SHAPING ENTREPRENEURIAL OPPORTUNITIES: MANAGING UNCERTAINTY AND EQUIVOCALITY IN THE ENTREPRENEURIAL PROCESS

by

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To my family.

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ABSTRACT

This dissertation develops and tests a theory of how technology entrepreneurs shape their business opportunity and the organizing practices that facilitate that process. I begin by suggesting that entrepreneurial opportunities are not predetermined phenomena to be discovered by vigilant individuals (as is assumed by most previous research), but rather are emergent and dynamic, created by founders as they respond to and manage the uncertainties of the entrepreneurial process. Thus, if we are to understand how entrepreneurial opportunities come to exist, we need to explicate this generally unexplored creation process. Study 1 is a qualitative, case-based analysis of technology ventures. The findings of this study suggest that opportunities emerge as founders shape their ventures to match their evolving knowledge and changing environmental realities. This is a change process, occurring in real time and based on experience. As founders learn from experience, receive feedback and advice and respond to unexpected events, they make changes to the venture. Through these changes, the opportunity takes form, but because change can be disruptive and time-consuming, the process can be very costly to the venture. Based on the findings of this study and building on research on the management of uncertainty and innovation, I develop a theoretical framework of organizational practices that facilitate the shaping process by reducing the disruptive effects of change. I suggest that because the shaping process occurs in a dynamic and uncertain context, ventures that develop a vigilant awareness of changing conditions, through performance monitoring and environmental scanning, may be more able to catch the need for change early before problems can escalate. In addition, ventures that develop organizing practices to systematically and analytically learn from their experience (i.e.,

experiential learning strategies) are more able to rapidly reduce equivocality and build knowledge about the venture. As a result of this rapid learning, change efforts tend to be smaller, more incremental and based on more accurate information resulting in less disruption for the venture. I test my hypotheses in Study 2 using an online survey of technology entrepreneurs. The findings suggest that performance monitoring reduces the overall change experienced by ventures and environmental scanning is associated with higher levels of perceived performance. Experiential learning strategies reduce the disruptiveness of change efforts and are associated with higher levels of perceived performance. Mediation tests suggest that experiential learning strategies reduce disruption and improve performance in part because they allow entrepreneurs to build certainty about the venture's internal and external environment.

This dissertation contributes to the entrepreneurship and innovation literatures by providing a window into the micro-level processes through which new opportunities are created, managed and shaped. Beyond that, however, this dissertation represents an instance of a more fundamental human challenge – managing dynamic uncertainties. By addressing the real-time organizing practices that allow entrepreneurs to manage their emerging opportunity, this research also contributes to literatures on managing uncertainty and unexpected events.

CHAPTER 1. INTRODUCTION

Entrepreneurship is viewed as critical to economic vitality and growth globally (Timmons, 2008). While governments, educational institutions and businesses seek ways to facilitate the development of entrepreneurial opportunities, the unfortunate reality is most new ventures fail (Shane, 2008). For every Google or Yahoo there are a thousand opportunities that never see the light of day. Scholars have had mixed success explaining this failure rate, in part because we still know very little about what entrepreneurs actually do.

Previous studies have tended to focus on associating the characteristics of new ventures and their founders with outcomes (Reynolds, 2007a). For example, many studies have explored the personal characteristics that may typify a good entrepreneur or entrepreneurial team (Baron, 1998; Baum & Locke, 2004; Busenitz & Barney, 1997; Ensley & Pearce, 2001; Forbes, 2005; Hayward, Shepherd, & Griffin, 2006). Other studies have considered the extent to which different firm-level characteristics may be associated with venture performance and success (Brush, Manolova, & Edelman, 2008; Davila, Foster, & Gupta, 2003; Reynolds, 2007a; Shane, 2008). However, there are two drawbacks to these approaches. First, by focusing on the association between particular economic, venture or personal characteristics with new opportunities, we get very little insight into the process by which these opportunities emerge. Second, because opportunities are viewed as objective, economic phenomenon arising from imperfections in the market, they are treated as a static phenomenon to be discovered (Casson, 1982; Kirzner, 1997). As a result, this research underestimates or entirely fails to examine the

role of human action in shaping entrepreneurial opportunities over time (Alvarez & Barney, 2007a).

More recently, theorists have begun to explore entrepreneurship as an agentic process, arising from the actions and interactions of entrepreneurial founders and other stakeholders (e.g., Alvarez & Barney, 2007a; Baker & Nelson, 2005; Baron & Ensley, 2006; Sarasvathy, 2001). However, while these literatures have shifted the focus from economic forces to individual action, our understanding of what entrepreneurs actually *do* to create their ventures is still in its infancy. In particular, we lack a clear understanding of the process by which founders' proactive behaviors shape and even create different opportunities (Alvarez & Barney, 2007a).

To address this gap, I have designed my dissertation around two research questions: "What is the process by which entrepreneurs shape their emerging opportunities?" and "What organizing practices facilitate that process?" I address these questions through two studies. In the first, theory-building study, I use qualitative interviews to develop a set of case histories of entrepreneurial opportunities, describing the processes by which founders came to define, explore and exploit them. Within this study I analyze the kinds of changes that opportunities often undergo and the types of experiences and events that trigger or lead to those changes. Based on the findings of this study, I propose a model suggesting that opportunities emerge as founders shape their ventures to match their evolving knowledge and changing environmental realities. Fundamentally, this is a process of continual change. However, while change is necessary in order for firms to adapt and adjust to dynamic conditions, at the same time, change can be very disruptive and time-consuming, inhibiting performance and ultimately

threatening the survival of the firm. Based on the findings of this study and drawing on innovation, new product development and managing uncertainty literatures, I develop a theory of the practices that may facilitate the shaping process by managing the effects of change. I then elaborate, test and refine this model in the second, quantitative study using survey data from entrepreneurs and their investors.

Theoretically, my findings will contribute to the entrepreneurship and innovation literatures by providing a window into the processes by which new opportunities are created, managed and shaped. Beyond that, however, this dissertation represents an instance of a more fundamental human challenge – managing dynamic uncertainties. It is part of a broader exploration into how people organize to manage uncertain and equivocal events in real time, as they are unfolding. By specifically addressing the real-time organizing practices that allow entrepreneurs to manage their emerging opportunity, this research will also contribute to literatures of adaptation, learning and organizational change. Practically, my findings will identify behaviors that enable innovators and others involved in dynamic and uncertain situations to maintain a vigilant awareness of real-time experience and to learn effectively from and in the moment.

In Chapter 2, I define entrepreneurial opportunities and provide an overview of the literatures that explore them, distinguishing between the more traditional "discovery" models and the more recent "creation" models. I then frame the boundaries of my theorizing and identify the gaps that I wish to fill. Chapter 3 presents Study 1, a qualitative study of 24 startups exploring the process by which opportunities emerged and changed over time and the various effects of that change process. In Chapter 4, I theorize the practices that likely facilitate the shaping process by reducing the disruptive effects of

change. Chapter 5 presents Study 2 which tests the hypotheses developed in Chapter 4. In Chapter 6, I discuss the implications and contributions of my findings as well as directions for future research.

CHAPTER 2. REVIEW OF LITERATURE ON ENTREPRENEURIAL OPPORTUNITIES

In this chapter, I start by defining entrepreneurial opportunities and framing the boundaries of this research, in particular distinguishing innovative opportunities from other kinds of entrepreneurship and from the study of new firm creation. I then present an overview of the current literature exploring entrepreneurial opportunities from a variety of perspectives. Finally, I situate my research in an emerging new perspective on opportunity creation, identify gaps in this literature and define my research questions.

WHAT ARE ENTREPRENEURIAL OPPORTUNITIES?

Very few theorists define an entrepreneurial opportunity, which has resulted in some confusion around what is or is not 'entrepreneurial'. In general terms entrepreneurial opportunities are the potential for new economic value arising from competitive imperfections in the market (Alvarez & Barney, 2007b; Kirzner, 1997; Schumpeter, 1934). Schumpeter outlines five forms of entrepreneurial opportunities: the introduction of new goods (or improvement in quality of existing goods), the introduction of a new method of production, the opening of a new market, the control of a new source of raw materials or half-manufactured goods, or the creation of a new type of industrial organization (Casson, 1982; Schumpeter, 1934). Based on these, Eckhardt and Shane (2003) offer a slightly more specific definition of entrepreneurial opportunities as "those situations in which new goods, services, raw materials and organizing methods can be introduced through the formation of new means, ends or means-ends relationships" (p. 333). For my research, I refer to this definition, in large part because by focusing on *new*

goods, services, etc., it distinguishes innovative entrepreneurial opportunities from other forms of entrepreneurship.

One of the significant problems facing entrepreneurial scholarship is the lack of consistent definitions of entrepreneurship. For example, entrepreneurship may include franchises (Azoulay & Shane, 2001), self-employment (Davidsson & Honig, 2003; Parker, 2006), venture capital-backed firms (Beckman, Burton, & O'Reilly, 2007; Dubini, 1989) and even corporate venturing (Barringer & Bluedorn, 1999; Corbett, Neck, & DeTienne, 2007; David, 1994). Similarly, studies are conducted in many different industries, from low to high tech. All of these studies profess to be about entrepreneurship but to group them as such risks over generalizing the findings of any one study. For example, some studies conflate self-employment (e.g., opening a franchise or individual proprietorship) and innovative entrepreneurship (e.g., starting new technology firm) (Shane, 2008). Yet different kinds of entrepreneurial endeavors appear to require different types of resources, involve different processes and incorporate different types and levels of risk (Reynolds, 2007a).

This dissertation focuses only on innovative entrepreneurship. Clearly "innovativeness" exists along a spectrum yet we know that start-up processes, levels of uncertainty and many other factors differ significantly between ends of this spectrum (Reynolds, 2007a). Innovation tends to be a very uncertain process often occurring in very dynamic and uncertain industries (Andrew, Sirkin, Haanaes, & Michael, 2007; Brown & Eisenhardt, 1995; Cheng & VandeVen, 1996; Christensen, Suarez, & Utterback, 1998) . It is likely, therefore, that the processes and behaviors that lead to new opportunities in, for example, a high-tech context are very different than those that are

necessary for opening a new hair salon. In any case, I would not wish to assume they were the same. The Eckhardt and Shane (2003) definition of entrepreneurial opportunities is helpful in that it specifies that opportunities involve the creation of something *new*. Therefore, at least for the purposes of this research, franchising or opening a new location of an existing business would not be considered entrepreneurial. Similarly, self-employment (e.g., opening a dry-cleaning business) is not sufficient to qualify as an entrepreneurial opportunity since the opportunity must be new to the market, not just to the founder. Thus, for the remainder of this dissertation, when I refer to "entrepreneurial opportunities" I am referring to innovative opportunities.

Entrepreneurial opportunities vs. firm creation

The study of entrepreneurial opportunities is not the same as the study of firm creation (Shane & Venkataraman, 2000). The difference lies in the level and focus of study. The study of firm formation arose primarily out of ecological and evolutionary traditions (Aldrich & Kenworthy, 1999; Hannan & Freeman, 1977) where the unit of analysis is the firm or population of firms. As a result, this line of research examines macro level trends such as founding or survival rates (Aldrich, Rosen, & Woodward, 1987; Singh & Lumsden, 1990) with an emphasis on firm structure, performance and survival (Aldrich & Pfeffer, 1976; Hannan & Freeman, 1984a; Stinchcombe, 1965). In contrast the study of entrepreneurial opportunities tends to view the business idea or proposition as the unit of analysis (Corbett, 2007; McMullen & Shepherd, 2006; Shane, 2000). Scholars studying entrepreneurial opportunities look at such factors as how business opportunities are discovered (Eckhardt & Shane, 2003) or created (Alvarez & Barney, 2007a), who discovers them (Minniti, 2004; Shane, 2000) and the contextual

factors that facilitate or hinder that process (Dew, Velamuri, & Venkataraman, 2004; Gruber & Henkel, 2006). This study, then, focuses on entrepreneurial opportunities. In most cases, these opportunities arise in the context of an emerging organization. However, I am interested not in the creation of the firm per se, but rather in the creation of the business opportunity around which the firm is organized.

