0.86** | 0.32 | 0.47 | 0.58 | 0.41 | 0.54 | 0.15  | 0.33 | 0.50 |
| INFRA1 | 0.38 | 0.34 | 0.48 | 0.37 | **0.91** | 0.60 | 0.48 | 0.25 | 0.41 | 0.08  | 0.22 | 0.34 |
| INFRA2 | 0.34 | 0.37 | 0.33 | 0.31 | **0.90** | 0.54 | 0.44 | 0.30 | 0.41 | -0.01 | 0.16 | 0.36 |
| INFRA3 | 0.31 | 0.40 | 0.36 | 0.37 | **0.93** | 0.59 | 0.44 | 0.35 | 0.45 | 0.02  | 0.22 | 0.37 |
| INFRA4 | 0.34 | 0.33 | 0.43 | 0.30 | **0.94** | 0.56 | 0.43 | 0.28 | 0.43 | 0.01  | 0.24 | 0.32 |
| CLIM1  | 0.54 | 0.54 | 0.42 | 0.44 | 0.53 | **0.91** | 0.67 | 0.43 | 0.49 | -0.03 | 0.20 | 0.42 |
| CLIM2  | 0.46 | 0.43 | 0.58 | 0.37 | 0.52 | **0.84** | 0.45 | 0.33 | 0.44 | 0.07  | 0.20 | 0.43 |
| CLIM3  | 0.55 | 0.56 | 0.46 | 0.48 | 0.59 | **0.93** | 0.69 | 0.42 | 0.54 | 0.02  | 0.23 | 0.45 |
| CLIM4  | 0.50 | 0.50 | 0.49 | 0.48 | 0.57 | **0.88** | 0.52 | 0.40 | 0.54 | 0.09  | 0.28 | 0.48 |
| MIND1  | 0.48 | 0.51 | 0.28 | 0.57 | 0.34 | 0.54 | **0.85** | 0.36 | 0.56 | 0.18  | 0.25 | 0.40 |
| MIND2  | 0.55 | 0.48 | 0.34 | 0.57 | 0.34 | 0.56 | **0.87** | 0.37 | 0.56 | 0.18  | 0.22 | 0.37 |
| MIND3  | 0.59 | 0.51 | 0.51 | 0.52 | 0.40 | 0.56 | **0.88** | 0.34 | 0.45 | 0.12  | 0.29 | 0.30 |
| MIND4  | 0.60 | 0.57 | 0.49 | 0.53 | 0.46 | 0.64 | **0.93** | 0.39 | 0.56 | 0.12  | 0.26 | 0.33 |
| MIND5  | 0.55 | 0.43 | 0.40 | 0.56 | 0.43 | 0.52 | **0.87** | 0.36 | 0.53 | 0.19  | 0.25 | 0.30 |
| MIND6  | 0.58 | 0.55 | 0.54 | 0.57 | 0.48 | 0.60 | **0.86** | 0.27 | 0.44 | 0.22  | 0.32 | 0.33 |
| MIND7  | 0.49 | 0.47 | 0.47 | 0.43 | 0.50 | 0.53 | **0.81** | 0.25 | 0.40 | -0.01 | 0.21 | 0.27 |
| AUTO1  | 0.30 | 0.24 | 0.18 | 0.25 | 0.14 | 0.24 | 0.22 | **0.78** | 0.46 | 0.16  | 0.14 | 0.38 |
| AUTO2  | 0.30 | 0.40 | 0.24 | 0.30 | 0.33 | 0.46 | 0.36 | **0.81** | 0.50 | 0.06  | 0.20 | 0.41 |
| AUTO3  | 0.29 | 0.30 | 0.19 | 0.30 | 0.21 | 0.34 | 0.32 | **0.88** | 0.51 | 0.03  | 0.11 | 0.42 |
| AUTO4  | 0.34 | 0.28 | 0.32 | 0.41 | 0.37 | 0.43 | 0.37 | **0.84** | 0.55 | 0.06  | 0.22 | 0.43 |
| USE1   | 0.42 | 0.30 | 0.28 | 0.40 | 0.38 | 0.48 | 0.42 | 0.47 | **0.84** | 0.08  | 0.21 | 0.43 |
| USE2   | 0.45 | 0.46 | 0.29 | 0.46 | 0.37 | 0.52 | 0.54 | 0.56 | **0.92** | 0.10  | 0.33 | 0.49 |
| USE3   | 0.54 | 0.41 | 0.37 | 0.52 | 0.47 | 0.52 | 0.55 | 0.58 | **0.91** | 0.09  | 0.37 | 0.52 |
| USE4   | 0.37 | 0.46 | 0.43 | 0.45 | 0.38 | 0.43 | 0.49 | 0.51 | **0.81** | 0.14  | 0.31 | 0.43 |
| FPC1   | 0.17 | 0.11 | 0.10 | 0.14 | 0.00 | 0.04 | 0.15 | 0.06 | 0.07 | **0.96**  | 0.40 | 0.13 |
| FPC2   | 0.17 | 0.16 | 0.19 | 0.25 | 0.05 | 0.04 | 0.17 | 0.11 | 0.15 | **0.98**  | 0.50 | 0.22 |
| FP1    | 0.38 | 0.27 | 0.25 | 0.35 | 0.20 | 0.23 | 0.28 | 0.16 | 0.29 | 0.49  | **0.96** | 0.28 |
| FP2    | 0.37 | 0.29 | 0.32 | 0.39 | 0.23 | 0.26 | 0.29 | 0.22 | 0.39 | 0.41  | **0.96** | 0.31 |
| PP1    | 0.30 | 0.28 | 0.31 | 0.50 | 0.32 | 0.41 | 0.32 | 0.38 | 0.47 | 0.14  | 0.26 | **0.90** |
| PP2    | 0.36 | 0.35 | 0.31 | 0.53 | 0.36 | 0.48 | 0.38 | 0.51 | 0.56 | 0.20  | 0.36 | **0.94** |
| PP3    | 0.29 | 0.30 | 0.31 | 0.36 | 0.30 | 0.42 | 0.26 | 0.38 | 0.33 | 0.13  | 0.13 | **0.76** |

**Note: Factor numbers refer to the appropriate factors as indicated in bold.**

**TABLE 1.4 - PLS OUTER MODEL LOADINGS**

| Item | Weight | PLS Outer Model Loading |
|------|--------|-------------------------|
| TO1 | 0.283 | 0.915 |
| TO2 | 0.276 | 0.905 |
| TO3 | 0.277 | 0.871 |
| TO4 | 0.276 | 0.906 |
| MO1 | 0.311 | 0.800 |
| MO2 | 0.350 | 0.820 |
| MO3 | 0.280 | 0.775 |
| MO4 | 0.308 | 0.802 |
| EO1 | 0.342 | 0.842 |
| EO2 | 0.350 | 0.831 |
| EO3 | 0.260 | 0.740 |
| EO4 | 0.301 | 0.760 |
| ITMAN1 | 0.263 | 0.866 |
| ITMAN2 | 0.275 | 0.874 |
| ITMAN3 | 0.313 | 0.932 |
| ITMAN4 | 0.280 | 0.863 |
| INFRA1 | 0.276 | 0.914 |
| INFRA2 | 0.261 | 0.899 |
| INFRA3 | 0.280 | 0.935 |
| INFRA4 | 0.267 | 0.940 |
| CLIM1 | 0.282 | 0.912 |
| CLIM2 | 0.257 | 0.844 |
| CLIM3 | 0.296 | 0.932 |
| CLIM4 | 0.284 | 0.882 |
| MIND1 | 0.157 | 0.846 |
| MIND2 | 0.164 | 0.874 |
| MIND3 | 0.169 | 0.879 |
| MIND4 | 0.185 | 0.931 |
| MIND5 | 0.162 | 0.874 |
| MIND6 | 0.166 | 0.863 |
| MIND7 | 0.146 | 0.811 |
| AUTO1 | 0.279 | 0.781 |
| AUTO2 | 0.298 | 0.809 |
| AUTO3 | 0.313 | 0.881 |
| AUTO4 | 0.318 | 0.838 |
| USE1 | 0.269 | 0.843 |
| USE2 | 0.302 | 0.917 |
| USE3 | 0.305 | 0.907 |
| USE4 | 0.271 | 0.813 |
| FPC1 | 0.462 | 0.964 |
| FPC2 | 0.568 | 0.976 |
| FP1 | 0.532 | 0.958 |
| FP2 | 0.513 | 0.955 |
| PP1 | 0.374 | 0.897 |
| PP2 | 0.482 | 0.939 |
| PP3 | 0.280 | 0.758 |

Note: All loadings significant at $p < 0.001$.

# CHAPTER 2: PROFITING FROM THE INTERNET CHANNEL: THE COMPLEMENTARITY OF ELECTRONIC COMMERCE CAPABILITIES AND BUSINESS PROCESS CHANGE

## 2.1 ABSTRACT

The emergence of the Internet channel presents opportunities and challenges for traditional retailers. As a result, understanding those factors that enable retailers to benefit from the Internet channel can aid in management decision making as well as contribute to the stream of research addressing electronic commerce. In this essay, we develop and empirically test a model which examines the complementarities between electronic commerce capabilities and business process change in influencing Internet channel performance. A survey of over 639 organizations in the retail auto industry enables us to empirically test the proposed model of Internet channel performance. We find that electronic commerce capabilities are made more effective when accompanied by business process change. These complementarities, however, are accompanied by a direct negative relationship between business process change and Internet channel performance that makes the net effect positive only for organizations with high levels of EC capabilities. By identifying the benefits and hazards of business process change, this research provides practical advice to practitioners while integrating theory from the resource based view (RBV) of the firm and business process reengineering (BPR) under a common complementarities framework.

**2.2 INTRODUCTION**

Information technology and the Internet have changed the way that many retail

organizations interact with consumers, providing both an efficient transaction mechanism

for retailers (Smith et al. 2000) and an efficient price comparison mechanism for

consumers (Bakos 1997). While the Internet channel typically offers retailers lower

prices compared to traditional offline channels (Brynjolfsson and Smith 2000), efficiency

gains from electronic communications offer the promise of lower costs (Barua et al.

1995), thereby creating the opportunity for retailers to provide increased value to

consumers. In order to benefit from the Internet channel, however, retailers must develop

the capabilities necessary to interact via the Web (Amit and Zott 2001). As a result, the

value proposition for selling online may be unclear for some retailers. Retailers must

justify the expenses which result from channel cannibalization (Viswanathan 2005), in

which individuals who would have purchased through the higher-price offline channel

select the lower-price online channel, and the expenses necessary for building the

capabilities to utilize the Internet channel. Therefore, understanding the factors that

influence a retailer's ability to create value through the Internet channel is an area of

importance for both practitioners and researchers alike.

As the Internet channel represents an important way for organizations to interact

with consumers, it has not surprisingly generated a great deal of interest from researchers.

A growing stream of research has addressed *consumers' use of the Internet,* examining

consumer web satisfaction (e.g., McKinney et al. 2002), price paid (e.g., Brynjolfsson

and Smith 2000), infomediary use (e.g., Scott-Morton et al. 2001), value (e.g., Keeney

1999), and welfare impacts (e.g., Brynjolfsson et al. 2003). Similarly, a second stream of

research has addressed *organizations' use of the Internet*, examining infomediary use (e.g., Chen et al. 2002), net-enablement (e.g., Wheeler 2002) and net-enabled business transformation (e.g., Barua et al. 2004; Straub and Watson 2001). While empirical examinations of outcomes from consumers' use of the Internet—i.e., price paid—have been common (e.g., Brynjolfsson and Smith 2000; Scott-Morton et al. 2001), empirical examinations of outcomes from organizations' use of the Internet—i.e., Internet channel performance—are lacking. One possible explanation for this may be that overall financial metrics do not typically capture outcomes by channel. As a result, few studies have specifically examined the drivers of Internet channel performance outcomes.

This paper seeks to fill this gap in the literature by examining the performance outcomes of business processes through which retailers interact with the Internet channel. Drawing from the resource-based view (RBV) of the firm (for a review, see Wade and Hulland 2004) and framing the research within the IT value stream (for a review, see Melville et al. 2004), we examine relationships among electronic commerce (EC) capabilities, business process change, and Internet channel performance. The RBV has given researchers a theoretical foundation to understand how organizations interact with the Internet channel (Amit and Zott 2001; Barua et al. 2004; Zhu and Kraemer 2002) and researchers have argued that capabilities are important to the generation of value from a production economics perspective (Bharadwaj 2000; Santhanam and Hartono 2003). While EC capabilities have been found to be an important driver of firm performance, little research has identified ways that existing EC capabilities can be made more valuable through the existence of other firm resources (for an exception, see Zhu 2004).

We test our model in the context of the auto retailing industry. Auto retailing represents the biggest retail sector in the US, with annual sales estimated at around a trillion dollars. In addition to being an important part of the US economy by itself, recent research and commentaries have pointed to the important contribution of industry-level studies. Findings by Hawawini et al (2003) reveal that industry-level effects may overshadow firm-level effects when examining the influence of radical IT innovation such as the Internet on organizational outcomes, suggesting that within-industry studies may be better able to examine the role of specific organizational characteristics in influencing organizational performance. Industry-level studies are also more likely to yield actionable outcomes managers will believe, increasing the relevance and impact of IS research (Agarwal and Lucas 2005; Chiasson and Davidson 2006).

The retail auto industry is also a compelling example of an industry that has undergone an IT-enabled transformation, as the emergence of online infomediaries and the web have lowered search costs and fundamentally altered the way that firms compete (Chen et al. 2002; Zettelmeyer 2000). Unlike most retail sectors, there is no national brand and the ten largest dealerships enjoy less than 6% of overall sales, resulting in significant variance in how organizations deal with the effects of industry transformation. Thus, an industry-level study of detailed organizational characteristics may inform practitioners of how to navigate the difficult road of technology transformation, making this research relevant, useful, and impactful (Agarwal and Lucas 2005). Our analysis of a survey of 639 auto retailers conducted by a leading market research organization includes both detailed measures of retailer characteristics and objective measures of Internet channel performance.

Through this research we make three main contributions.  First, we provide further support for the important role of electronic commerce capabilities in influencing Internet channel performance, demonstrating the dimensions of EC capabilities which are most likely to offer sustained benefits to retailers.  Second, by identifying the complementarities between electronic commerce capabilities and business process change, we are able to obtain a better understanding of the how organizations can make capabilities more effective in generating value for the organization.  Third, by identifying a negative relationship between business process change and Internet channel performance, we demonstrate that change efforts can have a negative consequence when not paired with the development of associated capabilities.  These contributions add to the growing literature utilizing complementarities as a theoretical lens through which to understand the role of IT-related capabilities in predicting important firm outcomes.