PREVIOUS MODELS OF ENTREPRENEURIAL OPPORTUNITIES

Several streams of research have explored entrepreneurial opportunities. The earliest research emerged from economic models attempting to explain how and why new *types* of business were formed. Later scholars began to explore who formed these businesses and how entrepreneurs differed from other types of managers, initially focusing on personality differences but more recently exploring differences in cognitive style and processes. Much more recently the development of several large, longitudinal data bases has allowed scholars to follow ventures over time, tracking such things as demographic characteristics and start-up practices to determine what factors are associated with longer term performance and survival. Below, I briefly review each of these traditions and then, in the next section, highlight some gaps in these literatures and how my research is designed to fill those gaps.

Economic models

Schumpeter suggested that new opportunities arise when an exogenous shock to the current economic market (e.g., new technologies) makes it more efficient to recombine existing production goods in some new way (Schumpeter, 1942). He pointed out that the technological shocks driving new opportunities usually arise from within existing organizations but are exploited outside of those organizations, often destroying

the very structures from which they arose. In this way, entrepreneurial opportunities serve to both drive and shape economic markets, in an evolutionary process he called "the gales of creative destruction" (Schumpeter, 1942). Different individuals have different beliefs about the value of certain resources or combinations of resources (Kirzner, 1997). These different beliefs represent market imperfections which can be exploited. When an individual believes that a set of resources are not put to its best use, and conceive of some alternative use, they "discover" an opportunity in the market (Shane & Venkataraman, 2000, p.176). For example, with the discovery of silicon, it became more efficient to use sand for silicon wafers than for hourglasses. Opportunities, therefore, arise from market imperfections (Casson, 1982; Schumpeter, 1934). Furthermore, insofar as market imperfections exist as objective economic phenomena, it is assumed that opportunities also exist whether or not they are discovered and exploited (Shane & Venkataraman, 2000). However, while this line of exploration has led to important insight into the economic conditions that drive market imperfections (e.g., Gruber & Henkel, 2006; Kihlstrom & Laffont, 1979; Kirzner, 1997), it says little if anything about how entrepreneurs turn those imperfections into realized opportunities.

Person-based models

Another major stream of research considers *who* is likely to discover or recognize an entrepreneurial opportunity. Researchers within this stream have had mixed success at best in explaining discovery on the basis of founder characteristics. Personality-based explanations, though representing the oldest and most robust stream of research, have had the least success. For example, while some scholars argue that entrepreneurs differ from non-entrepreneurs in their risk-seeking tendencies (Stewart & Roth, 2001) or optimism

(Cooper, Woo, & Dunkelberg, 1988), others have found no differences (Brockhaus, 1980; Palich & Bagby, 1995). Similarly, while demographic studies suggest some trends (e.g., white males are the predominant demographic group) they provide little predictive value (e.g., being a white male does not make you likely to become an entrepreneur) (Shane, 2008). Social structural explanations have found more success in predicting the discovery of opportunities. For example, individuals are more likely to discover opportunities if they have prior access to relevant information (Kaish & Gilad, 1987; Shane, 2000) or are a member of a business network (Davidsson & Honig, 2003). Finally, one other important stream of research arising from person-based models is the burgeoning field of entrepreneurial cognition. Much of this work considers how the cognitive processes of entrepreneurs and non-entrepreneurs differ. For example, Sarasvathy and colleagues (1998) suggest that entrepreneurs are more likely to frame situations as opportunities rather than risks. Other scholars are trying to understand the cognitive processes underlying opportunity recognition (Grégoire, Barr, & Shepherd, forthcoming, 2009). Thus, while some individual characteristics appear to play a role in determining the likelihood that an individual will recognize, believe in and act upon an entrepreneurial opportunity, most are not good predictors. Moreover, the mechanisms through which these factors influence outcomes are frequently left unexplored.

Venture characteristics models

A very recent stream of research has attempted to uncover the venture characteristics that are associated with successful start ups. This research is founded on a few large panel studies that have collected data from nascent entrepreneurs over several years (Ballou et al., 2008; Reynolds, 2007b). By tracking individuals and teams who have

taken some steps towards founding a new firm (e.g., registered an LLC), these studies determined particular factors associated with the successful *start* of a new venture. For example, higher household income, diverse business experience and more business experience are all positively associated with the likelihood of successfully starting a new business (Reynolds, 2007b)[1]. However, there is great variation in success even among ventures with these attributes, and, the fact remains that the majority still fail (Shane, 2008). These studies, while of great importance to the field, do not attempt to explain *why* certain attributes are associated with the rise of an opportunity, nor the process by which this occurs.

GAPS IN THE CURRENT LITERATURE

Most of the research described so far draws on what is sometimes referred to as the "discovery" model of entrepreneurship. That is, opportunities are seen as pre-existing, objective economic phenomena. The research emphasis therefore is on when, why and by whom these opportunities are discovered. There are two shortcomings to this approach. First, by focusing on the association between particular economic, venture, or personal characteristics with new opportunities, we get very little insight into the process by which these opportunities emerge. In fact, most models don't see them as emerging at all, but rather treat opportunities as static and unchanging (Kirzner, 1997). However, the reality is that most new ventures diverge from their initial plans (Shane, 2008). Yet we know very little about this emergent process. Second, most of this research underestimates or entirely fails to examine the role of human action in shaping and creating entrepreneurial

[1] These statistics refer only to whether or not individuals successfully launched a business, not whether that business itself was successful. Also the panel studies use "self-employment" as the definition of entrepreneurship so the majority of businesses studied are *not* novel.

opportunities over time. A new stream of research, within which I situate my dissertation, is beginning to address both these shortcomings.

Opportunity creation perspective

Recently, some scholars have argued that opportunities may not exist until entrepreneurs act to create them (e.g., Alvarez & Barney, 2007a; Baker & Nelson, 2005). Drawing upon enactment theories (e.g., Weick, 1979), this research suggests that opportunities do not result from search and discovery (or recognition) alone, but rather emerge from action. For example, Sarasvathy (2001) theorizes that opportunities emerge from entrepreneurs' choices and decisions with respect to a given set of resources, rather than through the explicit implementation of a preplanned path. Furthermore, Baker and colleagues have demonstrated that resources themselves are not a given, but are often created by entrepreneurs through bricolage and improvisation (Baker, Miner, & Eesley, 2003; Baker & Nelson, 2005). While this work has put the spotlight firmly on the entrepreneurs themselves as agentic actors in an emergent process of opportunity creation, the specifics of that process remain unknown. To address this gap, I have designed this dissertation to address two research questions:

- What is the process by which opportunities are created?
- What organizing practices facilitate or inhibit this process?

My dissertation begins with an exploratory question concerning a phenomenon that is both complex and under-theorized. Therefore, I employ both qualitative and quantitative methods to derive a rich and detailed understanding of the entrepreneurial process (Denzin, 1970; Jick, 1979). As mentioned previously, I begin with a qualitative study designed to explore and better understand the process by which opportunities emerge and

to develop a model of the opportunity creation process. Based on that model, I theorize the practices that may facilitate the process. Finally, using quantitative data from a survey of entrepreneurs and investors, I test the hypotheses that emerged from this theorizing.

CHAPTER 3. AN INDUCTIVE STUDY OF THE ENTREPRENEURIAL PROCESS (STUDY 1)

The purpose of the first study was to address the question, what is the process by which opportunities are created? Previous research has emphasized the outcomes of entrepreneurial efforts to the exclusion of understanding the process by which those efforts lead to new opportunities. This has occurred, in part because entrepreneurial opportunities themselves ("those situations in which new goods, services, raw materials and organizing methods can be introduced through the formation of new means, ends or means-ends relationships" (Eckhardt & Shane, 2003: 333)) are generally viewed as static and pre-existing phenomena that are discovered by vigilant individuals (Kirzner, 1997). As such, opportunities are either discovered or not. That opportunities might be affected by the process, even changed by it, has not been explored empirically. If, however, we take as our starting point, that opportunities may be created rather than discovered (Alvarez & Barney, 2007a) – that they emerge from the actions and beliefs of their founders – an entirely new set of research questions are highlighted. This perspective shifts the focus of inquiry to the process of emergence and the agentic actors who choose to behave in ways that may facilitate or inhibit this process.

Towards that end, this study was designed to dive more deeply into the process by which opportunities are created, to uncover how they emerge over time and to explicate the forces that shape that emergence. A secondary goal of this study was to better understand what types of entrepreneurial practices may influence the efficacy of the process. However, given the exploratory nature of this study, it was not my intention to test the efficacy of these practices, but rather to look for patterns that could inform the

design of the second, quantitative study, which focuses more explicitly on those practices.

METHODS

Given my goal to develop theory about the process by which opportunities emerge, it was appropriate to use an inductive, qualitative approach to data collection. Inductive, qualitative approaches may be particularly useful for exploratory studies in which the goal is to gather "thick, detailed descriptions" (Gephart, 2004: 455) for the purpose of building, rather than testing, theory (Glaser & Strauss, 1967). Furthermore, qualitative methods are appropriate "for addressing "how" questions—rather than "how many"; for understanding the world from the perspective of those studied (i.e., informants); and for examining and articulating processes" (Pratt, 2009). In particular, I utilized a case study approach to data collection and analysis. A case study is an "empirical inquiry that investigates a contemporary phenomenon within its real-life context" (Yin, 1994: 23). Case studies are generalizable to theory rather than to populations but are particularly useful for explicating processes (Eisenhardt, 1989b; Yin, 1994). To create the cases for my study, I recruited and interviewed individuals whose experiences were likely to provide insight into the research question (Eisenhardt, 1989b; Glaser & Strauss, 1967) and interviewed them about their specific experiences with an entrepreneurial opportunity (see Data Collection below).

Data collection

The sample. After receiving IRB approval for the study, I built the sample using multiple sources. I recruited some respondents through personal contacts. I also worked with several individuals associated with the Tucson Angels (an Angel Investing company

in Arizona) and an investor associated with the Zell Lurie Institute at the Ross School of Business, University of Michigan. These individuals helped me recruit investors and entrepreneurs from around the country to participate in this study by providing introductions via email to me and to my research (See Appendix A for a sample recruiting email).

Since the purpose of this study was to build rather than test theory, I did not select individuals to be representative of the population, but rather selected respondents using a purposeful sampling approach (Singleton & Straits, 1999). However, following principles of purposive sampling, I identified likely sources of variation in the population and attempted to maximize representation across them. The main sources of variation included geography, industry, funding source (i.e., external vs. internal), and experience of entrepreneur (novice vs. serial entrepreneur).

My sample consisted of 23 entrepreneurs and 6 investors (venture capitalists and angel investors) involved in technology-based startups. The interviews with the 6 investors were instrumental in developing the interview protocol and, to some extent, the emerging theory (see Analysis below), but were not included in the data analysis per se. The 23 entrepreneurs represented 24 startups but two of the respondents provided information on the same two start-ups (they were co-founders of both) and one provided information on two distinct startups. Since my primary interest was in the entrepreneurial process rather than outcomes, I focused on respondents who were involved in ongoing ventures. However, I also included four respondents who were involved in ventures that had 'exited' – two failed and two had successful IPOs. The remaining respondents were

involved with ventures that were experiencing varying rates of performance…from the brink of failure to flourishing.

The respondents were all founding members of the ventures. As with many other studies, I assume that founders are primarily responsible for the exploitation of entrepreneurial opportunities. Thus, they are in a position to describe and explain these opportunities. Founders are often used as informants for their teams and their actions are likely to strongly influence the team structure and performance (Ensley, Carland, & Carland, 2000). Therefore, it is reasonable to rely on founders as informants, not only to describe the creation of entrepreneurial opportunities, but to describe team structures such as communication and organizing patterns, since generally they are the ones who put those structures in place.

The startups ranged in age between less than one year and 10 years and represented many different technology industries including software development, bio-technology, and medical devices.[2] Four respondents were women and 19 were men. As was mentioned earlier, all but 4 ventures had not yet exited. Table 3.1 provides basic information about the respondents and startups. The interviews lasted between 1 – 2 hours. One interview was conducted in person and the remainder were conducted by telephone. All but one were taped and transcribed verbatim. One interviewee requested not to be taped so data for that interview consisted of copious notes taken during the

[2] For this study, I calculated age of the firm based on the date of incorporation. While this is a widely used and relatively objective measure of age, it has some limitations for research, particularly in high tech. Many technology firms incorporate when they decide to commercialize a nascent technology. It may be years, however, before they start to organize as a firm. For example, two firms in my sample incorporated in 2000. However, the firms consisted only of scientists for the next 4-5 years. It was not until 2004/5 that they hired a CEO and began to really focus on commercialization. Thus, subjectively, they were more like 4 year old companies.

interview. The interviews resulted in over 41 hours of tapes and over 920 pages of transcribed data.