The rest of the paper is organized as follows.  In section one we review the relevant research related to the RBV and IT value—two streams that have been critical to the understanding of the relationship between technology and firm performance. Following this, we discuss the model of the retailers' interaction with the online channel, making arguments for the determinants of Internet channel performance.  We then review the sample and analysis technique.  We finally examine the implications of this research for retailers' use of the Internet.

## 2.3 LITERATURE REVIEW

In this section we review significant findings for the RBV and explore how it has been used in the IT value literature.

### The Resource Based View of the Firm

Originating in the field of strategic management (Barney 1986; 1991; Penrose 1959; Wernerfelt 1984), the resource-based view (RBV) of the firm has become a critical lens through which researchers have examined the drivers of firm performance and competitive advantage. The RBV suggests that firms compete on the basis of VRIN resources—those that are valuable, rare, inimitable, and non-substitutable (Barney 1991; Connor 1991). Possession of VRIN resources can lead to a temporary competitive advantage and positively influence performance, as shown through empirical studies in a variety of domains (Bharadwaj 2000; Dutta et al. 1999, 2005; Srivastava et al. 2001).

The RBV provides a useful framework for IS researchers to understand the strategic value of IT and its influence on firm performance. Using the RBV, researchers can characterize how specific technology-related capabilities influence firm outcomes, adding greater detail to the value creation process. In addition, as the RBV has been applied to numerous areas of organizational research, it provides a vehicle through which to compare the magnitude of the effects from IT to the effects from other organizational phenomena and a theoretical foundation through which to conduct cross-disciplinary research (Wade and Hulland 2004).

**Resources and Capability Identification**

The identification of resources and capabilities is an important step towards the use of the RBV to understand firm behavior and outcomes. Grant (1991) distinguished between resources and capabilities, defining resources as tangible assets of the firm and capabilities as a bundle of resources that has the potential for action. Wade and Hulland (2004) adopt the definition of *resources* as assets and capabilities which are useful in detecting or acting on threats or opportunities in the competitive environment (Sanchez et

al. 1996).  They further define *assets* as those resources associated with the development, manufacture, or sale of products and *capabilities* as repeatable organizational actions (Wade and Hulland 2004).

The identification of what constitutes a specific IT-related resource has created some challenges for IT researchers in particular.  Several studies have argued that IT resources can lead to a strategic advantage only when they are combined with other organizational resources (Clemons and Row 1991; Ross et al. 1996).  In examining specific types of IT resources, Mata et al. (1995) argued that of the variety of resources related to IT, only IT management skills can lead to a lasting strategic competitive advantage.  Multidimensional typologies of core IT capabilities have been developed by several researchers.  Feeny and Willcocks (1998) identified nine core IT-related capabilities including business systems thinking, relationship building, architecture planning, leadership, informed buying, contract facilitation, vendor development, contract monitoring, and making technology work.  Bharadwaj et al. (1998) suggested and empirically validated six dimensions of IT capabilities including IT business partnerships, external IT linkages, business IT strategic thinking, IT business process integration, IT management, and IT infrastructure.  In their review of the use of the RBV in IS research, Wade and Hulland (2004) integrated this prior research and identified three main categories (outside-in, spanning, and inside-out) of resources across a total of eight dimensions including manage external resources, market responsiveness, IT-business partnerships, IT planning and change management, IT infrastructure, IT technical skills,  IT development, and cost effective IT operations.  Outside-in resources influence the organization's outward-facing external relationship management and

market responsiveness. Spanning resources include IT-business partnerships and planning/change management. Inside-out resources include IT technical skills, IT development, and cost-effective IT operations. A summary of the dimensions found in competing frameworks is found in Table 2.1.

**Resource and Capability Measurement**

For empirical studies investigating IT and utilizing the RBV, difficulties in measurement have caused theoretical questions of what constitutes resources and capabilities to be addressed directly alongside empirical questions of how to measure them. Several researchers have utilized overall reputation as indicated by an *Information Week* list of IT innovation leaders by industry as a measure of IT capabilities (Bharadwaj 2000; Santhanam and Hartono 2003). This type of measurement has the advantage of being externally developed by a panel of industry experts. However, the use of a binary variable to represent IT capabilities does not allow for the analysis of incremental capabilities, is not consistent with the multidimensional capabilities specified by the RBV (Santhanam and Hartono 2003), and thus may provide limited insight into the specific mechanisms through which IT capabilities may influence organizational performance.

As an alternative, numerous studies have measured responses from key informants within organizations through a survey methodology. For example, Armstrong and Sambamurthy (1999) found that CIO capabilities and IT infrastructure each lead to IT assimilation. Ray et al. (2005) found that managerial IT knowledge and service climate positively influence customer outcomes. An advantage of this technique is that it enables the measurement of constructs not accessible through objective measures. While the key informant survey methodology has been extensively used throughout

organizational research, objections to this methodology are that measures typically reflect

the opinion of one individual and ignore the possibility that IT-related capabilities may

occur throughout various parts of the firm.

An alternative to survey measures is the use of metrics related to IT

functionalities, or specific system features/functions that organizations develop.

Although IT related capabilities are the constructs of theoretical interest, IT

functionalities are argued to be enabled by and thus reflective of underlying capabilities.

This approach has been used to measure capabilities related to electronic commerce (Zhu

2004; Zhu and Kraemer 2002) and net-enabled business processes (Barua et al. 2004).

The use of metrics or IT functionalities has the advantage that they are objective

measures which typically can be determined either through survey methodology or

through direct observation—i.e., from examining public press releases and websites.

Unlike typical survey measures, however, metrics have the disadvantage that they must

be updated as IT functionalities diffuse through an entire population of organizations and

new functionalities emerge.

**Complementarities**

In addition to the direct positive effect of IT resources and capabilities, the

complementarities among resources have also been of particular interest. Clemons and

Row (1991) argued that IT resources provide more value when paired with organizational

resources. In the context of electronic commerce, Zhu (2004) found that EC capabilities

were more valuable when combined with internal infrastructure resources. Similarly,

Barua et al. (2004) found that customer (supplier) focused capabilities were more

valuable when customers (suppliers) had a high degree of readiness for net-enabled

business processes.  Overall, by examining ways in which the overall efficiencies of business processes are improved through synergistic capabilities, the complementarities lens provides an important framework to understand organizational performance.

**Dynamic Capabilities**

Due to the changing nature of e-commerce technologies, the organizations' ability to develop systems related to net-enablement have been argued to be a dynamic capability (Wheeler 2002; Zhu and Kraemer 2002).  Dynamic capabilities refer to a firm's ability to adapt and change in high velocity environments that require new capabilities on an ongoing basis (Teece et al. 1997).  A firm must continually adapt e-commerce strategies, business practices, and technologies, and as a result the measurement of e-commerce capabilities actually reflects the firm's ability to change with the environment.  Wheeler (2002) used the dynamic capabilities perspective to develop a process model of the specific mechanisms through which firms develop IT capabilities and learn from both actions and the environment.  He suggests that organizations develop IT capabilities by a process of choosing technologies, matching technologies with opportunities, and acting on those opportunities.  Zahra and George (2002) also point out the importance of dynamic capabilities in examining how IT relates to organizations.

**The RBV and IT Value**

The resource-based view has frequently been used as a foundation for understanding the mechanisms through which IT creates value (Bharadwaj 2000; Santhanam and Hartono 2003).  A recent review article by Melville et al (2004) integrates prior research from each of these streams into a framework indicating how IT

creates value in organizations.  This framework conceptualizes the process through which

IT generates value as one in which IT resources and complementary organizational

resources interact to influence the performance of business processes.  The impact on

business process performance, in turn, influences organizational performance.  This

entire process is affected by contextual factors such as the country and industry in which

the business process takes place and the other trading partners that may be involved with

the business process.  Overall, this framework provides an effective way to begin to

understand how organizations create value through interacting with the online channel.

In sum, the RBV has provided a rich foundation through which to understand the

strategic importance of IT and how IT can influence firm outcomes.  It is useful both as a

way to theoretically understand those characteristics which enable firms to obtain

sustained competitive advantage and empirically examine those characteristics which

provide firms with value.

## 2.4 RESEARCH MODEL AND HYPOTHESES

In developing the model, shown in Figure 2.1, we adopt a complementarities-

based theoretical framework to understand how electronic commerce (EC) capabilities

and business process change relate to organizational performance.  Overall, the model

suggests that both the EC capabilities and business process change are important for

retailers to derive value from the Internet channel.

**Internet Channel Performance**

Understanding the ways through which information technologies influence the

performance of organizations is one the key themes of IS research.  While numerous

organizational studies have identified those factors influencing overall business

performance (e.g., Brynjolfsson and Hitt 1996; Zhu and Kraemer 2002; Zhu and Kraemer 2005), there are several advantages to studying the performance of the Internet channel—i.e., *Internet channel performance*—separately from overall organizational performance. In an industry such as auto retailing, many of the existing business processes have been significantly altered by the presence of the Internet. Measuring Internet channel performance directly gives us a way to understand and examine empirically those factors which enable organizations to be successful, as they incorporate a new model of sales provided by the Internet. Measuring overall organizational performance, while important, may not reveal the detailed process level factors which enable organizations to succeed in utilizing the Internet channel. This incorporation of business process specific outcomes has been a key theme within the IT value literature (e.g., Mukhodaphyay and Kekre 2002; Mukhopadhyay and Kekre 1995). In essence, examining process level performance enables us to determine how a given organization has been able to utilize the Internet channel as a way to grow overall sales.

**EC Capabilities**

We argue that EC capabilities will lead to increased Internet channel performance. EC capabilities refer directly to the ability of the organization to implement and manage systems supporting electronic commerce, a more specific version of overall IT capabilities. As outlined earlier, a rich literature has linked IT-related capabilities with firm performance (Bharadwaj 2000; Santhanam and Hartono 2003; Zhu and Kraemer 2002). IT-related capabilities benefit firms by making IT investment dollars more effective though lowered IT costs (Feeny and Willcocks 1998; Ross et al. 1996), better management of IT opportunities (Bharadwaj 2000; Bharadwaj et al. 1998; Mata et al.

1995), or increased impact of IT systems (Devaraj and Kohli 2003).  Similarly, EC capabilities are expected to enable retailers to effectively implement EC systems, take advantage of EC partnerships, and make sales through the Internet channel.  Thus, those retailers with high levels of EC capabilities would be better able to attract consumer leads and convert those leads to sales than those with low levels of EC capabilities.

Prior research has identified the multidimensional nature of EC capabilities.  As dimensions of EC capabilities are those which enable organizations to gain competitive advantage within a particular context, the dimensions need to be adapted to the specific context being evaluated.  When examining manufacturing firms, Zhu and Kraemer (2002) identified four dimensions of EC capabilities: (1) information; (2) transaction; (3) interaction and customization; and (4) supplier connection.  In the context of auto retailing, we conceptualize EC capabilities across three dimensions: (1) informational, (2) transactional, and (3) relational capabilities.  Informational capabilities provide useful information about products and services.  Transactional capabilities enable online purchases.  Within this population and time period, auto retailers had little ability to provide customers with the same types of customized options as the manufacturing sector examined by Zhu and Kramer, making the interaction and customization dimension less applicable.  In addition, the use of online infomediaries represents a critical way in which retailers interrelate with their customers online that is not adequately captured by the supplier connection dimension.  In this context, the relational capabilities dimension captures both the integration with suppliers (original equipment manufacturers) and online infomediaries.

Informational, transactional, and relational capabilities are each expected to influence performance through different mechanisms. Informational capabilities enable organizations to provide customers with the information they need to make decisions, thus increasing the likelihood they will purchase through the Internet channel. Transactional capabilities enable customers to easily obtain price quotes or make offers on vehicles, making the overall process of buying a vehicle or related product easier. Relational capabilities provide the dealership with leads to customers from trusted third party firms, such as infomediaries and manufacturers. This provides the dealer with access to customers that he or she may not have had access to otherwise. In addition, research has shown that the during the process of linking from a third party firm to a organization, institutional trust from the known third party is transferred to the unknown dealership, making the individual more likely to purchase (Stewart 2003). For these reasons, and the general benefits of EC capabilities discussed earlier, we expect:

*H1A: Informational capabilities are positively associated with Internet channel performance.*

*H1B: Transactional capabilities are positively associated with Internet channel performance.*

*H1C: Relational capabilities are positively associated with Internet channel performance.*

Zhu and Kraemer (2002) viewed all dimensions of EC capabilities equally, arguing that all dimensions of EC capabilities were reflective of an underlying construct—i.e, EC capabilities. However, there is reason to believe that different dimensions of EC capabilities may have different effects on performance, as each

dimension of EC capabilities may differ in how easily specific advantages can be imitated and competed away. Technologies emerge and are adopted by a population of organizations, and as all organizations adopt a technology the competitive benefits transferred to the organization are reduced or eliminated. As a result, those EC capabilities which cannot be easily competed away would be expected to provide the most value to organizations.

We argue that performance benefits from relational capabilities are less likely to be competed away and are therefore more likely to provide lasting value to retailers than informational or transactional capabilities. The development of informational and transactional capabilities may require the retailer to engage outside expertise or develop internal capabilities to actively manage the systems involved. These capabilities, however, offer the retailer no degree of exclusivity with respect to competitors. Even highly advanced web functionality can be relatively easily replicated or purchased from technology vendors. Thus, over the long run advantages related to informational and transactional capabilities are likely to be competed away. Relational capabilities, in contrast, typically involve exclusive relationships with an infomediary or manufacturer for a geographical area. As demonstrated analytically by Chen et al. (2002), both the informediaries and the dealers themselves benefit from the exclusive nature of these agreements. This is expected to result in relational capabilities having a greater impact on performance than informational or transactional capabilities. Thus, we hypothesize:

> *H2: The relationship between relational capabilities and performance is stronger*
>
> *than the relationship between informational or transactional capabilities and*
>
> *performance.*

**Business Process Change**

Prior research has highlighted the importance of the organizational changes which are often associated with technology investments (e.g., Broadbent and Weill 1999; Grover et al. 1998; Kettinger and Teng 1997). This research, however, has placed much of the emphasis on the business processes of enacting change (e.g., Datta 1998; El Sawy 2001; Kettinger and Teng 1997; Nissen 1998) rather than the outcome of the change itself. While procedures for business process change are quite important operationally, they do not provide information for decision makers regarding the likely benefits of business process change or how business process changes may influence the value derived from technology investments.

In this research, we argue that business process change makes EC capabilities more effective in influencing the performance of the Internet channel. This relationship is similar to that between EC capabilities and IT infrastructure examined by Zhu (2004), who found that EC capabilities were more effective in the presence of IT infrastructure. EC capabilities enable firms to take advantage of the Internet as a medium for the rich exchange of information with partners (Bakos 1998; Bakos and Brynjolfsson 1993). IT infrastructure improves the effectiveness of EC capabilities by bridging the Internet-enabled communications to the internal systems of the organization (Zhu 2004). Following a similar line of reasoning, complementary business process change makes EC capabilities more effective by aligning the external EC process with the internal firm resources. This may include providing a bridge to the human resources within the organization or ensuring that EC investments are adequately monitored and optimized. The development of these EC capabilities by themselves does not ensure that the

organization will have the internal resources necessary to take advantage of them. When organizations undergo business process change, they optimize business and workflow processes (Barua et al. 1996; El Sawy 2001), thus ensuring that technologies are adequately integrated into operations.

In the case of auto retailing, when dealerships become net-enabled, the Internet may be viewed either as an external function that provides a new way of obtaining leads or as a significantly new business process. Dealers treating the Internet as an external function may handle the leads in the same way in which they handle normal leads—allowing salesperson availability at the time the leads come in to determine who obtains the leads—making little change to the overall business process. Alternately, the dealership may redesign the business process to match the specific demands of the Internet channel, dedicating individuals with specific goals related to interacting with and tracking customers electronically. The choice made by the dealership of how to handle the consumer interactions initiated via the Internet, therefore, may have an important influence on Internet channel performance.

One reason for the importance of this type of business process change is the increased use of email and handheld devices, as consumers now may have a lower tolerance for delays in communication than they once did. Salespersons splitting time between online enquires and traditional walk-in customers may be much slower in responding to electronic communication. A dedicated group, however, would be able to effectively manage electronic communications with a large group of potential customers. Second, managing communications electronically may require extensive use of communication technology and with it significantly different skills than face-to-face

interaction. Third, in the technology adoption literature, social aspects have been found to be among the strongest reasons for technology adoption (for a review, see Venkatesh et al. 2003). Introducing a new technology and positively influencing perceptions of usefulness may be difficult in a group with established work processes. Instituting a dedicated group with the objective of handling Internet leads would lead the organization to develop its own social climate toward usage. Without a history of work processes, the social factors that influence the use of the technology would not have to be overcome— likely leading to more complete adoption of the technologies. The argument that the organizations which change business processes will be more effective is also consistent with the suggestion by El Sawy and Bowles (1997) that firms should reexamine customer processes that interact with the Internet. As the overall impact of complementary business process change on performance requires the existence of identified customers that have the ability and willingness to purchase, this suggests that business process change will moderate the relationship between each of the three dimensions of EC capabilities and Internet channel performance. Therefore, we hypothesize:

> *H3A: Complementary business process change positively moderates the relationship between the informational capabilities and Internet channel performance, such that the relationship is stronger when the organization has undergone business process change.*
>
> *H3B: Complementary business process change positively moderates the relationship between transactional capabilities and Internet channel performance, such that the relationship is stronger when the organization has undergone business process change.*

*H3C: Complementary business process change positively moderates the relationship between the relational capabilities and Internet channel performance, such that the relationship is stronger when the organization has undergone business process change.*

## 2.5 RESEARCH METHODOLOGY

### Sampling and Data Collection

The data for this study is drawn from the ongoing work of a leading market research organization. The organization contacted 17,160 dealerships and asked them to participate in a 30-minute online survey detailing aspects of their use of the online channel. As the overall population of dealerships in the US is nearly 23,000, this sample represented nearly 75% of the retail auto industry and included nearly all medium to large dealerships. From the initial email, 1,016 retailers completed the survey, representing a 6% response rate. The average number of vehicles sales per for the organizations responding to the survey was 990. This was higher than the average dealership sales reported during this timeframe, which was equal to 730 vehicles per year (NADA 2002). As the survey was primarily targeted at organizations use of the Internet, it is possible that larger organizations with established Internet operations may have been more likely to complete the survey. In addition, as the survey was conducted online, smaller firms may not have had the connectivity to be reached by the market research organization. Among the respondents, 283 did not report profit levels per vehicle. Additional listwise deletion of missing variables yielded 639 usable responses.. While the response rate is low, the sample size is overall very large and represents nearly 3% of the total population of dealerships. In addition, it is estimated that based on past experiences of the market

research organization, approximately 20% of the contact emails were not valid. Adjusting the number of organizations contacted downward by 20% results in an overall response rate for valid contacts of 5%.

## Measures

*Informational* capabilities were measured through four binary indicators of specific information-related functionality, such as "Lists all photos on websites." Similarly, *transactional* capabilities were measured through four binary indicators related to purchasing or furthering the purchase process online, such as "Price quote request form." Finally, *relational* capabilities were measured using number of total infomediaries and manufacturers in which the dealership has established relationships to receive customer leads, the total number of leads obtained, and the total invested in establishing relationships.

The measure for business process change indicates whether the retailer has established separate organizational resources to handle Internet-generated leads within the organization. Specifically, the retailer was asked "Are leads distributed to specific sales people who don't take regular floor traffic?" As discussed earlier, the designation of a separate business process is an important way for organizations to indicate that the Internet is not an external feed for leads but rather requires a new way of interacting with customers—i.e., it represents substantial business process change.

In order to determine the overall performance of the Internet channel, managers were asked to indicate the total number of sales originating in the Internet channel and the average profit per sale. This question was asked iteratively, where the respondent entered all of the sources of her Internet sales and then had the opportunity to adjust her

response after seeing the totals. Internet channel performance was measured by total Internet profit, which was calculated by multiplying the total Internet sales by the average profit per Internet sale.

Several other variables were included to control for other factors which may influence the overall Internet channel performance but where not hypothesized in the model. We controlled for the number of luxury brands (*luxury*), the number of domestic brands carried (*domestic*), and the number of imported brands (*import*) carried by the retailer. The overall sales volume as measured by the number of sales per month (*sales volume*) and the discount offered from the online channel (*online discount*) were also utilized as controls.

**Validity of EC Capabilities Measures**

As this research involved the use of EC capabilities measures specific to retailing, multiple tests of construct validity were completed according to established procedures. Measures for EC capabilities were relatively highly correlated (0.20-0.40) but exhibited adequate discriminant and convergent validity. We utilized exploratory factor analysis using the principal components approach with Varimax rotation to access discriminant validity. Entering each of the items for the EC capabilities yielded three factors. Loadings for the informational, transactional, and relational capabilities were each as expected, with all loadings >0.6 for all measures and <0.3 for cross loadings. The factor loading matrix is found in Table 2.3. In order to further confirm the factor structure, CFA with EQS 6.1 was used to examine the informational, transactional, and relational capabilities. Factor loadings for each measure were greater than 0.4, thereby exceeding the cutoff criteria of 0.4 set by Gefen et al. (2000). The overall fit for the measurement

model was as follows $X^2$(DF=32, N=1016) = 42.490 (N.S.); RMSEA =0.021 (0.000,0.036); CFI = 0.996; SRMR= .029 NFI= 0.985; NNFI = .994; IFI = .996.  The level of fit met the criteria provided by past research.  The RMSEA was less than 0.06, the CFI greater than 0.96, and the SRMR less than 0.10, meeting all three of the criteria suggested by Hu and Bentler (1999).  Overall, this suggests that the three dimensions of EC capabilities exhibit adequate discriminant and convergent validity, as indicated by both the principal component analysis and the CFA.

**Analysis and Results**

Our data analysis was completed using *ordinary least squares* (OLS) regression to examine the impact of EC capabilities and complementary business process change on Internet channel performance.  We centered the variable in order to reduce the possibility of multicollinearity due to inclusion of interaction terms for testing the moderation hypothesis.

Overall, the analyses indicated support for a model involving complementarities between EC capabilities and business process change in influencing Internet channel performance.  Direct effects for transactional and relational EC capabilities were found to be associated with higher levels of Internet channel performance, but the effect for informational EC capabilities was not significant.  In addition, the direct effect of business process change on the resulting performance level was negative, indicating that there may be some additional coordination costs which may reduce the benefits from business process change.  The interaction terms between information/relational EC capabilities and business process change were positive in influencing Internet channel performance.  A graph of the interaction of relational capabilities and business process

change, shown in Figure 2.2, indicates that the overall effect of business process change is positive only when relational capabilities are high. The interaction term between transactional EC capabilities and business process change was not significant.

Effect sizes for the relationships observed were well within the range where they represent significant financial incentives for the organizations within this industry. For the direct relationship between EC capabilities and profits, a one standard deviation increase in transactional capabilities was associated with an increase in monthly profits of nearly $1.5K while a one standard deviation increase in relational capabilities was associated with an increase in monthly profits of nearly $4.5K. The effects of complementarities were also in a range expected to be significant to the organizations studied. A one standard deviation change in both informational capabilities and business process change were associated with an increase in profit of $3K per month. A one standard deviation change in both relational capabilities and business process change were associated with an increase in profit of $5K per month. Statistics from NADA indicate that the average dealer had over $1.6 million in monthly new car sales but only $6.5K in net profits (NADA 2005). While the data reported in our analysis of the role of capabilities are gross profits—i.e., excluding the cost of goods sold but not including operational costs—it is still likely that they represent a sizable percentage of the dealerships' bottom-line. Overall, the effect sizes related to the models examined are of sufficient size that they are likely to have an important influence on the performance of the organization.

**2.6 DISCUSSION**

The RBV has recently received a great deal of focus within the IS community, as both IT-related capabilities and organizational characteristics complementary to IT-related capabilities have been identified.  This research extends this work by demonstrating the differing effects of different EC capabilities, integrating the role of business process change, and identifying the complementarities between business process change and EC capabilities in influencing Internet channel performance.  By directly assessing Internet channel performance within a single industry, we are also able to show those factors which help organizations to thrive within the context of an IT-enabled transformation.

**Implications for Theory**

A key contribution of this research is that it integrates the capabilities framework of the RBV literature with the concept of business process change from the business process reengineering (BPR) literature.  In doing so, it extends the literature in both areas and provides additional depth to the knowledge of complementarities in predicting performance.  This also suggests that additional linkages between existing literatures may be possible through a complementarities lens—allowing a more nuanced understanding of the process of IT value creation.

An additional contribution is related to the identification of the negative direct effect of business process change on performance.  This finding suggests that overall efforts to significantly changing business processes can be costly to the organization if not paired with the development of EC capabilities.  This finding suggests the need to understand the role of mindful practices (Weick et al. 1999) as they relate to business

process change.  In studying IT, mindfulness provides a way of capturing how organizations address adoption decisions related to new technologies (Butler and Gray 2006; Fichman 2004; Swanson and Ramiller 2004).  Here, a lack of mindfulness—i.e., mindlessness—may help to explain the negative outcome from business process change for some organizations.  Additional work should further explore the theoretical relationships between IT, business process change, mindfulness, and IT value.

The lack of significance of specific relationships in the model should also be acknowledged.  The direct relationship between informational capabilities and Internet channel performance was found to not be significant.  A key aspect of the RBV that is rarely acknowledged empirically is that some capabilities can be expected to loose competitive value over time as they are competed away.  This lack of significance suggests that informational capabilities may have reached this status.  As numerous technologies make it easier for organizations to place information on the web, it is likely that just the presence of information may not provide a competitive advantage, while information along with dedicated individuals with the incentives to ensure the information is correct and up-to-date—i.e., with the presence of business process change—still offers a performance benefit.

We also found that the interaction between transactional capabilities and business process change was not significant.  This suggests that transactional capabilities may not benefit from the same type of synergies with the rest of the organization that were found for informational and relational capabilities.  Transactional capabilities typically provide a specific business function, acting as a substitute for interactions with other organizational processes rather than as a compliment to other organizational processes, as

with informational and relational capabilities. More work is needed to further determine whether the results here may be generalizable or a result of the limited interactions between transactions and other organizational processes specific to the retail auto industry.

**Implications for Practice**

For organizations, this research provides insights into the performance benefits resulting from the development of EC capabilities. Transactional and relational capabilities had a direct performance benefit, while informational capabilities did not. Informational EC capabilities represent the most basic and imitable of the EC capabilities. This suggests that organizations should maximize investments in developing capabilities that will provide lasting organizational value.

This research also indicates both the potential benefits and the potential pitfalls of complementary business process change. Those organizations which are able to develop capabilities to execute electronic commerce are able to make those capabilities more valuable through business process change. This change does not come without a cost, however, and organizations must therefore assess both their level of commitment to electronic commerce and their ability to develop electronic commerce capabilities. These findings support much of the general disappointment associated with the returns from many business process reengineering efforts in the late 1990s.

It is also important to note that there is a potential negative impact of Internet sales on overall profits. While the Internet and the use of infomediaries enables organizations to gain market share by locating new customers, it also can cannibalize existing profits, as customers who would have purchased from the retailer at the higher

offline price obtain the online discount. Thus, organizations must pursue a strategy which attempts to maximize overall profits, setting online prices such that the negative effects of channel cannibalization do not outweigh the positive benefits of increased market share.

**Limitations**

A limitation of this research is that it takes place in a single industry and therefore may not be generalizable to other contexts. While this is a limitation of this work, the use of metrics and the effects from detailed organizational characteristics related to technology may only be detectible in single-industry studies, as industry-level effects may overshadow organizational-level effects for many types of technology impacts (Hawawini et al. 2003). As a result, future research should confirm the role of complementarities between EC capabilities and business process change within different industries.

A second potential limitation of this work is that the measures were collected using a single survey and thus were susceptible to common method bias. This is somewhat mitigated by the objective nature of the performance measures, and a Harmon's single factor test indicated that less that 25% of the variance was explained by any single factor. However, future work should consider the impact of complementarities between EC capabilities, business process change, and other measures of organizational performance which can be obtained from third party sources.

A third limitation of this work is related to the data being collected from a single source. Collecting data from a single individual within the organization increases the

likelihood of measurement error. While this is a frequent limitation of organizational studies, future work should attempt to obtain average values from multiple respondents.

A fourth limitation of this work is that single item binary measures were used to capture business process change. In reality, organizations may undergo several different types of business process change that may vary both in scope and degree. Different scopes and degrees of business process change may result in different resulting levels of value. Future work should access business process change using measures capturing specific changes made, as it may be that there are only certain aspects of changes that influence resulting performance outcomes.