Table 3.1 Qualitative study sample

Venture type	Location	Angel /VC Funding?	Status of venture at time of interview	Age of venture at time of interview	Gender of respondent	Serial entrepreneur ?
Web-based information service	CA	Angel	Intact	1 year	male	no
High tech Material sciences	MI	VC	Intact	9 years	female	no
Web-based apparel service	MI	Angel	Defunct	3 years	male	no
Medical records software	MI	Friends & Family	Intact	2 years	male	no
Medical research device	MI	VC	Intact	4 years	female	no
Biotech	MI	VC	Intact	9 years	male	yes
Medical diagnostics	MI	VC	Intact	9 years	male	yes
Advanced materials science	MI	VC	Intact	2 years	male	yes
Medical devices	MI	VC	Initial company acquired by spinout and then went public with spin out.	10 years (initial company) 5 years (spin-out)	male	no
High tech Consulting	MI	No	Intact	2 years	male	yes
Medical device	NJ	Angel	Intact	5 years	male	yes

Table 3.1 continued

Venture type	Location	Angel /VC Funding?	Status of venture at time of interview	Age of venture at time of interview	Gender of respondent	Serial entrepreneur ?
Online appointment scheduling software	AZ	No	Intact	7 years	male	yes
Automotive, advanced materials sciences	MI	Angel	Intact	4 years	[3]male	yes
Oil & Gas	CO	Angel	Converted to LLC but still intact	7 years	male	yes
Web service for managing home maintenance	AZ	No	Intact	4 years	male	yes
Web service for managing inventory and RFPs	AZ	No	Intact	10 years	male	no
Medical diagnostics	AZ	No	Intact	2 years	female	no
Medical device	AZ	Angel	Intact	5 years	male	yes
Medical device	AZ	Angel	Intact	1 year	male	no
Web services	NJ	VC	IPO	8 years	male	no
Medical device	MA	Angel	Intact	7 years	male	yes
Web services	MA	Funding from LBO firm	Defunct	3 years	[4]1 male 1 female	no
Marketing consulting	MA	No	Intact	8 years	1 male 1 female	yes
Emergency alert software	MA	VC	Intact	9 years	1 male	yes

Interview protocol development. As with much qualitative research, data analysis and collection overlapped to some degree (Eisenhardt, 1989), in particular

[3] This and the next respondent is the same individual.
[4] These two respondents and the respondents in the next row are the same two people

during the early stages as I refined my interview protocol. To create the protocol, I started by interviewing four investors and three entrepreneurs. My questions focused on two aspects of venture creation. First, I asked respondents to describe to me the venture creation process in their experience (for investors, I asked them to describe their typical experience). During this discussion, I asked questions about typical stages of development, evaluation and funding. My purpose was to frame the overarching process of new venture formation and to identify some of the key practices and steps in the process. Following this discussion, I asked respondents if they had ever had an experience in which the venture opportunity changed mid-course and if so, to provide a description of that experience. Often these experiences came up during the first part of the interview, in which case I directed the respondents to go back and describe that experience in more detail. During this part of the interview, I focused on collecting as much detail as possible about the change experience and also solicited the respondent's opinions about what led to the change, what resulted from it and what practices or entrepreneurial characteristics seemed instrumental in the management of the change.

These early interviews influenced the design of the final interview protocol in two ways. First, they provided insight into the major steps of a new venture creation process (e.g., team formation, formal incorporation, development of technology, development of operational strategy, recruiting investment, etc.) which helped me frame the interview protocol to touch on the entire process[5]. Second, I realized that respondents struggled to identify "a change" in their venture since the process appeared to be one of continual

[5] These steps did not always occur in the same order, but most teams went through all of them. Therefore, in designing the protocol, I made sure to include 'probes' about each of the steps in the event that respondents didn't mention them.

small changes, occasionally interspersed with major shifts. Therefore, some respondents struggled to identify *which* change to focus on. Also, for some respondents, large shifts or changes in the venture appeared, in retrospect, to be a natural progression in the venture or happened so smoothly that they did not view them as a big change. It was only when respondents were systematically reporting their experiences in a linear fashion ("then we did x"), that these changes became apparent, often accompanied by comments like "come to think of it, that was a really big change for us."

Based on these interviews, I designed my final protocol as a loosely structured inquiry into the timeline of their venture and how founders came to exploit their particular entrepreneurial opportunity. My purpose was to lead them through a time line of their activities, using a "then-what" approach. This approach allowed respondents to think about their specific behaviors rather than their espoused behaviors. Furthermore, by asking for them to relate, step-by-step, their actions, the resulting data was rich in behavioral information about process rather than only attitudinal (Ajzen & Fishbein, 1977). During the interview, I allowed change events to emerge naturally rather than asking entrepreneurs to select changes. Then, as respondents mentioned changes, I probed for additional detail around these events. The interview protocol is attached in Appendix B.

Building case studies. I next created a case study for each venture using primarily the transcribed interview narratives, but also information from venture websites or other publically available data. Building the case studies involved creating a linear case description of each venture's development. As much as possible, I retained the exact wording from the interviews, merely rearranging pieces when the respondent discussed

the venture out of order and occasionally filling in information from other sources. This resulted in 23 cases. The case approach allowed me to focus my efforts on conceptually useful stories (those describing the creation of opportunities) while still retaining theoretical flexibility around the elements that make up that process (Eisenhardt, 1989b).

Analysis

I began the analysis following a grounded theory approach (Glaser & Strauss, 1967), iterating between collecting and analyzing data (from the first four investors and three entrepreneurs). By traveling back and forth between the data and my emerging theory, I looked for cross-case patterns as well as outliers and differences (Eisenhardt, 1989b) which then informed my sampling strategy. For example, after reading through the early interviews, I noticed that both investors and entrepreneurs reported that opportunities tended to change, at least to some degree, in the early stages of the process. As respondents described the typical process (investors) or their own specific experience (entrepreneurs), they included descriptions of changes to the product or service, the team, the strategy, and so on. This led me to focus on change events in the course of the venture's history as indicators of the emergent process. In other words, if opportunities emerge over time (rather than pre-exist) then it is through these change events that they likely take shape. Furthermore, because change events were recurrent and relatively identifiable, they were "codable moments" (Boyatzis, 1998). Thus, in the remaining stages of analysis, I focused on coding the change events in each case.

Coding – type of change. In the first round of coding, I identified any instance in which respondents discussed a change in the venture. These ranged from small changes (e.g., adding a different feature to the product) to very large changes (e.g., targeting a

different market). For each change event, I noted the terms (i.e., open codes) individuals used to describe the nature of the change. Based on these terms, I developed a set of analytical codes representing broad patterns abstracted from those data (e.g., "new market" "personnel changes" "product changes"). Many change events included multiple codes. For example, "change to product" often occurred in conjunction with "change in market."

There are many ways to categorize change events. I considered several existing typologies of change that might help distinguish between changes to the opportunity itself vs. more tactical adjustments to the venture's operations. For example, changes could be considered "radical vs. incremental" (Tushman & OReilly, 1996) or "architectural" vs. "modular" (Henderson & Clark, 1990). However, these definitions tend to focus on changes to the technology itself, often relative to existing products and technologies. In contrast, I was concerned with changes to the opportunity (which includes both technology and market elements) and distinguishing this from changes to operations. Another possibility was to categorize change as "strategic" vs. "tactical." However, these also tend to bridge across changes to opportunities vs. other changes. For example, a strategic change might include developing a totally new offering or approaching a different market, but could also include creating new approaches to capturing the same market. Thus, including strategic changes as a category would not allow me to distinguish whether or not ventures changed their opportunity. Since my purpose was not to fully dimensionalize the types of change that ventures experience, but rather to demonstrate that ventures often make changes not only to operations but to the very opportunity itself, I used my own typology: Opportunity Changes and Operational Changes.

In a sense, this categorization was a rough dichotomy between changes to opportunity vs. all other changes. A change to the opportunity was defined as a change to the fundamental

purpose or definition of the business and was operationalized to include any change to the fundamental purpose of the offering (e.g., from an internet advertisement service to an intranet emergency contact service) or to the target market (e.g., from high-end components manufacturers to tool & die providers). Operational Changes included any change in the approach to achieving a particular opportunity, for example a new partnership, approach to development (e.g., bringing manufacturing in-house), or funding strategy (e.g., seeking external investors rather than self-funding).

Based on these definitions, opportunity changes may be akin to "transformational change" in that they represent a change that is "radical and fundamentally alters the organization at its core" (Newman, 2000: 604). However, I chose not to use the transformational vs. transitional typology because while all opportunity changes were transformational, not all transformational changes represent a change to the opportunity. For example, an organization might completely change its structure (e.g., outsourcing all development) which could be considered a transformational change, but at the same time, this may have no effect on the opportunity itself.

The opportunity vs. operational dichotomy is, of course, a fairly rough categorization and changes varied considerably even within these categories (as can be seen in the different analytical codes described above). Furthermore, changes to opportunity often involved a change in operations. However, the opposite was not always true. That is, there were many events that were only a change in operations. Thus, events were categorized as a change to opportunity as long as they met that definition regardless of whether or not operational changes were also included.

Coding – trigger of change. In the next stage of coding, for each change event, I analyzed what entrepreneurs said about why the change occurred. Again, I began with

open codes (e.g., “hospitals wouldn’t buy the product” or “our partner was acquired by a firm that did not want to work with us”) and from these developed analytical codes including, “learned from deliberate experiment” “learned from trial-and-error” “learned from research” “sought feedback or advice” “unexpected event - technical failure” “unexpected event - market change” “unexpected event – partnership failure” and “unexpected opportunity.” Finally, I grouped these into three types of triggers for change, “learning from experience,” “feedback and advice” and “unexpected events” which I discuss further below.

Coding – effects of change. In the last stage of coding, I reviewed each change event and gathered information about the extent to which the change was disruptive, difficult or time-consuming. Since many changes occurred over a period of time, I captured information not just about the outcome of the change but also about the effects of the change process as it was occurring. Process effects of change refer to the “costs associated with redirecting resources” such as learning new routines, building new relationships and redirecting operations (Haveman, Russo, & Meyer, 2001: 253). In the data, change effects included such things as delays in product development or release, termination of relationships, or lost capital as well as increases in funding, market opportunity or development capabilities. These were much harder to disentangle from change itself (e.g., the decision to cancel a product’s development might necessitate firing a developer which is, itself, a change in operations as well as an effect of change). Therefore, for this last stage of analysis, I varied my approach somewhat. Rather than coding change effects into different *types*, I searched the data for *dimensions* along which the change process seems to vary. Two dimensions were most prevalent: temporal (i.e.,

how long changes took or to what extent they caused delays) and disruptiveness to operations (i.e., the extent to which resources were gained, lost or had to be reassigned). Then, for each change event, I noted any available information on timing effects (e.g., "it took 6 months") and resources disrupted (e.g., "we fired 3 people" "it cost $1M").

When coding was complete, for each venture I had a list of change events, each of which was categorized as either an opportunity change or an operational change. For each change event, I noted the trigger or triggers involved and the extent to which the change process was disruptive or time-consuming. See Appendix C for a sample of the coded data. Throughout this process, I also kept notes regarding any practices that seemed to facilitate or inhibit the change process.

FINDINGS

The data suggest that ventures are shaped as founders make two kinds of changes: changes to the operations (e.g., new development approach or new sales distribution strategy) and changes to the opportunity itself (e.g., different product/service offering or different target market). These changes come about because entrepreneurs are continually learning from their experiences, gaining new information from feedback and advice and responding to unexpected events. However, the process of change varies a great deal across and within ventures and changes can be extremely disruptive, time-consuming and even detrimental to the organization's success. In the following sections, I discuss the findings with respect to each of these aspects of the opportunity creation process. Then, in the Discussion section, I propose a model of the opportunity creation process that arises from these findings.

Opportunity creation as a change process

The data indicate that ventures undergo two kinds of change: operational changes and opportunity changes. All 24 ventures in my sample experienced multiple instances of operational change. These included personnel changes, for example one respondent recalled hiring additional programmers so that he could offer clients customized versions of his product but later had to fire them when the expected revenues were not realized. Another respondent brought on and later fired an entire sales team. Operational changes also included changes in product development approaches. On several occasions entrepreneurs discovered that what they had hoped to buy off the shelf or contract with others to develop, they would have to do themselves. For example, one respondent recalled,

> "The company had planned to use off the shelf technology for that [component], but we concluded during the process of developing the [product] that the off the shelf technology wouldn't work … we couldn't achieve the technical performance levels we needed … we'd have to develop our own."