## 2.7 SUMMARY

This research has provided a more complete understanding of the drivers of firm performance in the Internet channel. Specifically, we identify complementarities between EC capabilities and complementary business process change. In doing so, we provide guidance to firms making decisions related to investing in the Internet channel and optimizing existing Internet channel investments.
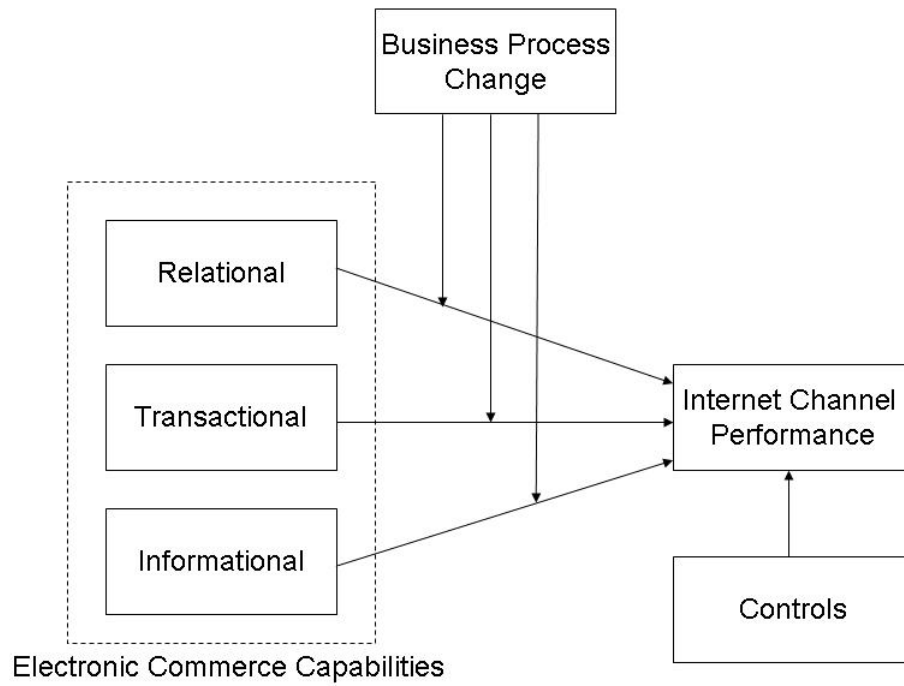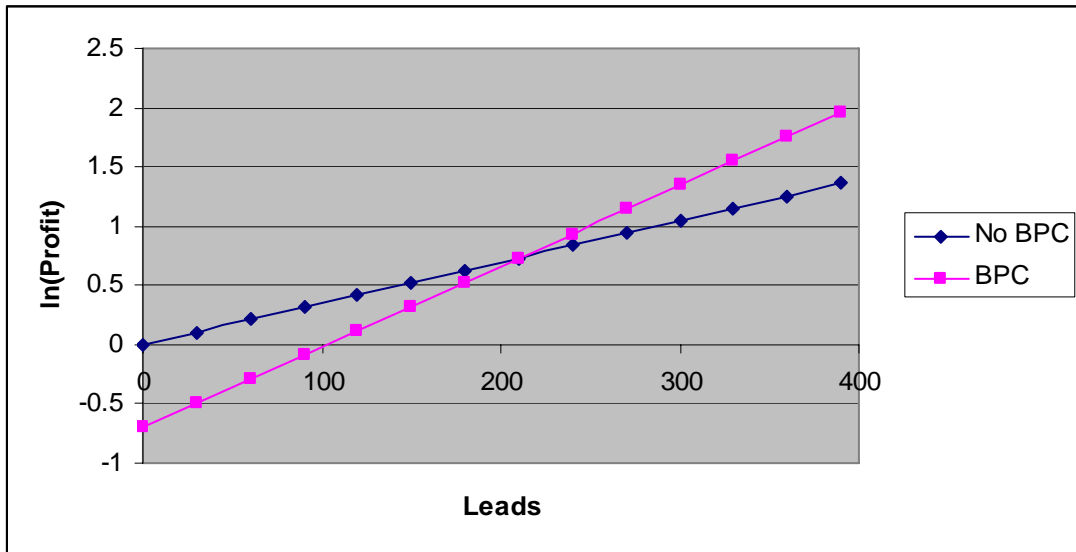
**2.8 FIGURES**

**FIGURE 2.1 – RESEARCH MODEL**

**FIGURE 2.2 - GRAPH OF PROFIT VS. NUMBER OF LEADS**

## 2.9 TABLES

### TABLE 2.1 - SUMMARY OF TYPOLOGIES OF IT CAPABILITIES

| Framework | Dimensions |
|---|---|
| Wade and Hulland (2004) | 1. Manage external resources<br>2. Market responsiveness<br>3. IT-business partnerships<br>4. IT planning and change management<br>5. IT infrastructure<br>6. IT technical skills<br>7. IT development<br>8. Cost effective IT operations |
| Bharadwaj et al. (1998) | 1. IT business partnerships<br>2. External IT linkages<br>3. Business IT strategic thinking<br>4. IT business process integration<br>5. IT management<br>6. IT infrastructure |
| Feeny and Willcocks (1998) | 1. Business systems thinking<br>2. Relationship building<br>3. Architecture planning<br>4. Leadership<br>5. Informed buying<br>6. Contract facilitation<br>7. Vendor development<br>8. Contract monitoring<br>9. Making technology work |

**TABLE 2.2 - DESCRIPTIVE STATISTICS**

| | Mean | Std |
|---|---|---|
| Online Discount<br><br>*(Offline profit – Online Profit)/1000* | 0.394 | 0.465 |
| Size *(Total # sales/100)* | 0.865 | 0.802 |
| Domestic *(# of domestic brands)* | 0.535 | 0.499 |
| Import *(# of imported brands)* | 0.142 | 0.349 |
| Luxury *(# luxury brands)* | 0.076 | 0.265 |
| Informational (Metrics, see measures) | 2.510 | 1.630 |
| Transactional (Metrics, see measures) | 2.598 | 1.370 |
| Relational (Metrics, see measures) | 0.914 | 1.346 |
| Business Process Change (BPC) | 0.684 | 0.465 |
| ln(profit) | 8.700 | 1.619 |
| Profit | 15,930.160 | 30,061.780 |

**TABLE 2.3 - PRINCIPAL COMPONENT ANALYSIS**

|  | 1 | 2 | 3 |
|---|---|---|---|
| **Informational1** | 0.887 | | |
| **Informational2** | 0.871 | | |
| **Informational3** | 0.831 | | |
| **Informational4** | 0.733 | | |
| **Transactional1** | | 0.742 | |
| **Transactional2** | | 0.727 | |
| **Transactional3** | | 0.711 | |
| **Transactional4** | | 0.636 | |
| **Relational1** | | | 0.830 |
| **Relational2** | | | 0.765 |
| **Relational3** | | | 0.693 |

N = 1017

*Cross loadings less than 0.3 are not shown.

**TABLE 2.4 - CORRELATION TABLE**

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Informational | 1.000 | | | | | | | | |
| 2. Transactional | 0.446 | 1.000 | | | | | | | |
| 3. Relational | 0.290 | 0.196 | 1.000 | | | | | | |
| 4. Business Process Change | -0.216 | -0.115 | -0.337 | 1.000 | | | | | |
| 5. Performance | 0.210 | 0.090 | 0.694 | -0.221 | 1.000 | | | | |
| 6. Online Discount | 0.001 | -0.066 | -0.033 | 0.059 | -0.049 | 1.000 | | | |
| 7. Size | 0.297 | 0.143 | 0.585 | -0.319 | 0.523 | 0.000 | 1.000 | | |
| 8. Domestic | 0.115 | 0.075 | 0.141 | -0.076 | 0.019 | 0.042 | 0.107 | 1.000 | |
| 9. Import | -0.143 | -0.042 | -0.277 | 0.157 | -0.256 | -0.088 | -0.251 | -0.436 | 1.000 |
| 10. Luxury | 0.013 | -0.110 | 0.054 | -0.037 | 0.141 | 0.120 | 0.016 | -0.116 | -0.307 |

**TABLE 2.5 - REGRESSION ANALYSIS RESULTS PREDICTING LN(PROFIT)**

| | Direct | Interaction |
|---|---|---|
| Intercept | 7.935*** | 8.429*** |
| *Controls* | | |
| Online Discount <br> *(Offline profit – Online Profit)/1000* | -0.472*** | -0.475*** |
| Size *(Total # sales/100)* | 0.328*** | 0.339*** |
| Domestic *(# of domestic brands)* | -0.498*** | -0.446*** |
| Import *(# of imported brands)* | -0.152 | -0.118 |
| Luxury *(# luxury brands)* | 0.504** | 0.520** |
| *Direct Effects* | | |
| Informational (Metrics, see measures) | 0.027 | -0.081 |
| Transactional (Metrics, see measures) | 0.175*** | 0.162* |
| Relational (Leads/1000) | 0.476*** | 0.348*** |
| Business Process Change (BPC) | -0.330** | -1.052*** |
| *Interactions* | | |
| Informational*BPC | | 0.152* |
| Transactional*BPC | | -0.013 |
| Relational*BPC | | 0.335*** |
| Adjusted $R^2$ | 0.469 | 0.491 |
| F-value | 61.79 | 50.25 |
| N | 639 | 639 |

Note: * $p<0.05$  **$P<0.001$  ***$p<0.0001$

# CHAPTER 3: UNDERSTANDING RETAILER USE OF ONLINE AUCTION CHANNELS: STRATEGIES IN REPEATED SEARCH PROCESSES

## 3.1 ABSTRACT

We examine sellers' use of the online auctions for vehicles at eBay Motors through the theoretical lens of search theory, viewing sellers' interaction with online auctions as a process of searching for high-valuation customers. The vehicle market on eBay motors has three distinguishing characteristics that make it ideal as a context to examine seller behavior. First, more than half of the auctions on the eBay motors website fail to lead to a completed transaction. Second, automobiles are somewhat unique in that their vehicle identification number (VIN) enables a tracking of outcomes for a single item across multiple auctions and even across multiple channels. Third, because over 70% of sellers that sell through the eBay Motors channel are auto dealerships, auction outcomes can be observed alongside sellers' activities in other channels. We find that the characteristics for the market for a particular product type—particularly the price variance and mean of the prior offer distribution—along with the extent that a seller searches in other channels influence the resulting price premium the seller obtains. In addition, we find that the total duration of search (number of days in which an item is offered through the online channel) is negatively related to the resulting price premium while the number of auctions in which an item appears is positively related to the resulting price premium. This suggests that sellers discount their reserve price with time but benefit as the number of auctions in which an item appears increases. In sum, this research provides an understanding of how sellers use online auctions as part of an overall business process of selling an item.

## 3.2 INTRODUCTION

The Internet, along with the rapid adoption of electronic markets, has changed the way in which buyers and sellers locate each other and transact in many industries. Buyers and sellers now have access to many new channels—including web-based stores, infomediaries, and electronic auctions—and may utilize several of these channels as part of the sales process. Online auctions are one of the most widely adopted of these new channels, with eBay in 2005 alone attracting 68 million users, 1.8 billion items, and $43.2 billion in gross merchandise volume (eBay 2005). As sellers may utilize auctions in different ways as part of their overall sales strategy, understanding how sellers use and obtain benefits from these online auctions is an important area for researchers to pursue.

There have been a number of studies of online auctions, examining topics such as the validity of analytical model predictions (Lucking-Reiley 1999), the role of new auction mechanisms (Budish and Takeyama 2001; Stephen 2001), and bidder behavior (Bapna et al. 2004; Roth and Ockenfels 2000). While existing studies have greatly increased our understanding of outcomes from individual online auctions, a notable gap in the literature acknowledged by Wood (2004) is that there are "few articles on seller strategies (other than reputation) that can be employed to gain a larger price paid." For example, very little is known about how external factors related to the market, the product, or the seller may influence the seller's reserve price—the key lever that the seller uses to control the minimum price obtained from a sale. By better understanding the underlying motivations and resulting impact related to seller strategies and behaviors, we can better understand how sellers can optimize profits and market makers can best serve both buyers and sellers.

This research examines seller behavior in the use of the electronic markets for vehicles at eBay Motors, conceptualizing a seller's use of the auction channel as a process of searching for high-valuation customers (Genesove 1995). A basic tenet of search theory is that individuals optimize their search behavior based on the tradeoffs between the expected benefits and the expected costs from search (Diamond 1985). Consumer search behavior has frequently used *duration of search* as a key way to understand shopping behavior in the retail channel (e.g., Banks and Moorthy 1999; Dellaert and Haubl 2004; Johnson et al. 2004). Here, we conceptualize seller search behavior through the *duration of search* and the *number of auctions*. These highly related aspects of search behavior more fully capture the seller search process than duration of search alone. However, duration of search is modeled as the key optimizing variable by which sellers make decisions, as it is related to the seller's inventory holding costs. In the context of high-valuation goods such as vehicles, inventory holding costs can be quite large when compared to overall profit, and metrics such as the number of days vehicles have been on the lot are frequently used to drive operational decisions.

In understanding sellers' motivations, we incorporate an understanding of how external factors outside of the individual auction—namely, the sellers' search in other channels (SOC) and the product offer distribution—influence the duration of search and the resulting premium of the seller. SOC represents sellers' use of other channels for the same product—captured through a search for the VIN number using a popular search engine. By identifying sellers' activities in listing a particular item through other higher valuation channels, we develop an understanding of how these activities influence the sellers' activities in the auction channel. Similarly, characteristics of the product offer

distribution—that is the distribution of high bids for both those auctions which ended in a sale and those that did not—are expected to influence the willingness of the seller to search in the online channel. In sum, by identifying these key external factors related to the potential benefits that a seller obtains from search, we can understand both the duration of search and the resulting price premium obtained by the seller, thereby obtaining a more complete picture of the causes and consequences of seller search behavior. A framework describing the proposed relationships is found in Figure 3.1.

The vehicle market on eBay motors has three distinguishing characteristics that make it ideal as a context to examine seller behavior. First, more than half of the auctions on the eBay motors website fail to lead to a completed transaction. This suggests that sellers may employ complex strategies as they set and reset their reserve price in subsequent auctions for the same product. Second, automobiles are somewhat unique in that their vehicle identification number (VIN) enables a tracking of outcomes for a single item across multiple auctions and even across multiple channels. With the capability to observe how sellers use online auctions over time, we are able to obtain insights into the strategies employed by these sellers as part of the sales process. Third, because over 70% of sellers in the eBay Motors channel are auto dealerships which also have access to an offline channel, it gives us a way to understand auction outcomes in a context in which sellers have access to more than one channel. In sum, the eBay Motors channel provides a rich context in which to develop and empirically test a model of seller search behaviors and outcomes in the business process of selling a high-valuation product. We tested our model, shown in Figure 3.2, using a selection of 31,445 auctions for new and used vehicles.

There are two primary contributions of this paper.  First, as the role of the lower search costs of the Internet has primarily been viewed from the customers' perspective (e.g., Bakos 1997), viewing sellers' use of online auctions as a process of searching for a high-valuation customer provides a greater understanding of the role of low search costs in influencing stakeholder behaviors in electronic markets.  Second, as the value implications of technology use is an important theme in the IS literature (e.g., Devaraj and Kohli 2003; Zhu and Kraemer 2004), this research identifies how different aspects of use—namely, the seller strategies for re-listing items and searching other online channels—drive the value the organization obtains from the use of online auctions.

The rest of the paper is organized as follows.  First, we provide a description of the online auction mechanism and discuss relevant past research.  We then provide a brief overview of the search literature as it relates to electronic markets and explains the behavior of sellers.  This is followed by specific hypotheses related to the sellers' search in online auctions, the data and analysis techniques used, the results, and a discussion of the implications of this work.

### 3.3 LITERATURE REVIEW

In this section, we first discuss the context of this study—the online auto market at eBay motors—and provide background on other work which has examined online auctions.  Next, we provide a basic overview of the concepts governing search theory, with specific reference to how search theory has been applied to electronic markets and seller behavior.  This foundation then enables us to build a model predicting the causes and consequences of seller search behavior in the next section.

### The Online Auction

Beginning primarily as a market for collectibles and used consumer goods, the eBay site has continued to expand in the breadth of products offered and the number of individual items available. In 2000, eBay recognized the large number of autos being sold on its site and set up the eBay motors site—the sub-unit of eBay specializing in automobiles and accessories. The number of vehicles sold through eBay has continued to grow rapidly, and eBay is used by retailers to sell both new and used vehicles, though used vehicles make up the vast majority of sales.

The auctions on eBay Motors follow the same rules as other eBay auctions, which have been described as second-price ascending proxy-bid auctions. The seller selects the reserve price, the starting bid, and the period of time over which the auction will occur (i.e., 3-10 days). Buyers search for items online and may choose to enter a "proxy bid," or the maximum amount that they are willing to pay for a vehicle. After a bid is placed the auction mechanism lists the highest bidder at an increment above the second highest bid. For example, a bid increment of $1.00 would result in a (proxy) bid of $15.00 for bidder A and a bid of $8.00 for bidder B being displayed as a high bid of $9.00. A more complete description of the auction mechanism used by eBay can be found in prior research (Aldridge 2005; Bajari and Hortacsu 2002).

For some, the existence of an online market for primarily used vehicles may be surprising in itself. Vehicles are typically considered to be high-involvement purchases, in which buyers often search extensively before making a purchase decision (Ratchford et al. 2003). As a result, purchasing a used vehicle without physically inspecting it initially appears to be something that would not appeal to many consumers. Akerlof's (1970) seminal paper examining aspects of used vehicles further casts doubt on the feasibility of

a market with lower levels of product quality information, as is the case with online auctions. He suggested that as information asymmetry increases, markets are more likely to fail as bad vehicles or "lemons" drive out the good vehicles through a process of adverse selection. Given that when inspecting automobiles through electronic markets individuals have less information than when inspecting automobiles in person, it would follow that that those sellers with lemons would be more likely to pick the online auction channel.

There are several associated findings, however, which may help to explain the thriving online auction market for used vehicles on eBay Motors. First, the presence of a feedback mechanism is one important design feature of online auctions that discourages opportunistic behavior (Dellarocas 2003). Feedback mechanisms work by enabling buyers to provide feedback on sellers and sellers to provide feedback on buyers. Since sellers obtain a price premium from high quality reputations (Ba and Pavlou 2002; Dellarocas 2005; Jeffrey 2005; Mikhail and James 2002), the mechanism discourages sellers from inaccurately representing the quality of goods sold. Second, tests of Ackerlof's hypothesis have indicated little empirical support in real world situations. An examination of repair records for the truck market suggest that buyers of used trucks less than 10 years old were no more likely than buyers of new trucks to experience repairs (Bond 1982, 1984). Engers et al. (2005) similarly found no greater incidence of problems for used vehicles when compared with new vehicles. A final factor driving the success of the online auction market for used vehicles is that online channels typically offer significantly lower prices and increased convenience for consumers. Scott-Morton et al. (2001) found that new vehicles sold through online infomediaries were discounted

an average of $450.  As a result, consumers may take advantage of the ability to purchase

autos at a significant discount from offline channels if those benefits outweigh the risks

posed by increased information asymmetry.  Overall, with the use of reputation

mechanisms to control information asymmetry and the advantages of cost savings,

consumers have moved in significant numbers to obtain the benefits offered by online

auctions for vehicles.

## Search Theory

It is well known that extensive streams of literature exist in economics and

marketing investigating both search and auction theory.  Diamond (1985) and Stiglitz

(1989) provide reviews of the search literature as it relates to consumer search for

commodity goods, and Klemperer (1999) and Milgrom (1987) provide excellent

overviews of auction theory.  This research draws directly from the extensive literature

on search theory, but a full review of the search literature is outside of the scope of this

article.  Instead, it is important to provide an overview of search theory as it has been

applied to the understanding of electronic markets, and seller behavior..

**Search Theory, Electronic Markets, and Seller Behavior**

Search theory provides a way through which to understand the behaviors of

individuals and organizations as they optimize the costs and benefits of the search

process.  It has been particularly useful as a way of understanding electronic markets, as

the Internet has lowered the cost of searching for and providing information.  Reviews

outlining the impact of the Internet have specifically focused on the importance of lower

consumer search costs (e.g., Bailey et al. 1999; Bakos 1998; Bakos 2001; Smith et al.

2000).  Stahl (1989) formalized the impact of decreased search costs, which result in

lowered prices and improved consumer welfare. Bakos (1997) subsequently examined the incentives sellers, buyers, and infomediaries have to invest in online markets, as well as the differing role of lowered search costs for product and price information.

While the majority of research has focused on the benefits accruing to consumers from the lower search costs associated with the use of electronic markets, recently several papers have identified the benefits accruing to sellers. Campbell et al. (2005) demonstrated that lower consumer search costs may lead to collusive behavior among retailers. When search costs are low, it is much easier for retailers to monitor the prices of competitors—reducing the benefits from "cheating" by lowering prices. As a result of the collusion, prices increase and overall consumer welfare decreases. Lynch and Ariely (2000) experimentally examined the impact of lowered search costs for product and price information on both differentiated and undifferentiated products. They found that when search costs were low for quality information, individuals were less price-sensitive. They also found that the ability to compare prices across stores had no impact on price sensitivity for unique products. In a related study, Kuksov (2004) found that when product design is treated as something that can be acted upon by firms, product differentiation can actually counteract the increased competition resulting from lower search costs. Firms choose to differentiate their products more when search costs are low. With increased differentiation, product fit with consumer preferences provides a differentiating factor which limits price competition. Together, these three articles suggest that sellers will employ strategies which offset the decline in profit resulting from the lowered search costs of the Internet.

**Search Theory and Seller Search**

*Seller search* is defined as the activities engaged in by a seller in her search for a customer to purchase a specific item. For many contexts, this process is not individually observable, as sellers set prices and advertise as a way of searching for customers. Auctions, however, provide a situation in which seller search is individually observable. While the study of auctions using a framework of search theory has been quite limited, an important related study by Genesove (1995) examined seller search in the context of wholesale auto auctions, a context that corresponds very closely to that of the eBay motors market. Because of this relationship, it is relevant to provide a more detailed overview of the similarities and differences between Genesove (1995) and this work.

Genesove (1995) utilized the offer distribution characteristics—particularly the mean and the variance of the offer distribution—to predict the likelihood of sale for a particular auction. More specifically, in the basic search model proposed by Genesove (1995), a seller has one vehicle, incurs a search cost for transporting the vehicle to the auction house, and knows the offer distribution for her vehicle type. She sets her reserve price, above which she will accept any offer and below which she will continue to search, discounting future revenue. The procedures used in this work for the calculation of the mean and the variance from the offer distribution are adapted directly from Genesove (1995). Key findings from Genesove (1995) are that both the mean and the variance of the distribution of prior offers influence the probability of sale. This work extends the work by Genesove (1995) by examining the longitudinal processes of seller use of online auctions for the same product as well as viewing the simultaneous use of multiple online channels. Genesove (1995) viewed single auction outcomes without taking into account

whether the vehicle had been auctioned previously or whether the seller has offered the vehicle in other channels.

The wholesale auction case examined by Genesove (1995) differs in two notable ways from the eBay motors auction. First, in the wholesale auction, the seller receives a bid and then makes a decision whether to continue searching or accept the offer. In the eBay motors case, the seller selects a reserve price before the auction and then receives the high bid at the end of the auction that may or may not meet the reserve price. While the time at which the seller sets her reserve price is different, when sellers ex-ante have knowledge of the distribution of prior sales they adopt the same reserve price strategy (Kohn and Shavell 1974), thus allowing us to adopt the same search-based framework.

A second difference is that the wholesale auction analysis was completely offline and did not allow for the simultaneous offering of an item in more than one channel. The separation of the informational and logistical components of a transaction is one of the key differences between offline and online auctions (Kambil and van Heck 1998), and thus exploring seller search behavior in the presence of the lower search costs of online auctions is an important contribution. In the next section, we incorporate the drivers and outcomes of search into a full model of seller search behavior and price outcome.

## 3.4 RESEARCH MODEL AND HYPOTHESES

In building our model of the seller search, we first discuss a key dependant variable of interest, the price premium of the seller. Next, we address the search behavior—with particular emphasis on the duration of search and the number of auctions. Finally, we examine the role of two external factors related to the potential benefits the seller may possibly expect from the sale of an item (1) the sellers' search in other

channels and (2) the distribution of prior offers (final high bid) for products of the same type.

## Seller's Price Premium

In marketplaces such as eBay, there is no standard market clearing price for an item of a particular type. Instead, the auction process enables a matching of buyers and sellers through active bidding. To understand the benefits of different seller behaviors, it is necessary to establish a reference point and then determine the performance of sellers relative to that reference point—i.e., to determine the price premium obtained by the seller. One possible reference point is the predicted price for a vehicle based on its characteristics and other comparable sales. However, this would result in the price premium for some sales being negative. In defining the price premium of the seller, we first assume that each individual item $(i)$ is of a particular type $(j)$. We further assume that for an item of type $j$, there exists a price $P_{MIN(j)}$, below which no seller will sell the item. The price premium that the seller obtains for an item $i$ of type $j$ is then the difference between the price paid by the highest bidder $(P_{ij})$ and $P_{MIN(j)}$. This calculation of premium is very similar to the procedure followed by Ratchford and Srinivasan (1993) for the determination of the returns from consumer search.

*Premium* $= P_{ij} - P_{MIN(j)}$

### *Duration of Search and Number of Auctions*

As stated earlier, we follow prior research in marketing and labor economics to use duration of search as a key focal variable to understand search behavior. However, the duration of search and the number of auctions are two distinct yet highly related components of the sellers' search behavior which may each independently influence the

outcomes from search. For example, a seller may list an item in 3 seven-day auctions or 7 three-day auctions and have the same total search duration. While studies have consistently found that longer auctions yield higher prices (Bajari and Hortacsu 2002; Lucking-Reiley et al. 2000), these studies are cross-sectional in that they compare only auctions in which the reserve price is met while ignoring auctions in which the reserve price is not met. As a result, it is unclear from prior empirical findings whether sellers are able, on average, to obtain a higher premium through a single long auction or multiple shorter auctions. Thus, a further objective of this research is to provide practical advice to sellers on the tradeoffs between these two options.

The relationship among the sellers' search behavior—i.e., the duration of search and the number of auctions—and the price premium depends upon both the stochastic aspects of the search process and the reserve price strategy employed by the seller. The longer the duration that a seller searches for a buyer, the stochastic properties of search suggest that it is more likely that a seller will locate a higher valuation buyer. Assuming a constant arrival of potential bidders, the longer auction clearly has an advantage in exposing the seller's product to more potential buyers and thus increasing the likelihood of finding a high-valuation buyer. The stochastic properties of search also provide a key explanation of why longer auctions have been found to yield higher prices (Bajari and Hortacsu 2002; Lucking-Reiley et al. 2000). Thus, the stochastic aspects of the search process suggest that duration of search will be positively related to the price obtained.

Whether the overall effect of the duration of search on the price obtained is positive or negative, however, depends on the reserve price strategy adopted by the seller. Two simple reserve price strategies involve (1) a constant reserve price or (2) a reserve

price discounting strategy. Prior work by Ashfelter et al. (2002) in auctions for impressionist and contemporary art—a market which has similarities to the online vehicle market in that the sales rate is low and the overall price is high—developed an analytical model which suggests that the optimal strategy is for sellers to set a reserve that is a constant proportion of the expected high bid of the auction. This is also consistent with a well known finding from labor economics that a worker's optimal strategy is to set a reserve wage and accept only jobs above that wage (e.g., Lippman and McCall 1976). As each time a seller lists an item on the online auction they receive a sample from the overall distribution of potential buyers, on average sellers selecting a higher reserve price would be less likely to find a buyer within a single auction (Genesove 1995), thereby increasing the overall duration of search and the number of auctions. When a buyer is found, the higher reserve can act to obtain a slightly higher price from the bidder with the highest valuation (Samuelson 1981). Thus, we can expect that if sellers adopt a constant reserve price strategy both duration of search and the number of auctions will be positively related to the price premium.

The reserve discounting strategy is one in which sellers reduce their reserve price with time. Sellers may be likely to adopt this strategy in order to incorporate additional information learned as part of the sales process. In addition, as the overall value of items is high relative to the cost of searching, sellers may be willing to start their reserve price very high as they hope to find a "sucker." Lucking-Reiley (2000) found evidence of this "sucker search" effect in the relationship between the fees charged by different auction sites and the percentages of auctions that ended in a sale. He found that in 1999 when auctions taking place on Yahoo.com did not charge a seller fee only 16% of transactions

ended in a sale. For auctions taking place on eBay, which did charge a fee, 54% of all

auctions ended in a sale. In addition to online auctions providing the opportunity to

search for a "sucker," listing an item in subsequent auctions also provides sellers with an

opportunity to reassess their valuations downward as they obtain more information about

the current market conditions. Laboratory studies confirm this general behavior, finding

that sellers generally adjust reserve prices downward in subsequent auctions (Burdett and

Vishwanath 1988; Rosenfield and Shapiro 1981). In sum, we can expect that if sellers

engage in a reserve price discounting strategy duration of search will be negatively

related to the price obtained.

We suggest that the low cost of search provided by the online environment will

result in sellers adopting a strategy of discounting their reserve price with time. While

online services exist to provide the seller with the expected market value for a given item,

non-homogenous goods such as used vehicles can be expected to have a great deal of

variation in the price that buyers pay. Even among new vehicles, typical pricing and

negotiation is such that buyers may pay significantly different prices for the same make

and model vehicle. For example, work by Scott-Morton et al. (2001) found that buyers

negotiating prices through online infomediaries paid on average $425 less than buyers

negotiating price in person for the same make and model new vehicle. As the overall

cost of searching for a buyer using an online auction can be expected to be quite low

compared to the variation in price for high-valuation items such as vehicles, searching the

market for a high-valuation buyer ("suckers") and adjusting the reserve price downward

over time is likely to appeal to many sellers. Under this strategy, those vehicles which

sell earlier will be the ones that yield the highest prices while those that sell in subsequent auctions will yield a lower prices. As a result, we hypothesize:

*H1a: For items sold in online auctions, seller's search duration is negatively associated with seller's price premium.*

*H1b: For items sold in online auctions, the number of auctions is negatively associated with the seller's price premium.*

**Determinants of Duration of Search**

It is important to note that the relationship between the antecedents of search behavior, the duration of search, and the resulting price paid is not fully mediated by the duration of search, as is shown in Figure 3.1. In each individual auction, it is possible that a seller will locate a high-valuation buyer. As a result, it is not necessary for a seller to search across multiple auctions to locate a single high-valuation buyer. Instead, the sellers' *willingness to search*—captured by the antecedents of search—influences both the search duration and the resulting price premium.