Many of the ventures experienced changes in funding resources when investors or co-developers pulled out. Operational changes also included changes in approaches to distribution, sales or manufacturing. For example, one respondent described the switch from using distributors to a direct sales force:

> "We went down the path of starting to try and put those [distributors] in place and it became obvious that we weren't going to get the kind of mindshare of the sale force that we needed… and you didn't save that much by using distributors given how much mindshare you could get and how much control you didn't have… and ultimately we decided that was not a good plan."

Operational changes, therefore, were very common. Given that most entrepreneurial ventures are uncertain, not only in terms of outcome, but also in the appropriate process for achieving this outcome (Shepherd, Douglas, & Shanley, 2000),

this finding is somewhat predictable. If founders are not certain how to achieve their goals, it is likely that they will have to try more than one approach.

More interesting, however, is the fact that 21 out of the 24 cases included changes to the opportunity itself. In other words, founders not only adjusted their approach (Operational Change), but also adjusted the fundamental direction or definition of the business (Opportunity Change). For example, one firm started as a web-based system for pushing ads from online newspapers to their readers. Early customers were very positive about their service but as the ".com bubble" burst, advertising sales proved to be increasingly elusive and they could not develop a sustainable business model. So, the founders reframed the organization to focus on developing an enterprise version of their technology for use by financial services providers. The service would allow providers to send out real-time financial information to their internal constituents such as analysts and bankers. Unfortunately, just as they were getting that technology up and running, the financial services industry went into a steep decline and their market dried up. However, once again the organization was able to adjust by building on their newly acquired expertise in enterprise system software. Using what they had learned from the financial product, they reconfigured the technology for use by large organizations as a system to reach employees during emergencies. Their new target market was the homeland security and defense industries. This was the opportunity that they were able to implement and sustain and the company is now enjoying relative stability and growth. Of course, the degree of change varied to some extent depending on how many dimensions of a venture were affected. For example, in the example above, the opportunity changes included

changes to *both* product and market. In other cases, opportunity changes included only one or the other.

These findings indicate the existence of a dynamic process of emergence. In other words, change is an important part of the opportunity creation process. The business idea is just a starting point (Timmons, 1999) but rather than following a linear, design-then-execution model (Shane & Venkataraman, 2000; Stevenson & Jarillo, 1990), these data suggest that entrepreneurs adjust and adapt both the design (i.e. Opportunity Changes) and their execution (i.e., Operational Changes) throughout the opportunity creation process.

Triggers of change

The data indicate that change is a normal and pervasive component of the opportunity creation process. But to understand this as a process, it is critical to uncover the mechanisms behind change (Hedstrom & Swedberg, 1998). In other words, it is not enough to know that opportunities do change, but we must also explicate what drives that change. To better understand this process, for each change event in my sample, I considered what led to or triggered the change.

There were many experiences that led entrepreneurs to make changes to their operations or opportunities, but they fell into three categories. Entrepreneurs made changes as a result of learning from their experiences, responding to feedback and advice and responding to unexpected events. I discuss each of these below.

Learning from experience. Because opportunity creation involves novelty (e.g., "new goods, services, raw materials and organizing methods" (Eckhardt & Shane, 2003: 333)), existing knowledge may be limited at the outset of a venture and entrepreneurs

must engage in a great deal of experiential learning (Parker, 2006; Ravasi & Turati, 2005; Sexton, Upton, Wacholtz, & McDougall, 1997). Learning, however, does not just build knowledge. The data indicate that it frequently triggers change. That is, entrepreneurs learn from action – from attempting to implement a plan or action, noting its success or failure – and then make adjustments.

It is important to note that when using the term "learning" I am referring to a set of behaviors in which organizational actors take action, reflect on that action, develop theories about their observations and take new action. This process of action and reflection is generally considered to constitute "learning behaviors" (Crossan, Lane, & White, 1999; Edmondson, 2002; Kolb, 1984). Thus, learning in this context, is a set of activities in which "knowledge is created through the transformation of experience" (Kolb, 1984: 38). However, as with many empirical studies of learning, it is impossible to say whether this knowledge is objectively correct. In other words, I observe actors participating in learning behaviors. The knowledge that emerges represents entrepreneurs' theories-in-use (Argyris & Schön, 1978) which may or may not be objectively correct. Key to this analysis was whether or not entrepreneurs engaged in learning behaviors and to what extent these behaviors were associated with change events.

For example, one organization in my sample had been founded to build a type of life sciences research tool which normally sold for about $125K. The team had a technology that, they believed, would allow them to develop and sell this kind of tool for about $15K – clearly a significant competitive advantage. The venture received VC

funding, developed the technology and built a prototype. They began beta testing, fully convinced that they were ready to go to market. The founder recalls:

> When we went into some of our first beta tests we almost lost our VC funding… we kept thinking there would be a price performance tradeoff where people would be willing to accept slightly degraded performance for a much lower cost…that's one of those things you learn in business school…and in our case it didn't prove to be true."

So rather than ramping up manufacturing to go to market, this team had to go back to the drawing board and reassess not only their product but their underlying assumptions about the business model which ultimately led to a redesign of the product and their target market.

Learning from experience appeared to vary along a spectrum from very proactive and systematic approaches to learning, such as conducting tests and experiments to more reactive approaches, analogous to "adaptive learning," that occurred when entrepreneurs realized, after the fact, that a particular approach was working or not (Cyert & March, 1963; Van de Ven & Polley, 1992). Proactive learning occurred most often in the context of product development. In these cases, entrepreneurs literally designed and implemented an experience from which they could learn. For example, one respondent described how he set up experiments (literally in his back yard) to determine which combination of elements would provide the chemical reaction he needed.

> "The approach we took, and this is kind of my approach in manufacturing and everything, is test it to its extremes, and if it stands up to that, then we can refine it down. So it was a very simple approach. We just would dunk it into a strong solution of acid. If it fell apart, we just moved on to the next variation …"

Eventually, the respondent determined the correct variation and developed his technology accordingly. While proactive learning was more prevalent during product development, some entrepreneurs also designed quasi-experiments around the business itself. For

example, one respondent, the founder of an online advertising agency, described experimenting with a novel marketing tool which allowed potential customers to "try out" their advertising services during a summer weekend experience. They piloted the tool with existing customers first.

> "And it turned out to be an unbelievable new business tool for us, because it's an easy way for brands to work for us in a way that's not a big obligation, and they try us. And then they like us, and then we end up being their agency"

Based on this initial success, they created an organizational structure around the tool, employing a full-time staff member and later expanding their business around their novel and experiential approach to marketing. What started as a small experiment with a few customers became a central strategy for their business. Other entrepreneurs used pilot programs, engaging in limited or short-term relationships with customers or distributors, as a means of deliberately learning how to best launch their offering, and then made adjustments accordingly.

Overall, however, much of the experiential learning was far less deliberately designed and tended towards the adaptive end of the spectrum. Adaptive learning is a process whereby organizational actors evaluate the impact of previous behaviors and adapt routines and beliefs incrementally in response to feedback on those outcomes (Cyert & March, 1963 [1992]; Levitt & March, 1988). Importantly, however, adaptive learning is retrospective and does not assume that individuals purposefully design and test hypotheses. For example, one respondent recalled the learning experience that led to a significant change in the way he framed his opportunity:

> "So I figured, okay, we got a great product --the majority of surgeons that are trying it want to use it… We've got a great sales team … let's go out and sell this thing. And we spent, oh, probably three million dollars on trying to sell that product and, boy, did, did I learn a lot... And what we found was that our

> tremendous sales reps would go to these hospitals and … doctors say, "Yeah, I love the [products]. Order them." Well, there were probably another 12 doors that had to be opened before that purchase order was signed. And so that sales rep would spend 90% of their time trying to get that order locked up and that was time that they weren't spending going out to other accounts and opening other accounts. So our sales came in to be about a 10^{th} of what we thought they would be. And we eventually realized that we just were not going to be able to sell this product through our own independent sales force…"

Furthermore, in trying to sell the product, he learned:

> "… it was not a compelling product to buy. It was not a product that the surgeon had to have and, and really wanted to fight for. It was not a product that made the hospital money. In fact, it was a product that they'd actually spend a little bit more money on. So the drivers for adoption were just not there…"

As a result of this experience, the entrepreneur had to fire his sales force and find an external distributor for his products. In addition, he realized that his targeted market didn't perceive the product as necessary and so he also adjusted the target market, focusing instead on a more specialized niche market in which his product would provide more value. There was no question that he learned and adapted as a result of his experience, but the learning arose from trial-and-error, not deliberate design. In another example of adaptive learning, one respondent recalls his after-the-fact realization that he was not equipped to expand his business to include product customization.

> "So I ended up hiring three programmers and we started taking on all these modifications. And it was a disaster, because… If you have people like that you absolutely have to have very strong management over them. Well for me to take on that role of being the manager of the programmers and running the company and doing everything else, it just didn't work. I couldn't spend enough time with them, so the result of it was that the modification that was supposed to take five hours … would take 30 hours. And it would introduce bugs into the system…the salaries of these programmers was outweighing the amount of money they were bringing in… they weren't getting done as much as they should be getting done and that was one of the things that then led to the decision to get rid of all three of them."

Again, this respondent appeared to learn from his experience and adapted, but the learning experience was happenstance, not deliberate. Overall, learning from experience, whether proactive and deliberate or reactive and adaptive, was a primary trigger for change. As entrepreneurs' built their knowledge (or theories-in-use) out of experience, they hypothesized what would work and what wouldn't and adjusted accordingly.

Responding to feedback and advice. Many changes also occurred when entrepreneurs responded to feedback and advice from stakeholders or constituents. Some of the most influential stakeholders, not surprisingly, were investors. Venture capitalists and angel investors frequently persuaded entrepreneurs to frame their opportunity differently than originally planned. For example, one respondent had invented a new process for extruding composite fibers in such a way as to create a kind of complex pump for fluids. He had founded several companies before (some had succeeded and some had failed) but all had involved manufacturing a product of some sort and he never wanted to do it again. Instead, he wanted to build a business around licensing this new technology. He had tremendous interest from several potential customers. But in order to further develop the technology, he needed external funding. However, when he presented his business plan to investors, they felt that the licensing model was too ambiguous. It was not clear enough to them what exactly he would be selling and to whom and so they convinced him to use the technology to manufacture a specific product instead.

> "Originally, we had structured [the venture] to be a IP holding company and no investor liked that... They wanted it manufacturing and I was adamantly against it…until we got up there and they said no one is even going to give you the time of day…They wanted it solid, something tangible. As soon as we changed that, everyone liked it."

The entrepreneur followed their advice and reframed his value proposition around developing the technology and manufacturing it for use as a medical device. In another instance, an entrepreneur had been struggling to get into a high-end niche market with little success when several different venture capitalists pushed him to explore a lower-end, but larger market. He recalls that it took him awhile to realize that he was hearing the same thing from multiple sources but ultimately, he took their advice.

> "That's what got me thinking about this machine tool [market]… so it just took a long time listening and, and a couple of smart people trying to say the same thing."

Another source of feedback that motivated change was distributors, customers and others with close ties to the market. One respondent was particularly proactive about seeking advice from potential customers and explicitly sought development partnerships as a means of determining product direction.

> "I'm never gonna know more about the semiconductor industry and its needs than Intel or Samsung or the people at Semitech, which is a consortium of semiconductor manufacturing companies. So I'm not going to presume to be smarter than them, but if they're willing to put a couple million dollars into developing technology for their next generation product that's, in my experience, a much better endorsement than all the marketing research studies money will buy…and so we're cultivating customers and let's call it research sponsors in these different applications to help fund the development. And so whoever pays for it's going to get first access and we'll develop the distribution channels around that."

As a result of this approach, this respondent's opportunity was truly emergent, changing and adjusting over time to match the needs of whatever customers were willing to support its development. Customer feedback also led to changes in more tactical aspects of the venture. One respondent recalled that he went into his business planning to build a medical device for under $10 but quickly changed his ideals about pricing when

he realized that hospitals, his direct customers, had an entirely different way of valuing the device.