**Search in Other Channels**

The Internet offers many different opportunities and mechanisms for sellers to reach customers. These may include online infomediatries, online newspapers, or individual websites. We define *search in other channels* (SOC) as the seller's efforts to locate buyers in other online channels not including the eBay Motors channel. In most cases, it would be impossible to observe a seller's activities in multiple channels for the same product. However, in the context of vehicles, the unique VIN number along with the established practice of listing the VIN number when advertising a vehicle online enables us to measure SOC for each vehicle across different online channels.

SOC is expected to increase both the duration of search and the resulting seller's price premium. The justification for these relationships is related to the nature of the auction channel as a discount channel and the costs incurred as a result of SOC. Similar to electronic markets for coins (Bajari and Hortacsu 2002; Lucking-Reiley et al. 2000) and books (Brynjolfsson et al. 2003), the prices for vehicles purchased through online price negotiation mechanisms are lower than those purchased through the retail channel (Scott-Morton et al. 2001). While most online channels offering vehicles—i.e., Yahoo Autos, Autobytel, Cars Direct, or the dealers' website—may provide vehicle and price listing services, the actual negotiation process occurs face-to-face in the retail channel. As a result, other channels providing listing services without specific negotiation functionally can be considered as a way for the retailer to advertise for leads to the retail channel. An increase in the likelihood that a seller will sell an item through the higher-valuation retail channel will increase the seller's reserve price in the discount channel (Genesove 1995). In addition, when a seller experiences positive costs from advertising through multiple online channels, the price at which the seller experiences zero profit necessarily increases. In effect, a seller must set a higher reserve price in order to make the same level of profit. As a result, we expect:

> *H2a: For items sold in online auctions, seller's search in other channels (SOC) is positively associated with the seller's duration of search.*

> *H2b: For items sold in online auctions, seller's search in other channels (SOC) is positively associated with the seller's price premium.*

**Offer Distribution**

The online market for vehicles provides both buyers and sellers with a tremendous amount of information. This information can come from both auctions that end in a completed sale as well as those that do not. In other words, by placing a bid, an individual is communicating to the seller a willingness to purchase an item at a given price, and such additional information about the buyer's willingness to pay is helpful for the seller in setting the optimal reserve price (McAfee and Vincent 1992). We define the term *offer* to describe any auction that has at least one bid. The willingness of the seller to search and the resulting price premium are expected to be influenced by the offer distribution. We use both the expected offer mean and the expected offer variance as a way to capture the influence of the offer distribution on these outcomes, describing each effect individually.

The expected offer mean is predicted to be positively associated with the duration of search and the resulting price premium obtained by the seller. Like SOC, this relationship is also linked with the nature of online auctions as a discount channel. When a seller places a vehicle for sale in a discount channel, the resulting price the seller can be expected to obtain is significantly less than in the retail channel. Further, the amount of the discount typically is dependant on the overall vehicle price, such that buyers of more expensive vehicles obtain a greater discount (Scott-Morton et al. 2001). At the same time, the cost of re-listing an item on the online auction is a constant and not dependant on the price of the vehicle[1]. It follows from this that the opportunity costs for selling a more expensive vehicle online are greater than for a less expensive vehicle relative to the search costs, suggesting sellers will search longer and expect a greater price premium when the expected offer mean is higher. Empirical work by Genesove (1995) also

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[1] At the time the data was collected, the fee for listing a vehicle was $50.

supports a positive relationship between mean price and search duration, finding that an increase in the mean price decreases the probability of sale in any given auction. Thus, we hypothesize:

*H3a: For items sold in online auctions, the expected offer mean is positively associated with the seller's duration of search.*

*H3b: For items sold in online auctions, the expected offer mean is positively associated with the seller's price premium.*

An increase in the expected offer variance is also expected to increase the duration of search. The general intuition for this relationship is that an increase in the variance increases the potential benefits that a seller can hope to obtain from search. A seller marketing a product in a market with very low variance in offer price would have little incentive to search in more than one auction. The influence of the available benefits on search behavior is a central tenant of search theory (Diamond 1985). Analytical work by Balvers (1990) noted that an increase in this variance increases the willingness of an individual to search. This has also been supported empirically, as perceptions of price variance were found to influence the search effort of consumers (Duncan and Olshavsky 1982). In his study of seller search behavior in wholesale auctions, Genesove (1995) found that an increase in the variance in the price of a product decreases the probability of a sale while subsequently increasing the price obtained if the auction is successful. In this context, it is similarly expected that the increase in variance will increase the duration of search and the resulting price premium obtained by the seller. Therefore, we hypothesize:

*H4a: For items sold in online auctions, the expected offer variance is positively associated with the seller's duration of search.*

*H4b: For items sold in online auctions, the expected offer variance is positively associated with the seller's price premium.*

## 3.5 RESEARCH METHODOLOGY

We gathered data for 3 months of completed auctions from the eBay Motors website using an automated agent. This agent captured information about the characteristics of the vehicles, the sellers, and the auction itself. Vehicle characteristics included the VIN number, the number of miles, the existence of a seller warranty, the model year, and whether the vehicle was new or used. The first 9 digits of the VIN number were used to establish the model and trim level of the vehicle. Seller characteristics included the positive and negative feedback score of the seller. Auction characteristics measured included the starting bid, the number of bids, the high bid, and whether the auction ended with a completed sale. A second automated agent utilized a popular search engine to estimate the extent to which the seller searched in other channels (SOC) for the same vehicle, as identified by the unique 17-digit VIN number. We used the filtered number of unique pages returned as a proxy for SOC.

The overall dataset consisted of 450,040 auctions. Several steps were then taken to reduce the dataset to include only those vehicles in which the price premium could be accurately predicted. Because older vehicles typically have more variance in their overall condition, we first filtered our data to include only vehicles that were less than 5 years old. In addition, because we were primarily interested in understanding the behavior of dealers with access to more than one channel, we limited our analysis to only those

sellers that had sold at least 2 vehicles through the online auction channel. Next, as 30 is generally used as a rule of thumb as the number in which a distribution approximates the normal distribution, we eliminated all those models in which there were less than 30 completed sales. This filtering resulted in a total of 31,445 auctions that were analyzed, including 5,127 completed sales.

The analysis of the data was done in three stages. The first stage involved the calculation of the price premium obtained by the seller. For the reference point $P_{min}$ we used the lowest price that *any seller* would accept for a given model of vehicle (controlling for all vehicle characteristics) over the period of time in which the data was examined, controlling for vehicle and seller characteristics. To do this, we regressed vehicle and seller characteristics on the actual sale price to calculate the expected sale price based on the vehicle characteristics. Subtracting the actual sale price from the predicted sale price yielded a price residual which controlled for vehicle and seller characteristics. For each model of vehicle, as determined by the first 8 digits of the VIN number, the vehicle which had the most negative value for the residual was used as the reference point $P_{min}$. The price premium obtained was then calculated by subtracting the residual value for the vehicle designated as $P_{min}$ from the residual for all vehicles of the same model, yielding a condition adjusted value for the price premium. This is similar to the methodology used by Ratchford and Srinivasan (1993) in their calculation of the consumer price premium obtained from search, except in that work the dealer invoice price was used as a reference point.

The second step in the analysis involved calculating the *expected offer mean* and the *expected offer variance* using all auctions in which a single bid was placed—i.e., both

those that had ended in a sale and those that had not. In calculating the expected offer mean *(m_i)* for a given vehicle, the auction characteristics $x_i$, seller characteristics $y_i$, and vehicle characteristics $z_i$ were used as indicated in the equation below:

$$E[m_i| x_i, y_i, z_i] = \beta_0 + x_i\beta_1 + y_i\beta_2 + z_i\beta_3 \qquad (2)$$

The expected offer variance for a given vehicle can be calculated from the squared difference between the price $p_i$ and the expected mean offer $E[M_i| x_i, y_i, z_i]$. By regressing the auction characteristics $x_i$, seller characteristics $y_i$, and vehicle characteristics $z_i$ on the log of the squared residuals we can calculate the expected offer variance for each vehicle as indicated in the equation below.

$$E[(M_i - (\beta_0 + x_i\beta_1 + y_i\beta_2 + z_i\beta_3 \,|\, x_i, y_i, z_i))^2] = \exp(\alpha_0 + x_i\alpha_1 + y_i\alpha_2 + z_i\alpha_3) \quad (3)$$

We calculated the values for the expected offer mean and the expected offer variance using the equations above. As mentioned earlier, the procedure used follows that in related work, and addition details can be found in Genesove (1995). We first regressed the auction, seller, and vehicle characteristics on the offer price. This allowed us to calculate the expected offer mean for each vehicle. A second regression was then completed on the log of the squared difference between the expected offer mean and the actual high bid using the same auction, seller and vehicle predictors. The beta coefficients resulting from this second analysis were used to calculate the expected offer variance.

The final stage of the analysis was to examine the full system of equations used to predict the duration of search and the price premium obtained by the seller. Two instrumental variables were used in the analysis to enable the full system to meet the necessary rank and order criteria for identification. Appropriate instruments are highly

correlated with the dependant variables of the equation and not related to the other

independent variables. For the case of duration of search, the total number of vehicles

listed by the seller would be expected to influence the efficiency in which a seller

interacts with online auctions. This efficiency could be expected to be positively related

to the duration of search but not related to the price premium. In predicting the overall

price premium obtained by the seller, the number of bids can be expected to be positively

related to the overall premium but not to the duration of search. Other auction, vehicle,

and seller characteristics were omitted from this analysis because they were already

included in the calculation of the seller's price premium. The full system of equations

examined is shown below.

$$\log(\text{Premium}) = \beta_0 + \beta_1 \log(A) + \beta_2 \log(\text{SOC}) + \beta_3 E(M_{ij}) + \beta_4 \log(E(\text{Var}_{ij})) + \beta_5 \log(\text{Dur}) + \varepsilon$$

$$\log(\text{Dur}) = \beta_6 + \beta_7 \log(A) + \beta_8 \log(\text{OCS}) + \beta_9 E(M_{ij}) + \beta_{10} \log(E(\text{Var}_{ij})) + \beta_{11} \log(\text{Sold}) + \varepsilon$$

> *A = The number of auctions in which a vehicle has been offered*
>
> *SOC = Search in Other Channels (# of unique sites returned from search of VIN)*
>
> *E(M) = The estimated value for the offer mean, from equation 2*
>
> *E(Var) = The estimated offer variance, from equation 3*
>
> *Dur = The total duration of search (days)*
>
> *Sold = The total number of vehicles sold by the seller during the study*

The analysis of these equations was done using Three Stage Least Squares (3SLS)

estimation. The 3SLS systems estimator is used to calculate the full system of equations,

taking into account the endogenous relationships between the equations while controlling

for the potential correlation among the error terms. 3SLS combines 2SLS and SUR

methods to take into account both dependent repressors and cross-equation correlation of

errors, and is the recommended approach for triangular structural systems (Lahiri and Schmidt 1978), as in this study.

## Results

The first stage of the analysis involved calculating the price premium obtained by the seller. The regression analysis predicting the final sale price yielded an overall $R^2$ of 0.898, indicating that the characteristics of the vehicle, seller, and the auction provided a high degree of explanatory power. Positive feedback, a high starting bid, and the presence of a warranty each were associated with a higher price premium while negative feedback and the number of miles were each associated with a lower price premium. The results of this analysis are shown in Table 3.3. The predicted values calculated using the beta coefficients from Table 3.3 were used in order to calculate the price premium using the method described earlier.

The second stage of the analysis predicting the expected offer mean and the expected offer variance using the vehicle characteristics also indicated a high level of overall explanatory power, with an overall $R^2$ of 0.662 for the prediction of the expected offer mean and an overall $R^2$ of 0.226 for the expected variance. The results of the regression analysis are shown in Table 3.4. These analyses indicate that both the expected offer mean and the expected offer variance are influenced by the characteristics of the vehicles. Positive feedback had a positive influence on expected offer price and expected offer variance. A higher starting bid, a warranty, and a new vehicle each led to a higher offer and lower offer variance.

The results of the 3SLS analysis of the systems of equations indicate support for the hypothesized predictors, with the exception of the relationship between the number of

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auctions and the price premium. The results of the 3SLS analysis are shown in Table 3.5. As hypothesized, the expected offer mean and the expected offer variance were positively associated with both the duration of search and the resulting price premium. The SOC was positively associated with both the search duration and the resulting price premium of the seller. The duration of search was negatively associated with the price premium of the seller, indicating that sellers engaged in a reserve discounting strategy. Unexpectedly, the number of auctions was positively associated with the price premium, indicating that there were benefits to having multiple auctions.

Effect sizes for the relationships observed were well within the range where they represent significant financial incentives for the organizations within this industry. A one standard deviation change in the duration decreased the price premium by $150 while a one standard deviation increase in the number of auctions was associated with a $99 increase in the price premium. SOC is associated with a 0.1 day increase in the duration and a $117 price premium. Statistics from NADA indicate that the average dealer had over $9 million in sales, but only $90 thousand in profits, with an average profit of $141 on 638 vehicles. Using a discount rate of 8%, the inventory costs of holding each of the 638 vehicles for an additional week results in nearly 14 thousand dollars in inventory cost and represents 15% of the overall profit. Overall, the effect sizes related to models examined are of sufficient size that they are likely to have an important influence on the decision making and sales strategy related to online auctions.

### 3.6 DISCUSSION

This research provides a new way of viewing the outcome of subsequent auctions for the same individual product that has not been studied empirically by researchers.

While a great deal of research has identified factors influencing the outcomes of auctions, we extend prior work by showing how individual auctions can be influenced by external factors related to sellers' willingness to search. In reviewing the implications of these findings, we first discuss the findings related to SOC and then the findings related to the market characteristics of the mean and the variance of the offer price. We then further discuss the relationship between duration of search, number of auctions, and the price premium of the seller.

### *Search in Other Channels*

The results of the analysis also suggest that the extent to which sellers search in other channels (SOC) influences both the duration of search and the resulting price premium of the seller. These findings have implications for both buyers and market makers. Buyers may be able to use the SOC information as a way of identifying sellers likely to have lower reserve prices—i.e., those exclusively utilizing the online auction channel. The Internet and electronic markets make it easier for sellers to search for buyers using the Internet and online markets. However, this search process is not costless and sellers demand a price premium from buyers in the online auction channel when they have also listed a vehicle in other online sites.