"I started out the company with the idea of building the [device] for under $10…it would be fantastic if we could build a [device] for $10, sell it for $20 or $30 or even $100 and everyone would be happy. Well, the first thing [the hospitals] said was, 'Forget the $10. Don't even mention it to us again. We're getting reimbursed at $300 and $500 and that's all we ever want to hear from you…' So…you have your ideology and … you have to be realistic, too."

Finally, many entrepreneurs made changes to their operations as a result of advice from industry experts, often other entrepreneurs. For example, one respondent recalls how she had been trying to get federal and state money through lobbyists. However, realizing her firm couldn't afford that approach, she turned to a network of other entrepreneurs for advice. Friends in her network suggested that she go directly to senators and congressmen instead. She recalls how this advice changed the way her company operated:

> "We started figuring out how to go to the senate and the congressmen and lobby for money which was hysterical because we called somebody that's a lobbyist at …some big firm and said…go get us money from our senators.… And they said, okay, yeah you pay us ten thousand dollars a month. And at that point I think I threw up a little and then said, okay, how else can we get this done? So I started asking and there's this amazing network of women business owners and they all really help each other through all these crazy things. So I go talk to a couple of my friends… And they said, okay, well, you know, you got to request paperwork. You got to go in. You got to talk to [the Senator's] office and talk to their staff. And here's their phone number. So that was really cool…and you make your appointment and you just sit down in front of some kid that's half your age and tell them you want money. .. it's hugely valuable because otherwise you can't get products all the way through DOD funding. So that's how the mark up started happening."

Entrepreneurs varied with respect to how much advice they proactively sought. For some, touching base with advisors, customers, investors and even competitors was a regular occurrence. For others, it happened only sporadically. Not all advice resulted in

change, of course. Sometimes advice merely confirmed the current approach[6]. However, when changes were made, they were often made because of knowledge gained from feedback and advice.

Responding to unexpected events. The third trigger for change that appeared in the data was unexpected events. Unexpected events are jolts or sudden surprises in the ongoing flow of action and can include situations in which an expected event doesn't happen, an unexpected event does happen or an unthought-of event happens (Weick & Sutcliffe, 2007). Importantly, responding to an unexpected event with existing processes and procedures is often inappropriate or ineffective (Gersick & Hackman, 1990; Weick, 2004). When established routines don't work, organizations have to adjust, abandoning or otherwise changing existing routines in favor of a novel response (LePine, 2005). In other words, unexpected events generally require change.

The data suggest that unexpected events triggered change most often by creating new constraints and hurdles. Occasionally, however, an unexpected event created new options that founders chose to pursue. For example, one founder recalled how his business shifted from developing one kind of software product to an entirely different offering, because of an unexpected request from an existing customer.

> "[An existing customer] called a meeting and said, 'Look, I really like what you did with [software product]…I have this [other] problem…' and so we somewhat blindly started creating a process that could help."

In another example, one founder recalled that her venture had been stuck in a research mode, perfecting their technology but producing little in the way of products.

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[6] It is also highly likely that some advice did not result in change because it was ignored. However, respondents generally did not mention the advice they didn't take. Therefore, while I can deduce that much change resulted from advice, I cannot say whether change failed to occur despite advice.

Then, with the unexpected loss of a key scientist, they were able hire a manufacturing position and the venture transitioned into an entirely new, product oriented operation. The founder recalls:

> "[The venture] was primarily still science and technology, meaning I had a great science fair experiment going on… and we couldn't figure out how to get beyond that. And …during 2006 one of our key scientists left … he was one of the first hires that we had. And we were devastated… I thought, oh my g** he knows so much about our [technology]. How are we ever going to make [this technology]? And you feel so held hostage…everybody still had a very great subspecialty that only they could do. And that was actually huge for our company to lose him …we replaced him not with another scientist but with a guy that knew manufacturing. And that was huge because rather than have the scientist in the white lab coat constantly tweaking everything now I had a manufacturing guy focus on making the same thing more than once. And so it was a huge transition for our company to get our manufacturing guy in there, and start producing the same thing."

In these examples, unexpected events provided the venture with new options. More often, however, unexpected events created new constraints or hurdles that made previous approaches less effective and thus forced change. Often the source of change was external, for example, shifting economic conditions. This was the case with the security company described earlier. In 2001 they had been poised to launch their first enterprise system to financial services providers when their key customer pulled out.

> "[A financial services client] had spent with us months on piloting, testing …At that point, we were negotiating a multi-million dollar deal…in August and September [2001]. And after September 11, they froze everything and they literally dismantled their entire organization."

The aftermath of September 11 not only disrupted their key customer but their target market in general and they responded by redesigning the technology and organization to focus on corporate security. In a similar situation, a respondent recalled how his business was blindsided when the real estate market took a downturn. He had

developed a software product for homeowners and planned to distribute it through realtors. When the market fell, he was forced to look for other markets for his product.

Unexpected events also occurred internally, frequently in the form of technology failures. Several ventures had to adjust their product offering, target market or both when technologies did not perform as expected. In one of the most extreme examples, a founder recalled his desperate, but ultimately successful, attempt to build a new product after his initial product idea failed just days before a board meeting.

> "I came up with …a pretty cool catheter, and I tried it out on the bench using some meat that I'd gotten from the supermarket and, boy, did it work unbelievably well. I told the board of directors, 'I got a product and, and we've got a great market opportunity and we need to have a board meeting to see how we want to finance this.' And then …the weekend before the board meeting … I tried the catheter out on an animal heart and it didn't work at all…it was working on the supermarket meat … but it wasn't working on the actual heart. And I said, 'Well, I can't go to the board and say, I just don't have anything. I gotta get something.' So I took a Sear's Quick Clamp and glued a couple wires to it and insulated 'em and hooked 'em up to a bipolar generator and said, 'Look, okay, if I clamp both sides of the tissue I can monitor the voltage and current and I can calculate the resistance and I can determine when the lesion's gone all the way through the tissue,' which is pretty cool. It's not a catheter [but] that became … [our] main product."

Other examples of technology failures included a venture whose medical device unexpectedly failed to meet manufacturing specifications with the result that they lost a key distribution deal and had to fire over 50 employees. In another example a pharmaceutical company spent over a year evaluating a biological marker for a particular disease only to discover that the marker was useless as an indicator. They responded to this unexpected set back by reframing their business to develop diagnostic tests for the disease instead.

Finally, another common type of unexpected event leading to change was failed partnerships. Given how resource constrained they are, partnerships are an important

means of acquiring resources for entrepreneurs (Katila, Rosenberger, & Eisenhardt, 2008; Maurer & Ebers, 2006; McGee & Dowling, 1994). When these fail, therefore, those resources are often lost and others must be reassigned. In other words, change is inevitable. For example, one founder recalled that when a key distributor of their product was bought by another firm, the acquiring firm refused to honor the original distribution contract and they had to seek alternative means of distributing their product. There were several cases in which a venture partnered with an outside developer to help build the product, only to have the partnership dissolve when the developer backed out or had to be let go for failing to meet agreed upon goals.

Overall, unexpected events were common in the data and in fact, the respondents themselves seemed to view them as a normal part of the new venture process. As one entrepreneur put it:

> "There's always new things that come up. New challenges. You think you've got everything lined up and then a curve ball comes. You've got to be able to correct your swing and hit it."

Or, as a very experienced venture capitalist said:

> "It is certainly rare that everything goes according to plan. … the typical case is that things don't go according to plan."

However, the data indicate that unexpected events are not just problems to be overcome. Unexpected events play an important role in shaping the opportunity by allowing, or more often, forcing, entrepreneurs to reframe their business opportunity and operational approaches.

Throughout these cases, entrepreneurs were continually adjusting and adapting their opportunity and their operations. While there were many specific experiences that led to change, they generally fell into the three categories discussed above: learning from experience, responding to feedback & advice, and responding to unexpected events. All of these triggers were highly experiential, occurring in "real-time," that is, in the course of daily business operations.

The costs of change

It is clear from the data that change is integral to the opportunity creation process. However, as I continued my analysis, it became clear that this process can be very costly and difficult. In particular, changes often affect venture's timelines and/or disrupt operations (including funding).

Timeliness and disruptions to operations are particularly costly in the entrepreneurial process since entrepreneurs tend to be severely resource constrained (Baker & Nelson, 2005; Choi & Shepherd, 2004). Time is literally money in that funding is usually contingent upon achieving certain milestones as scheduled (Eckhardt, Shane, & Delmar, 2006). Furthermore, given the competitive environment of many ventures, timeliness is critical to achieving market dominance (Armstrong & Levesque, 2002; Mullins & Forlani, 2005). Therefore, when change efforts take a long time or cause delays in development or operating schedules, the cost to a venture is high. Similarly, any change that disrupts ongoing operations is costly because valuable resources are used up in managing the disruption. Moreover, the data suggest that timeliness and disruption generally go hand in hand. That is, when change events caused delays or took a long time to occur, operations tended to get disrupted. Similarly, disruptions in operations, such as loosing key personnel or failed partnerships tended to cause delays in operations.

The data suggest that change events were most often associated with disruption and delays when the changes were unexpected, occurred too late in the process or took a long time to accomplish. Also, although I did not explicitly code for the quality of the change decisions (i.e., the extent to which a change was the "right" thing to do) given the subjective nature of that assessment, there was some indication that 'bad' changes were

often made because of erroneous information or assumptions. In contrast, proactive changes and those made quickly or early in the venturing process, tended to be less problematic. I will discuss each of these findings below.

Big surprises = big costs. Changes that were triggered by unexpected events were often particularly disruptive and time-consuming (i.e., costly) because they generally required a redistribution of resources. For example, one respondent recalled that when a key distributor suddenly and unexpectedly pulled out of the relationship, the respondent was forced to delay manufacturing and lay off over 50 employees. Similarly, when another respondent realized that their technology had failed in testing, the team was forced to start over with development.

Time is money. Other changes were costly because they took so long to implement that operations were disrupted and resources were lost in the course of making the change. For example, one respondent recalled that his company took a very long time to redirect operations after realizing that their primary market was collapsing. Interestingly, he recognized the needed change in direction and saw it as a positive and necessary change. But he took too long to make the change and therefore used up many valuable resources.

> "And so … I started changing my views. I said, listen, we're not going to do this anymore. We're getting out of the real estate market. We're going to start designing this product for the insurance market…unfortunately I'd spent all my money going into the real estate market. "

In another instance, a respondent recalled the change process to internalize manufacturing. The external manufacturing company was proving inadequate, inflexible and too costly so he decided to stop outsourcing manufacturing. However, the process of making this change was extremely time-consuming and difficult. After months of

struggling to work with the external manufacturers, he spent more than 6 additional months making the change to internal manufacturing.

> "We went round and round and round, and after about six months of not getting anywhere, we started trying to force them into [producing]…It took us about another six to eight months to …get them out of there."

In these cases, the changes themselves were not the problem. It was the process of accomplishing them that caused disruption and delay and ultimately, cost, to the venture.

Unfounded assumptions lead to risky changes. If entrepreneurs make the wrong change or a 'bad' change, by definition, this is problematic for the organization. I did not try to explicitly code for this dimension of change because it is extremely subjective. There is a great deal of hindsight bias involved in assessing the extent to which a change was good or bad (Bukszar & Connolly, 1988; Fiske & Taylor, 1991). In addition, respondents tended to view most voluntary changes as positive and involuntary changes as necessary. So I chose to focus on the more objective effects of change and the change process, such as delays in timelines and disruptions to operations (e.g., lay-offs, loss of funding). However, I did note when entrepreneurs specifically called out a change as having been the wrong one. In each of those cases, respondents implied that they made the 'wrong' decision because they lacked critical information or knowledge prior to making the change. For example, one respondent looked back on his decision to refocus his technology on the automotive industry as being somewhat uninformed and ultimately, problematic.

> "You can't go back on the broad decision of getting involved in automotive…but…We're not doing well financially. We really have some serious problems to solve. We're working diligently on that. Nothing's more important to me and I'm bull headed enough to keep going. But we're not doing really well…I should have thought harder about what I didn't know. I didn't know what I didn't know about automotive."

Another respondent recalled making changes to the design of his product based on customer input only to realize later that he had made a mistake in assuming that his end users (high school and college students) were also the buyers. In fact, it was parents who made purchasing decisions and who went through the purchasing process. In designing the product solely for the students, he included design and purchasing elements that alienated the parents. He recalls finally realizing who his customers were.

> "And like idiots, three years later, who's our customer? It's not a kid. It's his mother who can't understand what the h** the kid was looking at…We designed the product for who we thought was our customer, and it turned out that wasn't our customer."

Sometimes change does not disrupt. It is important to note also that not all changes were disruptive and time-consuming, particularly when respondents were able to make changes quickly and proactively. For example, one respondent recalled the change process to internalize manufacturing. She faced a similar situation to that of the respondent discussed earlier. The external manufacturing company was proving inadequate, inflexible and too costly. Since she had no internal manufacturing capabilities at the time, the decision to start manufacturing on their own represented a big change for the venture. However, unlike the previous respondent's experience, the process of accomplishing this change went very smoothly. She recalls:

> "I called …an emergency board meeting, … did some financial modeling to show … it was actually viable for us to take [manufacturing] in house…and within three weeks I had terminated the relationship with the contract manager and hired a VP of manufacturing."

There were other instances of relatively efficient changes. For example, when the inventor described earlier created a new medical device just days before the board meeting, his product plans were changed considerably, but so quickly and early in the

process that no significant disruptions occurred. Similarly, the respondent described earlier who heard from customers to "forget $10" as a price point, learned this early and responded quickly with the result that he wasted little time investing in developing a product at the wrong end of the price scale.

In summary, the data on change effects suggest that the change process has the potential to be time-consuming and highly disruptive to a young venture. In particular, when change occurs unexpectedly or late in the process, takes a long time to implement and/or is based on incorrect assumptions, the costs to a venture can be very high. On the other hand when changes are made fast, early and accurately, they tend to be less disruptive.

Overall, the data suggest that the opportunity creation process is a change process. As entrepreneurs learn from experience, respond to feedback and advice and respond to unexpected events, they adjust and adapt their resources, their operations, and even their goals. From this continual re-organizing, the opportunity emerges and re-emerges over time. Experienced entrepreneurs in particular were well aware of this process and had come to expect a certain amount of change. As one respondent commented:

> "I've never seen a company start and finish with the same idea. When the company exits, gets acquired, IPOs, usually it's different than what the original business plan said."

Furthermore, while the change process has the potential to be extremely costly (i.e., disruptive and time-consuming) to a young venture, the extent to which entrepreneurs experience disruption from change varies considerably.

DISCUSSION

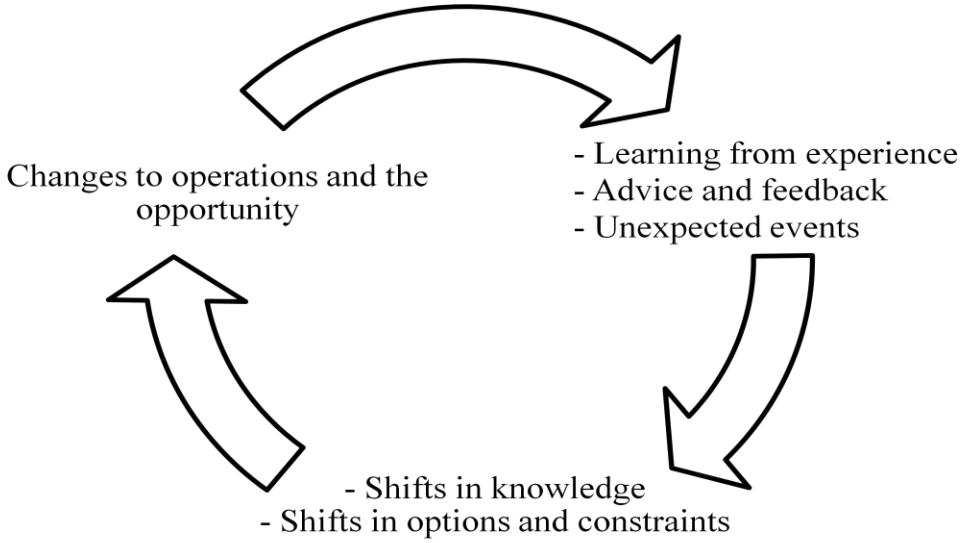
Study 1 suggests that the process of entrepreneurship is one of simultaneous creation and adaptation. As founders build their new venture, they are constantly buffeted by two forces for change motivating them to adapt their creation efforts in real time. First, their own knowledge is evolving and with it the implications for their ongoing activities. Entrepreneurs often start with a myopic view of the opportunity because they don't know yet how the market and the wider environment will respond to their actions (Alvarez & Barney, 2007a). By definition, they are engaged in something that is relatively novel[7] and therefore not only is the outcome uncertain, but so is the process for achieving that outcome (Shepherd et al., 2000). For example, when trying to size a market that will only exist once their product or service is launched, information is scarce (Alvarez & Barney, 2005) and planning is difficult and unreliable (Vandeven & Polley, 1992). The findings from Study 1 suggest that as entrepreneurs begin to build on their initial assumptions and goals, they learn from their experience and gather feedback and advice on their actions. This results in new and often different knowledge to which they must respond. For example, they may learn that customers require something different than they initially assumed or that a planned technological approach is not feasible. They may be advised to position themselves differently in the market or to seek different means of financing their venture. Thus, founders' evolving knowledge is one force for change.

[7] Of course the novelty of any particular venture varies from very new to 'reinventing the wheel.' However, the sample deliberately excluded many types of non-novel ventures (e.g., franchising) and to the extent that any new venture involves creation, at least some aspects are novel. Further, given changing technological advancements and a dynamic economic environment, even less novel technologies have to be developed for a novel environment. That is, the venture itself may be innovative even when a technology is more incremental. Thus, it is relatively safe to assume that technology-based ventures exist at the novel end of the spectrum.

The second force for change is unexpected events. These arise from the uncertainty of the environment itself. Much of the entrepreneurial activity we see today occurs in highly dynamic and uncertain industries such as information technology, pharmaceuticals and biomedical research and development (Timmons, 2008). Even in less dynamic industries, the environment for entrepreneurship is highly unstable (McMullen & Shepherd, 2006). Funding sources may come and go. Governmental policies are changing and difficult to predict. Technologies are novel and unreliable. Because the environment is uncertain and unstable, most entrepreneurs experience at least a few unexpected events arising from outside of their span of control. As the data show, sometimes, these present new and different opportunities. More often, they create new constraints and hurdles. In any case, they motivate change.

Because the early stages of a new venture are characterized by changes in founders' evolving knowledge and shifting events, entrepreneurs must continually shape their actions to match the changing realities. As their situation changes, they also have to change and it is out of these changes – to their operations, their goals, their resources - that the opportunity emerges and re-emerges. Of course this is not a one-time shift. It is an ongoing process not unlike sculpting. Founders may start by recognizing a particular opportunity and gathering resources to enact it (Sarasvathy, 2001), but as they create their venture, they also add to, take away from and change the initial form. From this shaping process, the opportunity emerges. See Figure 3.1.

Figure 3.1 The opportunity shaping process



Shaping vs. Strategic Change Processes

The shaping process might also be considered a kind of strategic change process, though it appears to differ from many current models of strategic change. In the following section, I consider how this process compares to other strategic change processes.

Strategic change has been defined as "an alteration in an organization's alignment with its external organization (Fiss & Zajac, 2006). Moreover, while this may refer to changes in an organization's structure or processes, it can also reflect a cognitive reorientation or the "redefinition of the organization's mission and purpose or a substantial shift in overall priorities and goals" (Gioia, Thomas, Clark, & Chittipeddi, 1994:364). In this sense, any change to an organization's opportunity represents a strategic change (though of course, they also engage in other, more tactical changes along the way). The process by which these changes occur, however, appears to be unique to new ventures.

Strategists have long examined how organizations make strategic changes. While there have been many different typologies of change process offered over the years, they tend to reflect a fundamental categorization initially offered by Mintzberg (1973) who suggested that change processes tended to fall into three modes: Entrepreneurial, Planning or Adaptive.

In the entrepreneurial mode, the "organization focuses on opportunities; problems are secondary." Mintzberg's description of the entrepreneurial mode is characterized by an all-powerful chief executive who "rules by fiat, relying on personal power and sometimes charisma" and strategy-making is described as "the taking of large, bold decisions" (Mintzberg, 1973: 45). While there is little mention of this mode of strategic change in the scholarly world today, it is somewhat reflected in work on transformational leadership (e.g., Bass, 1985; Howell & Avolio, 1993; Tichy & Ulrich, 1984).

Not surprisingly, Mintzberg (1973) suggests that the entrepreneurial mode of strategic change is most appropriate in the context of new ventures. Empirically, however, there is little evidence to suggest that this mode is either widely used or appropriate in today's new ventures. For example, most new ventures (and in particular technology ventures) are started by teams rather than a single entrepreneur (Francis & Sandberg, 2000; Ruef, Aldrich, & Carter, 2003). Furthermore, given the increasingly important and powerful role of venture capitalists, corporate venture organizations and angel investors, the notion of an all-powerful chief executive who "rules by fiat" is outdated. My data also suggest that while founders do occasionally make large, bold decisions, the shaping process is characterized by many small, incremental changes as well. Thus, as a model of strategic change, the "entrepreneurial mode" does not appear to reflect the shaping process as described in this study.

The next mode of strategic change offered by Mintzberg (1973) is the "planning mode" characterized by systematic and exhaustive analysis and the careful integration of decisions and

strategies. Sometimes referred to as "synoptic processes" this approach to change is based on a rational model in which information needed to make decisions is available (Fredrickson, 1984; Rajagopalan & Spreitzer, 1997). The planning mode is generally seen as appropriate when environments are stable and certain (Eisenhardt & Tabrizi, 1995). However, in more complex, unstable environments planned approaches to strategic change may be inadvisable or even impossible. Thus, the last mode of strategic change offered by Mintzberg is the "adaptive mode" which is characterized by a lack of clear goals, reactive problem-solving, incremental steps of change, and disjointed decisions (1973). Despite this somewhat negative summary of the process, scholars have since built on and expanded our understanding of the benefits of this mode, drawing particularly on a learning perspective (Rajagopalan & Spreitzer, 1997). For example, in unstable environments, adaptive processes (also referred to as "incremental processes") are generally associated with decision speed and flexibility allowing for the exploitation of changing opportunities and threats (Eisenhardt, 1989c; Fredrickson, 1984).

At first glance, the shaping process appears to be more consistent with the adaptive mode of strategic change. Clearly shaping occurs in an environment that is neither stable nor certain and under these circumstances, most scholars agree that comprehensive planning is likely to be ineffective (Fredrickson & Mitchell, 1984). Rather, managers must make sense of and respond to constant changes in the environment. However, shaping is not entirely consistent with the activities thought to characterize the adaptive mode. For example, in their comparison of synoptic (i.e., planning) vs. incremental (i.e., adaptive) processes, Fredrickson and Mitchell (1984) suggest that incremental processes are initiated in response to a problem whereas synoptic processes are initiated in response to opportunities that appear during constant surveillance. The data from this study suggest that shaping is initiated by both problems and new knowledge. Furthermore, incremental processes are viewed as somewhat reactive or remedial, whereas synoptic processes are goal directed. Again, the data suggest that entrepreneurs need to both create and adapt

simultaneously. As in incremental processes, entrepreneurs shaping their opportunity do tend to consider only a few alternatives rather than making an exhaustive search of goals and alternatives, but given the small size of the organizations, the integrative comprehensiveness of decisions (i.e., attempts to integrated decisions into an overall strategy) tend to be more characteristic of synoptic processes. In other words, the shaping process appears to be unique from both adaptive and planning processes, incorporating some elements of each.

One reason that shaping appears to be unique from other strategic change processes may be due to context effects. Strategy making has largely been studied in the context of large organizations (Burgelman, 1983) and thus impose certain assumptions based on that context. For example, scholars tend to view strategy making as occurring either from the top down or the bottom up (Huy & Mintzberg, 2003). Furthermore, organic processes are generally viewed as occurring from the bottom up and top down processes are generally seen as being more "dramatic" or transformational (Huy & Mintzberg, 2003). Thus, when organic change occurs in large organizations it may be somewhat isolated or lead to splintering as different factions fight for resources or attempt to change in different directions. However, in very small organizations with perhaps no more than 2 or 3 people, distinctions of top-down or bottom-up have little meaning. Unlike CEO's managing large multidivisional organizations, an entrepreneurial founder can and must learn, adapt and experiment even as they plan and analyze. Thus, process models of strategic change developed from studies of large organizations are unlikely to reflect the realities of change within a new venture. Rather, the shaping process appears to be unique to the specific constraints and pressures of new entrepreneurial ventures.