Market makers may be able to provide greater value and charge additional fees for the bundling of services with other online channels. This service bundle may allow sellers to even more easily sell across multiple online channels, providing a method of price discrimination. Though selling in multiple channels online may not require a great degree of technical sophistication, sellers still have to interact with multiple interfaces to list a vehicle on multiple websites. An integration of these sites or automated tools which

enabled a seller to list a vehicle on multiple different sites using a single interface may lower the search costs of the seller and the buyer, increasing the overall efficiency of the market.

## Market Characteristics

We found that the market characteristics, as captured by the expected offer mean and the expected offer variance, influence both the search duration and the price premium of the seller. The influence of the expected offer mean and the expected offer variance was identified by Genesove (1995) in a cross sectional study of wholesale auto auctions which examined whether the reserve price would be met as an auction outcome. This research extends that work by examining the use of the auction channel across subsequent auctions for the same unique product, relating the expected offer mean and the expected offer variance to the price premium of the seller and the duration of search.

## Search Behavior

Our results indicated a negative relationship between the duration of search and the price premium obtained by the seller, suggesting a reserve discounting strategy. This results in a situation in which the seller's price premium decreases as the overall duration of search increases, as shown in Figure 3.3. One question that logically follows from this finding is *Do sellers search too much?* While a full normative analysis of the seller search process is outside of the scope of this work, a further examination of the data shows that in a sufficient number of cases they do. In examining all of the auctions in which the vehicle appeared in more than one auction, 6% of the time sellers accepted a price that was lower in the final auction (in which a sale occurred) than was offered in a prior auction in which the reserve price was not met. For these cases, the average

difference between the price offered in a prior auction and the final price accepted by the dealer was $879 (standard deviation = $1500), an amount over four times the average profit for used vehicles (NADA 2005). This loss is in addition to the inventory holding costs resulting from the extended search effort.

One way to understand the relationship between the use of electronic auctions observed here and duration of search is through the metaphor of the Icarus Paradox. Icarus was given the power to fly when his father Daedalus glued wings to his back. Once given the power fly, Icarus was too excited by his new ability and flew too close to the sun, melting his wings and falling to his doom. Within the IS literature, the Icarus Paradox has been used to understand the negative consequences resulting from managers having access to extensive information on business processes and operations as a result of advance enterprise systems. Pinsonneault and Rivard (1998) found that managers with access to these systems tended to overinvest in the informational component of their role as managers while neglecting other managerial roles (Pinsonneault and Rivard 1998). Our data suggests that sellers with access to the online auctions at eBay motors may tend to overinvest in the search for a high-valuation buyer while neglecting their key goal of optimizing the overall sales process. As a result, while the channel remains useful as a way for sellers to identify buyers, the overall efficiency of the channel is much lower than it could be if sellers engaged in a reservation price strategy as suggested by Ashenfelter et al. (2002).

The relationship between the number of auctions and the resulting price paid was unexpectedly positive. This can also be understood by graphing the same search duration for auctions of different lengths—a shorter auction length will yield a larger number of

auctions for the same auction length, as shown in Figure 3.4. One possible explanation for this effect is the widely observed bidding pattern known as sniping—in which greater than 80% of the bids occur in the final minute of the auction (Bapna 2003; Ockenfels and Roth 2001; Roth and Ockenfels 2000). The positive relationship between the number of auctions and the resulting price premium suggests that sellers may obtain more benefits from these additional periods of sniping activity than from additional auction days, making shorter auctions preferable. A second possible explanation is that because the seller can be shown to reduce her reserve price with time, those sellers utilizing shorter auctions make smaller adjustments in their reserve price. These small, targeted reductions thereby enable sellers to extract additional surplus from buyers. In sum, though we cannot provide a definitive reason for the relationship between price premium and the number of auctions without an experiment, this research suggests that sellers wishing to optimize inventory management should consider multiple shorter auctions.

An alternative explanation of the relationships observed can be considered from the perspective of the buyer. The buyer also has access to information related to the completion of prior auctions. This could result in learning whereby buyers access the price they are willing to pay based on the outcomes of prior auctions. Observing prior auctions which did not end in a sale may lead the buyer to fear winners curse (Bajari and Hortacsu 2002; Kagel and Levin 2002; Mehta and Lee 1999) or to expect that a seller's motivations to sell an item may increase. The interpretation of the results in this fashion, however, does not influence the overall understanding of the relationships as interpreted from the perspective of the seller.

**Implications for Theory**

Numerous papers have examined the design characteristics and outcomes of auctions, but relatively few have expanded the theoretical lens to include marketplace characteristics outside of the focal unit of the individual auction. This research suggests that there are important extensions to prior work which can be made by examining how sellers actually use online auction channels, and how auctions are influenced by both the overall sales process in which they occur and by external factors. In addition, this research has identified basic strategies that sellers employ in the use of the online auction channel. In doing so, it opens the door for researchers to examine the complex strategies sellers.

**Implications for Practice**

Our findings indicate that the low search costs of the Internet may entice sellers to search as a way of gathering information that actually may be freely—though not conveniently—available. Sellers have numerous resources available for pricing vehicles in the offline and wholesale market. Blue book and black book pricing guides have been computerized to enable the seller to have nearly instant access to the expected market value of vehicles. The same is not true for eBay Motors. A quick analysis of the eBay Motors market indicates that the clearing price for vehicles is frequently somewhere between the wholesale price and the trade-in value. Although dealers using eBay motors may have access to prior closed auctions, there is no widely utilized way of determining the expected clearing price for a given auction or for individual electronic channels.

This suggests that there may be a need for tools which help sellers to understand the expected market clearing price depending on the channel used to attract the buyer. Rather than general valuations, these channel-specific valuations systems would help the

seller to optimize investments in different online and offline channels. In addition, the tool could help the seller to be realistic about pricing decisions by informing the seller of the probability of sale at different reserve/listing prices for different channels. With a more complete understanding of the likelihood of sale at different prices, the seller may be less likely to overinvest in search, thus making the overall market more efficient.

An additional implication for market makers is related to the listing fees. This research indicates that many sellers tend to use multiple auctions as a way to gather information about buyers' willingness to pay. Currently, leading market makers such as eBay offer fixed listing fees for sellers independent of the length of the auction or whether the item has been offered previously. It appears from the findings here that retailers may desire additional flexibility to match their specific search preferences. For instance, some sellers may prefer an "auction bundle" of three three-day auctions to a single ten-day auction. Thus, the market maker could extract additional surplus by giving sellers the option to relist their product if it does not sell. An auction bundle may increase the ability of sellers to adjust their reserve price rapidly to the level that matches buyers' willingness to pay while increasing the amount of bidding activity.

**Limitations**

Before concluding it is important to acknowledge the limitations of this work. There were several limitations specifically associated with the data collected. First, as a measure of SOC we collected the number of records return by a search from a leading search engine. It is possible that this method may systematically omit results from specific types of sites—i.e., those that do not list the VIN number or have implemented methods which prevent indexing. Further, it is also possible that the values captured for

SOC could represent other sellers listing the vehicle. For example, it is possible that a dealer could list a vehicle online, sell the vehicle at a wholesale auction, and then a second seller could offer the vehicle over eBay. This situation, however, would likely only reduce overall effect of SOC on performance. Thus, the presence of a significant effect suggests that this may happen infrequently.

A second limitation in measurement is related to the fact that we were unable to capture transactions initiated via the online auction but are completed offline. For example, when a reservation price is not met for a sale, a seller could contact a buyer offline in an effort to negotiate a price verbally. As this analysis primarily focused on those vehicles which had been sold through the online channel, these vehicles would have been omitted from the statistical analysis. It is expected that the strategies of sellers would hold in this situation.

Finally, because our analysis captured auctions over a period of three months, it is possible that vehicles which where eventually sold were omitted from the analysis. This selection effect is necessary—the data analysis must end at some point. While the selection of vehicles sold within a specific time period could slightly reduce the mean level of search, as sellers searching for an extended period of time would be more likely to be eliminated from the actions, it is unlikely that this would have an influence on the relationships observed. Overall, the number of vehicles omitted because of timing would be quite small compared to the number of vehicles sold.

### 3.7 SUMMARY

In sum, this research provides a framework for understanding how sellers actually use the online auction channel as part of the overall sales process. In doing so, we both

identify relevant antecedents to search duration and the resulting relationship between

search duration and the price premium obtained by the seller.  By the incorporation of a

longitudinal component to the study of auction outcomes for the same product, we obtain

surprising results which can directly inform both theory and practice.

## 3.8 FIGURES
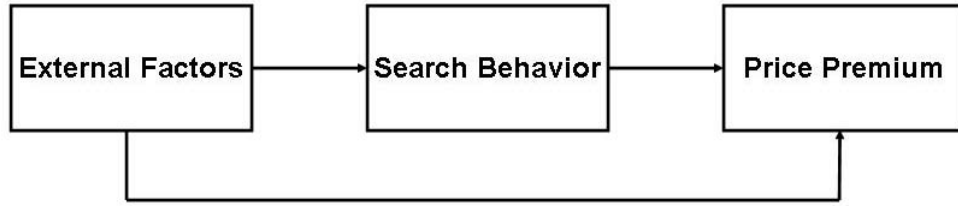
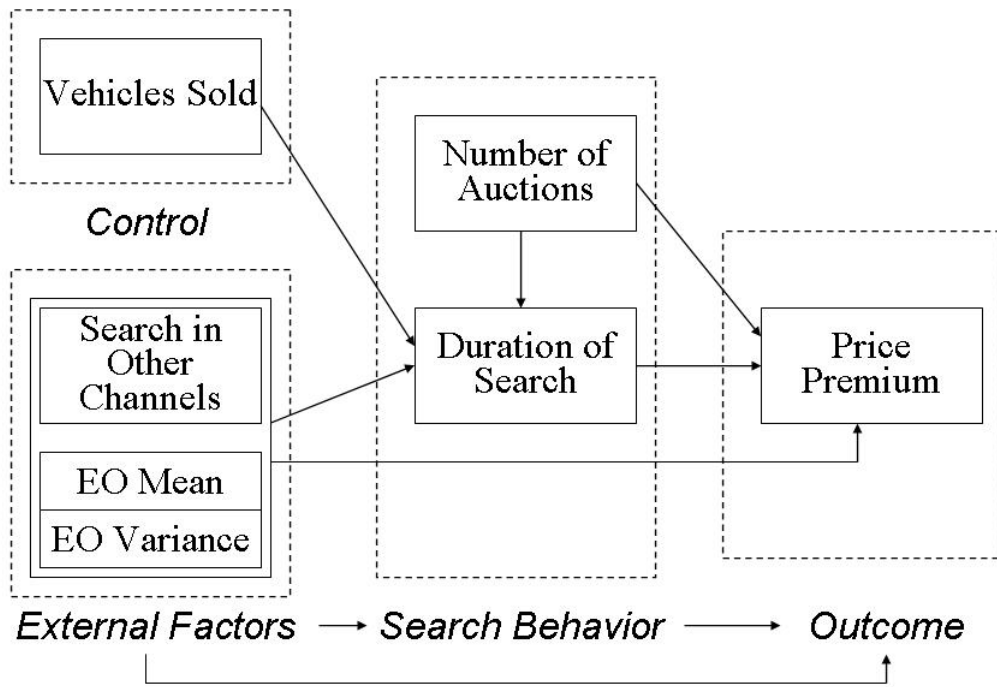### FIGURE 3.1 - CONCEPTUAL FRAMEWORK



### FIGURE 3.2 - RESEARCH MODEL
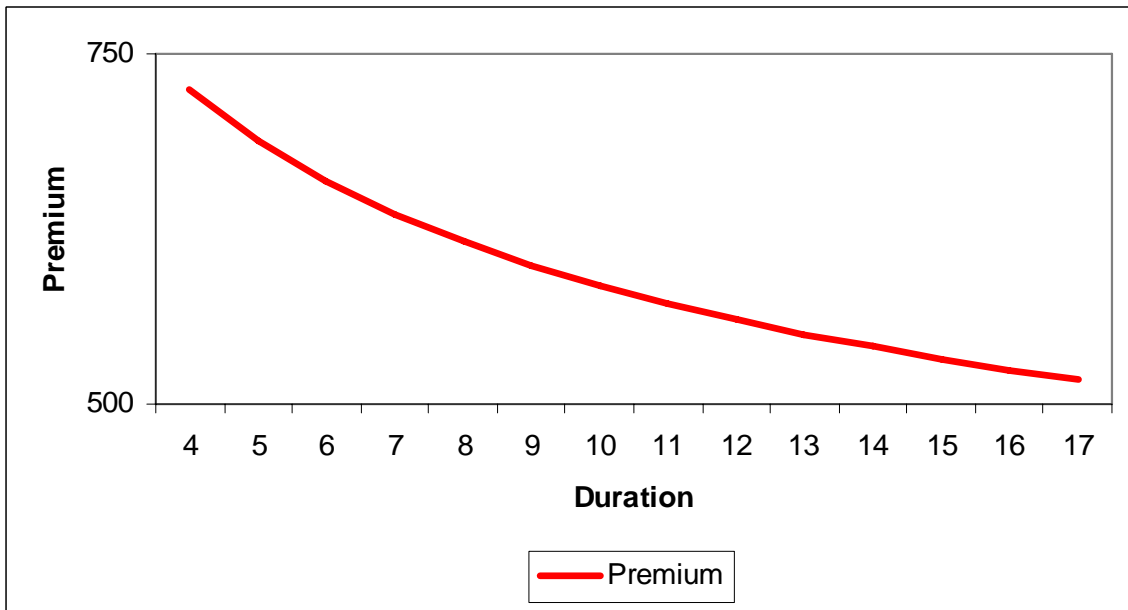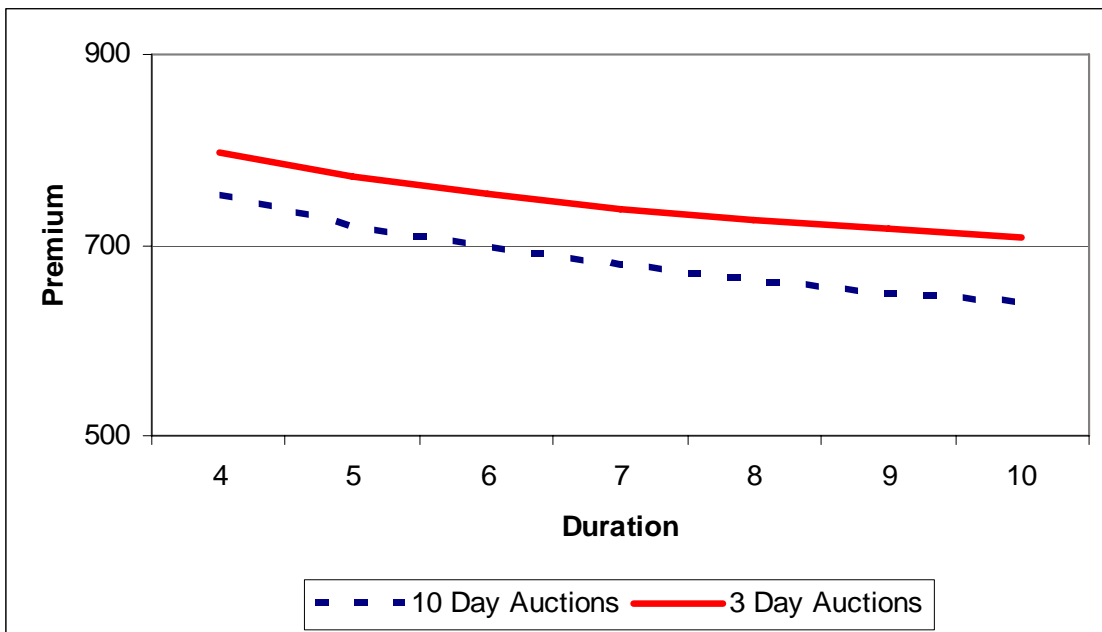
**FIGURE 3.3 - PLOT OF PRICE PREMIUM VS. DURATION**