Conclusion

In summary, the data from Study 1 suggest that opportunities emerge as founders shape their ventures to match their evolving knowledge and changing environmental

realities. This appears to be a real-time, experientially based process that differs from both adaptive and planning modes of strategic change as described in the literature on larger organizations. As founders learn from experience, receive feedback and advice and respond to unexpected events, they make changes to the venture. Through these changes, the opportunity takes form, but because change can be disruptive and time-consuming, the process can be very costly to the young venture. Particularly when change comes unexpectedly, takes a long time to implement or is based on inaccurate information, ventures are more likely to experience significant disruption. On the other hand, the data suggest that changes made quickly, early and accurately tend to be far less disruptive and costly.

In the next chapter I consider the second research question, what organizing practices facilitate or hinder the shaping process? Given the findings of the first study, it seems likely that facilitating practices will be those that allow entrepreneurs to avoid or minimize the disruptive effects of change.

CHAPTER 4. A THEORY OF OPPORTUNITY SHAPING PRACTICES

> "I think the success factor between the beginning and the end on these kinds of early stage companies are people who will listen to the trenches and adapt and come back and be able to both lead their investors and their team, not in a hundred and eighty degree shifts every day, but in two or three degree shifts. Steering it kind of through the land mine to get to the end, and usually, you end up a little bit different than the original road map said. Or a lot different, depending upon the market, but usually a lot doesn't work out…"

The results of Study 1 suggest that entrepreneurs create opportunities in a context of dynamic uncertainty. On a daily basis, they are motivated to adapt and adjust as the realities of their situation shift. This occurs for two reasons. First, their own knowledge changes over time. Given the novelty of their endeavors, entrepreneurs' knowledge in the early stages of a venture is incomplete (Alvarez & Barney, 2005). As they learn (e.g., about their technology, their customers and their competitors), their perceptions of appropriate goals, strategies and tactics also shift, motivating them to adjust accordingly. Second, the industries and environments in which they work tend to be very dynamic with new competing entrants, new technologies and economic pressures (McMullen & Shepherd, 2006; Timmons, 2008), again often motivating them to adjust and adapt. As their knowledge changes and the environment changes, they engage in a continual cycle of experience, interpretation and adjustment in an effort to build an opportunity that fits the changing contingencies of their venture and environment. However, adjustments come at a cost since they can be time-consuming and disruptive to the organization. How then can entrepreneurs manage the shaping process – a process of change – while avoiding or minimizing the costs of change?

This brings me to my second research question: What organizing practices facilitate the shaping process. Given the findings of study 1, practices that facilitate the

shaping process are likely those that allow entrepreneurs to adjust to changing or incomplete knowledge and dynamic environments while minimizing the costs of those changes.

To address this second research question, I consider what previous theorizing suggests with respect to managing dynamic and uncertain situations. I then build on those theories, guided by evidence from the qualitative study, to suggest specific practices that may facilitate the shaping process.

MANAGING DYNAMIC AND UNCERTAIN SITUATIONS

As organizations become increasingly complex and the speed of technological advances accelerates, the organizational world appears to be moving faster, with less certainty and more surprises (D'Aveni, 1994; Eisenhardt & Bourgeois, 1988; Weick & Sutcliffe, 2007). Several streams of work have addressed how organizations can best manage dynamic and uncertain situations but in particular two broad streams seem most relevant for entrepreneurs.

First, some scholars have considered how individuals and organizations can develop and maintain an awareness of dynamic events. The premise of this work is that when conditions are changing and uncertain, planning and predicting become less feasible and therefore high performing organizations are those that maintain a more fluid and heightened awareness of their ongoing experience (e.g., Endsley, 1995; Weick & Sutcliffe, 2007). Much of this work focuses on avoiding or managing unexpected events and crises (Perrow, 1999; Watkins & Bazerman, 2003; Weick & Sutcliffe, 2007; Weick, Sutcliffe, & Obstfeld, 1999) often drawing on studies from high-hazard organizational contexts such as healthcare (Vogus & Sutcliffe, 2007a), aviation (Krieger, 2005), nuclear

and chemical plants (Carroll, Rudolph, & Hatakenaka, 2002) or wildland firefighting (Barton & Sutcliffe, 2009). Given the preponderance and disruptiveness of unexpected events in the opportunity creation process, this body of work offers a useful basis for theorizing about entrepreneurial practice.

The second stream of research focuses on how individuals and organizations can develop routines and practices for learning from experience. The premise of this work is that organizations that learn in real-time are more able to adjust and adapt rapidly, as conditions change (Baker et al., 2003; Brown & Eisenhardt, 1998; Eisenhardt, 1989c; Lei, Hitt, & Bettis, 1996). Much of this work focuses on managing dynamic and uncertain conditions in the context of innovation and new product development (Bhattacharya, Krishnan, & Mahajan, 1998; Eisenhardt & Tabrizi, 1995; Jiang, Klein, Wu, & Liang, 2009; MacCormack, Verganti, & Iansiti, 2001) and so is of particular value to entrepreneurial contexts. Also, given that learning from experience is a critical component of the opportunity shaping process, this stream of research offers useful insight for theorizing about entrepreneurial practice.

In the following sections, I consider how each of these perspectives on managing uncertain and dynamic situations can inform a model of the practices that facilitate the opportunity creation process. More specifically, I suggest that the shaping process is facilitated when entrepreneurs 1) build and maintain a vigilant awareness of their ongoing experience through performance monitoring and environmental scanning and 2) deliberately design and implement opportunities for learning from that experience.

VIGILANT AWARENESS

When situations are dynamic and uncertain, organizations that build a rich awareness of their own activities and environment, are more likely to notice and quickly respond to signals that adjustments are necessary (e.g., Weick et al., 1999). This is akin to situation awareness in individuals. Endsley (1995) defines situation awareness informally as "knowing what's going on" and more formally as a hightened *perception* of the elements in the environment within a volume of time and space, *comprehension* of their meaning and *projection* of their status in the near future. Situation awareness is critical for military pilots, firefighters, and other individuals who must make sense of and respond to very dynamic and potentially dangerous situations (Endsley, Hansman, & Farley, 1999; Jones & Endsley, 1996; Riley, Endsley, Bolstad, & Cuevas, 2006). Likewise, scholars have recognized these same requirements for high-reliability organizations (HROs) – organizations that are continually exposed to potential crisis (e.g., nuclear power plants, aircraft carriers) and therefore must sustain high levels of attention and awareness to ongoing activities (Weick & Sutcliffe, 2007). For example, in their study of aircraft carriers, Weick and Roberts (1993) attributed the remarkable safety records in part to organizing practices that develop and maintain high levels of alertness. Furthermore, studies of crisis frequently cite *lack* of awareness as a contributing factor. That is, organizations or individuals failed to notice or incorporate signals that events were not unfolding as planned (Jones & Endsley, 1996; Reason, 2004; Starbuck & Milliken, 1988; Turner, 1976).

Critically, what these studies show is that firms can organize to be more aware of changing situations. For example, Weick and Sutcliffe (2007) note that highly reliable firms are more 'sensitive to operations.' They pay attention, not just to what is supposed

to be happening, but actively monitor what is actually happening (Weick & Sutcliffe, 2007: 61). By paying close attention to operations and performance, organizations are more likely to notice small anomalies or faint signals that expectations or assumptions are not in line with the reality of operations. Similarly, in dynamic environments, regularly scanning the external environment helps firms notice events or trends that may affect their operations (Barringer & Bluedorn, 1999; Daft, Sormunen, & Parks, 1988; Garg, Walters, & Priem, 2003). Since many crises start small and then escalate through a system (Perrow, 1994; Sagan, 1993), catching indications of them early tends to prevent ripple effects and may even allow managers to solve problems before they get to be crises (Weick & Sutcliffe, 2007). Furthermore, noticing small deviances from expectations gives organizations an opportunity to detect and learn from little failures (Sitkin, 1992).

Given the preceding arguments, it seems likely that building awareness is critical for entrepreneurial ventures as well. Organizing practices that create a heightened awareness of actual ongoing operations and current environmental trends may allow entrepreneurs to catch small signals that change is needed earlier and faster, before problems escalate. Recognizing the need for change early may also allow founders to respond in smaller, more incremental steps rather than having to make large shifts in direction (Eisenhardt & Tabrizi, 1995). Finally, even large shifts in direction may be less disruptive if they are completed quickly and before significant investments are made. For example, while the decision to outsource sales and distribution may be a significant change in strategy, it has few disruptive effects if no sales personnel have yet been hired. This is consistent with findings from Study 1 which suggested that changes made quickly and earlier tended to be less disruptive and costly. For example, one internet organization

was experiencing excellent sales. Their product appeared to be taking off and they were focusing primarily on building the business. However, they started to notice that customers, while still happy with the product, were balking at some of the sales terms. The CEO recalls:

> "It's really a low level discussion because the customer wants [the product], we are negotiating, they are advancing, but some term doesn't work for them. OK, well that's a flag. I mean, if it's a term that is fundamental to the business model, then tell us then what's going on here?... obviously I was also looking a lot at the macro level… so the market is going down a bit. I mean, big deal. It took sometimes years for companies to understand, I think, that things are really going bad. So these few inputs that came from customers and the dynamic of customers caused us actually to in some respects look up [from execution tasks]…So the essence here was to really … differentiate between acceptance of your product and the … macro level dynamics that essentially are changing your business model or changing the way the market works in some respect and affecting your business model."

The CEO not only paid attention to what were otherwise very weak signals but recognized that they were important indicators that their assumptions about internet revenue models were flawed. Recognizing this early allowed them realign their resources quickly before running out of money.

> "In retrospect, and that's what saved us, is that we managed to transition soon. It was literally within five, six months…we identified the issues and realigned. So we didn't waste much money and we had enough resources to do it."

Some entrepreneurs appeared to be well aware of the need for vigilance. As one mentioned:

> "You need to keep your eyes always open. Especially when everybody's executing so fast, that's exactly the time where you're in some respects blindsided. And at that time, you need to look around and make sure that you're not rushing to the wrong direction."

But how do entrepreneurs make sure they are not rushing in the wrong direction? A sensitivity to operations means that organizations are paying attention to action – what's happening – in relation to what is expected (Weick & Sutcliffe, 2007).

Furthermore, this means paying attention both to internal operations and to the external forces that act on those operations. Two practices that likely facilitate a heightened awareness of operations include performance monitoring and environmental scanning. I discuss each of these below.

Performance monitoring

One way for firms to build and maintain an awareness of operations is to monitor their performance (Eisenhardt, 1989c). That is, they set expectations – around milestones, benchmarks, budgets – and then regularly and frequently compare actual performance to expected performance. Performance monitoring is likely to reduce the size of change and disruptions from change in a couple ways. First, performance monitoring makes expectations explicit. This is critical because without explicit assumptions about what action should look like, it is easy to let small deviances go unchecked. For example, Vaughan suggested that the normalization of small failures was a contributing factor in the 1986 Space Shuttle Challenger disaster. When burn marks appeared on the booster rockets' O-rings, the definition of acceptable performance was allowed to expand to include some gas leakage through the gaskets (Vaughan, 1996). When expectations are explicit, entrepreneurs are more likely to notice small (or large) anomalies and, as mentioned earlier, catch problems before they escalate. This may even prevent some unexpected events from occurring. For example, if entrepreneurs notice signs that a relationship is not going well, they may have time to adjust their interactions and potentially prevent a complete failure of the relationship.

Second, performance monitoring also allows firms to notice and learn from small failures (Eisenhardt, 1989c). Especially when monitoring occurs frequently, there are

more opportunities to notice and learn from failures to meet interim rather than major deadlines or milestones. Learning from small failures is an essential means of figuring out what is working and what isn't (Edmondson, 2004; Ellis & Davidi, 2005; McGrath, 1999; Sitkin, 1992). Furthermore, noticing small failures may point to larger, underlying problems that can be addressed before too many resources are lost. For example, by creating and monitoring a budget, a firm is more likely to realize it is running out of money before that actually happens. Conversely, without a budget, it may be difficult to notice that a few extra dollars spent here or there are adding up to a trend of over spending. This occurred to one venture in my sample. The founder recalls that they continued spending money to develop their technology, adding what he called "bells & whistles" without restraint, only to discover that the technology didn't work.