**FIGURE 3.4 - PLOT OF PRICE PREMIUM VS. DURATION FOR DIFFERENT AUCTION LENGTHS**

**TABLE 3.1 - DESCRIPTIVE STATISTICS (ALL AUCTIONS ENDING IN SALE)**

| Variable | Mean | Std |
|---|---|---|
| Starting Bid *(thousand dollars)* | 3.965 | 8.067 |
| log (Positive Feedback) *(count)* | 4.469 | 1.765 |
| log (Negative Feedback) *(count)* | 0.906 | 0.969 |
| New *(yes/no)* | 0.011 | 0.106 |
| log (Miles) | 10.731 | 1.287 |
| Existing Warranty *(yes/no)* | 0.263 | 0.441 |
| Seller Warranty *(yes/no)* | 0.600 | 0.490 |
| log (Total Days) | 2.189 | 0.562 |
| log (Auctions) *(count)* | 0.232 | 0.420 |
| Price *(thousand dollars)* | 16.462 | 10.970 |
| Expected Offer Variance *(thousand dollars)* | 0.985 | 1.080 |
| Expected Offer Mean *(thousand dollars)* | 14.618 | 10.337 |
| log (Search Other Channels) *(count)* | 0.195 | 0.413 |
| log (Vehicles Sold) *(count)* | 0.201 | 0.406 |
| log (Bids) *(count)* | 2.846 | 0.892 |
| log (Price Premium) *(thousand dollars)* | 1.595 | 0.603 |

**TABLE 3.2 - CORRELATION MATRIX (ALL AUCTIONS ENDING IN SALE)**

| | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Starting Bid | 1.000 | | | | | | | | | | | | | | | |
| 2 | log (Positive Feedback) | -0.204 | 1.000 | | | | | | | | | | | | | | |
| 3 | log (Negative Feedback) | -0.119 | 0.647 | 1.000 | | | | | | | | | | | | | |
| 4 | New | 0.142 | -0.130 | -0.081 | 1.000 | | | | | | | | | | | | |
| 5 | log (Miles) | -0.306 | 0.195 | 0.153 | -0.614 | 1.000 | | | | | | | | | | | |
| 6 | Existing Warranty | 0.259 | -0.160 | -0.162 | 0.175 | -0.484 | 1.000 | | | | | | | | | | |
| 7 | Seller Warranty | -0.186 | 0.162 | 0.113 | -0.131 | 0.306 | -0.732 | 1.000 | | | | | | | | | |
| 8 | log (Total Days) | -0.016 | 0.145 | 0.025 | -0.031 | 0.036 | 0.022 | -0.012 | 1.000 | | | | | | | | |
| 9 | log (Auctions) | 0.010 | 0.117 | 0.039 | -0.020 | 0.042 | -0.004 | -0.003 | 0.712 | 1.000 | | | | | | | |
| 10 | Price | 0.479 | -0.097 | -0.107 | 0.158 | -0.460 | 0.475 | -0.336 | 0.048 | 0.017 | 1.000 | | | | | | |
| 11 | EO Mean | 0.356 | -0.099 | -0.115 | 0.239 | -0.559 | 0.456 | -0.385 | 0.038 | 0.015 | 0.793 | 1.000 | | | | | |
| 12 | EO Variance | 0.641 | -0.109 | -0.105 | 0.257 | -0.522 | 0.451 | -0.323 | 0.044 | 0.027 | 0.934 | 0.814 | 1.000 | | | | |
| 13 | log (SOC) | 0.061 | 0.000 | -0.020 | -0.023 | -0.083 | 0.147 | -0.065 | 0.069 | 0.038 | 0.202 | 0.153 | 0.169 | 1.000 | | | |
| 14 | log (Vehicles Sold) | -0.135 | 0.210 | 0.102 | -0.038 | 0.136 | -0.127 | 0.111 | 0.582 | 0.476 | -0.118 | -0.104 | -0.109 | -0.019 | 1.000 | | |
| 15 | log (Bids) | -0.579 | 0.213 | 0.110 | -0.046 | 0.100 | -0.069 | 0.066 | 0.000 | -0.026 | -0.055 | -0.046 | -0.186 | -0.003 | 0.125 | 1.000 | |
| 16 | log (Price Premium) | 0.081 | -0.038 | -0.002 | 0.157 | -0.220 | 0.051 | -0.051 | 0.002 | -0.032 | 0.433 | 0.316 | 0.249 | 0.079 | -0.098 | 0.068 | 1.000 |

**TABLE 3.3 – REGRESSION ANALYSIS OF FINAL SALE PRICE (USED IN CALCULATION OF PRICE PREMIUM)**

| Variable[1] | Sale Price Dependant |
|---|---|
| log (Positive Feedback) | 0.159***(0.039) |
| log (Negative Feedback) | -0.282***(0.070) |
| Starting bid | 0.086**(0.007) |
| log(Miles) | -0.652**(0.059) |
| Existing Warranty | 2.990***(0.202) |
| Seller Warranty | 1.097***(0.160) |
| New | -1.806*(0.821) |
| R-Squared | **0.898** |
| N | **5,127[1]** |

Note: * p<0.05  **P<0.001  ***p<0.0001
[1] Dummy variables for vehicle model not shown.
[2] Analysis includes all auctions ending in sale (i.e., the reserve price met)


**TABLE 3.4 – REGRESSION ANALYSIS OF EO MEAN AND EO VARIANCE**

| Variable[1] | EO Mean Dependant | EO Variance Dependant |
|---|---|---|
| log (Positive Feedback) | 0.261***(0.036) | 0.023**(0.008) |
| log (Negative Feedback) | -0.159*(0.081) | -0.033 (0.019) |
| Starting bid | 0.332***(0.005) | -0.002*(0.001) |
| log(Miles) | -1.507***(0.065) | -0.307***(0.015) |
| Existing Warranty | 0.723**(0.213) | -0.186**(0.049) |
| Seller Warranty | 0.652**(0.202) | -0.199***(0.047) |
| New | 8.703***(0.615) | -0.570***(0.142) |
| R-Squared | **0.662** | **0.226** |
| N | **31,445[2]** | **31,445[2]** |

Note: * p<0.05  **P<0.001  ***p<0.0001
[1] Dummy variables for vehicle model not shown
[2] Analysis includes all auctions (i.e., those in which the reserve price was met and those in which it was not met)

**TABLE 3.5 - 3SLS ANALYSIS OF DURATION OF SEARCH AND PRICE**

**PREMIUM**

| Variable | ln Duration Dependant | ln (Price Premium) Dependant |
|---|---|---|
| Vehicles Sold | 0.494***(0.015) | |
| Search in Other Channels | 0.065***(0.013) | 0.073** (0.020) |
| Expected Offer Mean | 0.002 (0.001) | 0.001$^{\psi}$ (0.001) |
| Expected Offer Variance | 0.017*(0.008) | 0.170***(0.013) |
| Number of Auctions | 0.651***(0.013) | 0.137**(0.043) |
| Duration of Search | | -0.233***(0.045) |
| R-Squared | 0.423 | |
| N | 5127 | |

Note: * $p<0.05$  **$P<0.001$  ***$p<0.0001$

**APPENDICES**

**APPENDIX A – ESSAY 1 MEASURES**

**Strategic Change Orientation**

*Technological Opportunism (Srinivasan et al. 2002)*

(1 = strongly disagree; 7 = strongly agree)

1. We are often one of the first in our industry to find new technology that may potentially affect our business.

2. We are always on the lookout for information on new technology for our business.

3. We periodically measure how changes in technology affect our business.

4. The top management of the dealership has a strong emphasis on technological innovation.

*Market Orientation (Navar and Slater 1990)*

(1 = strongly disagree; 7 = strongly agree)

1. Our competitive advantage is based on understanding and meeting our customers' needs.

2. Our managers understand how employees can provide value to customers.

3. We frequently measure customer satisfaction.

4. We pay close attention to after-sales service and maintenance.

*Entrepreneurial Orientation (Covin and Slevin 1989)*

(1 = strongly disagree; 7 = strongly agree)

1. We are quick to respond to significant changes in our competitors' pricing structures.

2. We are very often the first business to introduce new services to customers.

3. In dealing with competitors, we typically adopt a very competitive "undo the competitors" position.

4. Top management regularly discusses competitors' strength and weaknesses.

**IT Capabilities**

*IT Infrastructure (Bharadwaj et al. 1998)*

(1 = strongly disagree; 7 = strongly agree)

Our dealership's information technology (i.e., computers, networks, etc.)...

1. ...meets the business needs.

2. ...has an adequate number of computers with sufficient performance to meet user needs.

3. ...is reliable and efficient.

4. ...is flexible enough to meet the business needs.

*IT Management (Bharadwaj et al. 1998)*

(1 = strongly disagree; 7 = strongly agree)

Our dealership's technology manager(s)...

1. ...has specifically explained our technology management practices.

2. ...effectively plans for security control, standards compliance, and disaster recovery (loss of information, etc.).

3. ...employs the same technology policies throughout the dealership.

4. ...has established effective partnerships with technology providers (such as lead management systems)

**Climate for IT Use (Adopted from Schneider et al. (1998)**

(1 = low; 7 = high)

How would you rate…

1. The efforts to ensure employees use customer management system(s)?

2. The recognition and rewards employees receive for using the customer management system(s)?

3. The leadership shown by management in supporting the use of customer management system(s)?

4. The effectiveness of technology hardware, training, and other resources provided to promote the use of customer management system(s)?

**Mindfulness of IT Adoption (Adopted from Knight (2004))**

(1 = strongly disagree; 7 = strongly agree)

Our senior managers...

1. ...believe technology will help the dealership to serve customers better.

2. ...believe technology will create a significant competitive advantage to our dealership.

3. ...take choices of whether we adopt a new technology very seriously.

4. ...show great care in identifying and selecting technologies to adopt.

5. ...are results-focused with deciding whether to adopt new technologies.

6. ...seek outside expertise whenever making decisions related to types of technology they are not familiar with.

**Assimilation of Customer Relationship Management**

*Automation*

Scale adopted from Ray et al. (2005)

Please describe the extent of adoption of automated sales processes

(0=Don't Intend to Implement, 1= Not yet begun, 3 = Standard Implementation, 5 = Advanced Implementation)

*Automation - Sales Business Unit*

1. Automated regular email communications with leads.

2. Automated scheduling of tasks for members of the sales force.

3. Automated assignment of incoming leads to the appropriate person.

4. Automated tracking of responses to marketing promotions (from mailings and email).

*Automation - Service Business Unit*

1. Automated regular email communications with customers.

2. Automated creation of personalized service reminders.

3. Automated marketing and follow-up with customers across multiple channels (mailing, email, etc.).

4. Automated tracking of responses to marketing promotions (from mailings and email).

*CRM System Use*

*(1=Not used at all; 7=Used very extensively)*

*CRM System Use – Sales Area*

Our dealership uses customer management system(s) to...

1. ...record interactions with customers (i.e., phone calls, customer needs).

2. ...schedule follow-up with customers (through phone calls, personal email).

3. ...understand the overall state of the sales process (i.e., total leads, lead status).

4.  ...review and report ROI (return on investment) by lead source.

*CRM System Use – Service Area*

Our dealership uses customer management system(s) to...

1.  ...record interactions with customers (i.e., service visits, direct marketing

    materials).

2.  ...categorize customers to identify those which are most valuable to the

    dealership.

3.  ...measure response rates to marketing promotions.

4.  ...assess the lifetime value of our customers.

**Process Performance**

(Please describe the extent customer management systems have affected…)

(1 = created no value; 7 = created significant value)

Process Performance – Sales Area

1.  …the level of service provided to customers.

2.  …the productivity of salespersons.

3.  …the effective management of inventory.

Process Performance – Service Area

1.  …the utilization of the service area (i.e., the percentage of capacity used).

2.  …the effectiveness of your service and maintenance promotions.

3.  …the value we obtain from existing customer relationships.

**Financial Performance (Wall et al. 2004)**

(1 = Much worse than competitors; 7 = Much better than competitors)

Sales Area Performance - CONTROL

1992-1994—Vehicle sales—Sales growth

1992-1994—Vehicle sales—Profit Level and ROI

Service Area Performance - CONTROL

1992-1994—Parts and Service Area—Sales growth

1992-1994—Parts and Service Area—Profit Level and ROI

Sales Area Performance

2002-2004—Vehicle sales—Sales growth

2002-2004—Vehicle sales—Profit Level and ROI

Service Area Performance

2002-2004—Parts and Service Area—Sales growth

2002-2004—Parts and Service Area—Profit Level and ROI

**APPENDIX B - ESSAY 2 MEASURES**

**Informational Capabilities**

1. Lists price on website

2. Lists options on website

3. Lists all new vehicles on website

4. Lists photo on website

**Transactional Capabilities**

1. Links to independent sites

2. Tool for credit application

3. Price quote request form

4. Online service/appointment scheduling

**Relational Capabilities**

1. Count of the number of infomediary partnerships

2. Investment in infomediary partnerships ($/month)

3. Leads from Infomediary partners

**Sales Volume**

1. Total vehicle sales per month

**Complementary Business Process Change**

1. Are leads distributed to specific sales people who don't take regular floor traffic?
   (yes/no)

**Performance**

1. Monthly Profit (Total sales from Internet Channel x average profit for Internet
   channel)

**Controls**

1. Online discount (Offline profit – online profit)

2. Sales volume (total vehicle sales per month)

3. Domestic (count of number of domestic brands carried)

4. Luxury (count of number of luxury brands carried)

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