> "We had a scramble. Investors, board meetings, employees, new software companies, the current one just yelling and screaming and trying to figure out what's going on...And in the end, the assessment was we had spent six hundred thousand dollars on junk… I [had been] convinced that the bells and the whistles …were what were going to differentiate us in the market rather than just saying, 'Hey. Let's let our customer tell us what they want over time. Let's not make these assumptions and build a monument here.'"

Conversely, another venture more closely tracked expected and actual costs and revenues. When this entrepreneur realized that they were not meeting their numbers, he was able to develop a contingency plan in time to make up the shortfall.

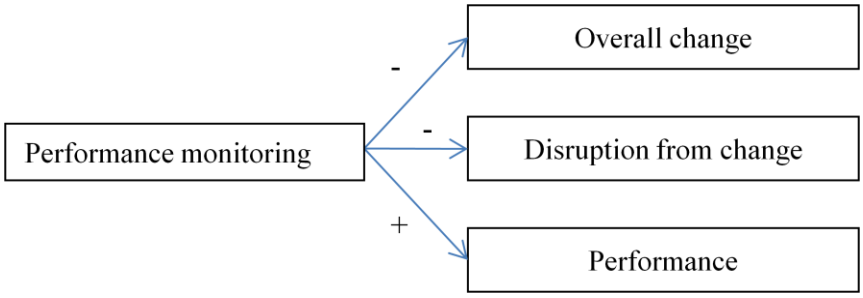
> "So I had to find a way of making money to keep us going…and we have to do whatever we can do with what we have now to make money. And one of those things was partnering up with the [small online auction site]."

This interim plan allowed the founder to stay afloat long enough to start getting sales from his main product. By regularly and frequently comparing actual performance against expected performance, new ventures are more likely to notice, learn from and

adjust to small short-falls before they escalate. As a result, changes are likely to be smaller (less overall change). That is, ventures may be able to make small, mid-course adjustments earlier in the process. In addition, changes are likely to be less disruptive to the firm since smaller changes, made earlier in the process are likely to involve fewer resources. Conversely, when performance *is* meeting expectations, firms will be less likely to make unnecessary changes. As a result, firms who engage in frequent performance monitoring will also enjoy better performance overall. Please see Figure 4.1. This leads to my first set of hypotheses:

> Hypothesis 1: More frequent use of performance monitoring will be associated with smaller overall change in the venture.
>
> Hypothesis 2: More frequent use of performance monitoring will be associated with less disruption from change.
>
> Hypothesis 3: More frequent use of performance monitoring will be associated with higher levels of performance.

Figure 4.1 The effects of performance monitoring on change, disruption and performance



Environmental scanning

As with any organization, new firms must create opportunities that match or 'fit' their environment (Burns & Stalker, 1961; Lawrence & Lorsch, 1967). When this environment is unstable and uncertain, it is particularly important that they maintain vigilance about that fit. That is, managers must frequently update their understanding of

the environment and the extent to which current operations (e.g., structures, processes, decisions) are consistent with external contingencies (Thompson, 1967). Environmental scanning refers to the frequency and means by which top managers receive data about external events and trends (Daft et al., 1988). This may include gathering information and advice from a variety of sources (e.g., suppliers, competitors, investors) and through a variety of means (e.g., personal contacts, websites) (Aguilar, 1967). Environmental scanning provides the external information critical to strategy-formulation and decision-making (Daft et al., 1988). Moreover, when environments are very uncertain, high performing firms engage in more frequent scanning (Daft et al., 1988) and pay attention to more kinds of real-time information (Eisenhardt, 1989c).

Seeking information from a *broad* range of external sources may be particularly important to entrepreneurs' ability to build and maintain awareness. A variety of external sources provide a broad array of sensors in the environment. Many studies have suggested that different network ties affect opportunity recognition (Ozgen & Baron, 2007; Shane, 2000; Yli-Renko, Autio, & Sapienza, 2001). Similarly, different contacts and sources of information are likely to pinpoint different trends, signals or critical assumptions about the environment and the venture's fit with it.

Many founding teams are very small often consisting of no more than 2 or 3 people (Shane, 2008). Therefore, they often lack the full breadth of expertise and functions found in more established top management teams. This limited breadth of perspectives may inhibit awareness. Individuals with different backgrounds bring with them unique thought worlds through which they view and even define the current situation (Dougherty, 1992). Also experts in different fields have access to different kinds of information (Cooper,

Folta, & Woo, 1995; Fiet, 1995). Similarly, secondary sources such as websites, journals or other publications all provide different perspectives on the venture environment. In the absence of broad perspectives, ventures may be less likely to monitor and notice whole swaths of the environment. This argument is consistent with some of the experiences relayed by respondents in my sample. For example, one respondent describes how his lack of expertise in the automotive industry prevented him from even knowing what to watch out for:

> "I wasn't smart--I just wasn't thinking hard enough about the fact that I've got my MBA, I know how to run companies, I've been a banker. I've built a company in another industry. But the auto industry is a special breed…and if I looked at my own experience and thought, Gee, what are all the things I'd know that other people don't know about the things I've been doing, I might have been a little bit more cautious about it. And I looked at automotive product development …as too generic a management assignment. And I've had to bump my head way too many times or get punched right in the face by the facts and circumstances of automotive that, even in good times, take greater savvy than I have, and greater savvy than any of us have in the company… I should have thought harder about what I didn't know. I didn't know what I didn't know…"

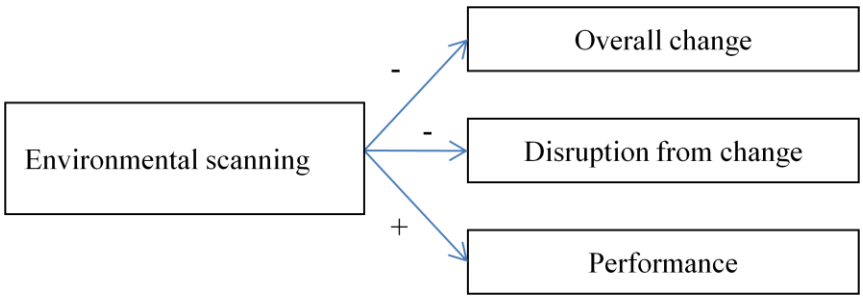
In contrast, some founders developed and maintained a very broad set of expert sources from whom to gather information and advice. For example, one CEO working to commercialize a medical device technology, sought advice from a regulatory expert to determine the specific FDA labeling requirements they would need to meet and how to meet them. He sought advice from a marketing expert on marketing strategies for the industry and another expert on sales. He also had a more general, strategy mentor to be "a sounding board" and to help "paint the picture" by asking critical strategic questions.

Using a variety of scanning sources provides entrepreneurs with a broad set of environmental sensors and is likely to facilitate awareness of changing environmental conditions and the venture's fit within those conditions. Consequently, frequent and

broad environmental scanning may allow entrepreneurs to notice emerging problems or issues quickly, allowing them to adjust or adapt before crises occur. As a result, changes are likely to be smaller (less overall change) and less disruptive to the firm. In addition, seeking information from multiple external sources can complement or augment a venture team's pool of expertise. As a result, they may have access to broader repertoires of action that can be drawn upon when adjustments are needed (Sutcliffe & Vogus, 2003), potentially in less disruptive and costly ways than might otherwise be considered. Therefore, firms who engage in frequent and broad environmental scanning are likely to enjoy better performance overall. Please see Figure 4.2. This leads to me to hypothesize:

> Hypothesis 4: Higher levels of environmental scanning will be associated with smaller overall change in the venture.
>
> Hypothesis 5: Higher levels of environmental scanning will be associated with less disruption from change.
>
> Hypothesis 6: Higher levels of environmental scanning will be associated with higher levels of performance.

Figure 4.2 The effects of environmental scanning on change, disruption and performance



LEARNING FROM EXPERIENCE

> "The operating principles for an early stage company – parenthetically for which there is no book that tells you what's going to happen next – is you have to very quickly discover what's working and do more of it, and what's not working and

stop doing it. It actually is that simple to say and that is incredibly difficult to implement…" – Founder

Scholars in the areas of innovation and new product development have suggested that when situations are dynamic and uncertain, organizations that can quickly learn from their experience may be better able to adjust and adapt (Baker et al., 2003; Brown & Eisenhardt, 1998; Eisenhardt, 1989c; Lei et al., 1996). Since innovation often involves trying to answer questions that no one else has ever answered (e.g., sizing a market that will only exist once their product or service is launched), planning is difficult and unreliable (Vandeven & Polley, 1992) and there are very few models of success (Cope, 2005; Corbett, 2005). Therefore, much of knowledge has to be developed through experience. Furthermore, in a dynamic environment conditions change so rapidly that current experience may be the best guide to the market reality (Eisenhardt & Tabrizi, 1995). For example, studies of large organizations competing in rapidly changing markets have suggested that while firms must learn from their past and shape the future, success hinges on their ability to focus strongly on the present (Brown & Eisenhardt, 1998). By paying attention to current experience, innovators are better able to stay abreast of rapid market changes and their own development efforts, keeping change events to smaller, more incremental and less disruptive adjustments (Adner, 2006; Chhatpar, 2007; Eisenhardt & Tabrizi, 1995).

The challenge of interpretation

However, if firms are to be guided by experience, they must first make sense of their experience. That is, organizational actors do not simply respond to information and experience, they have to interpret it (Daft & Weick, 1984; Weick & Daft, 1982). In fact, some scholars have suggested that organizing itself is an interpretive process (Weick,

1979). That is, "managers literally must wade into the swarm of events that constitute and surround the organization and actively try to impose some order on them" (Weick & Daft, 1983: 75). Similarly, entrepreneurs must observe and reflect on their experience and impose on that set of events, some meaning. However, the process of interpretation is particularly challenging when conditions are uncertain or equivocal (Daft & Lengel, 1984; Galbraith, 1972) – which are precisely the conditions surrounding the shaping process. As mentioned earlier, entrepreneurs face uncertainty in that outcomes and their probability are unknown (Duncan, 1972; Knight, 1921; Milliken, 1987). Perhaps even more challenging though, is the fact that many events are also highly equivocal. That is, data are unclear and suggest multiple interpretations (Weick, 2001: 251). For example, one founder in my sample was considering an expansion into Asia. He opened a very small trial office in Singapore, but when sales from that location failed to meet expectations, it was difficult to determine if the problem lay with the Asian market or with insufficient resources supplied to the project. As another respondent recalled:

> "For the first nine months of this company's history, the user trajectory was unbelievable. That's how we were able to raise a bunch of money in non-dilutive ways early on in the company's history. But since we kind of plateaued out at around month eight or nine, there was no clear plan. First of all there was no clear reason or explanation of *why* we plateaued out and more importantly there was no clear set of objectives about what we were going to do next to continue growth."

For these entrepreneurs, it was clear that current efforts were not working, but beyond that they had very little unequivocal data to suggest why current efforts were not working or what changes might improve their outcomes. Their experience was difficult to interpret not just because outcomes were unknown (uncertainty) but because the experience itself implied multiple meanings. Thus, simply having an experience doesn't

ensure that it can be easily interpreted. As Weick and Daft put it, "the organizational activity of interpreting the environment is an awesomely complex, fuzzy process" (Weick & Daft, 1983: 77).

How then can entrepreneurs make sense of their experience in order to learn and adjust effectively? To address this question, I turn to the innovation and new product development literature. Within this arena, scholars have offered several approaches to engaging in and drawing upon experience in ways that allow developers to make sense of their experience and adjust effectively. As I will discuss, these approaches are also likely to benefit entrepreneurs.

Experiential learning in new product development

When organizations are developing new product in very innovative contexts (e.g., high tech), many of the challenges they face are similar to those of entrepreneurs. Even within large organizations, developers must contest with rapidly changing technological and economic conditions, uncertain and increasingly limited resources and incomplete knowledge (Andrew et al., 2007; Brown & Eisenhardt, 1995; Dougherty & Hardy, 1996; McGrath, 2001). One approach to managing this uncertainty is to deliberately incorporate learning plans into development efforts. By creating a learning plan, developers are forced to explicitly assess the state of their knowledge, pinpoint knowledge gaps and critically, propose ways of filling those gaps, for example, by developing tests of their assumptions or uncertainties (Rice, O'Connor, & Pierantozzi, 2008; Sykes & Dunham, 1995).

Another approach is to design frequent tests and feedback into development efforts. For example, Eisenthardt and colleagues suggest that "experiential strategies"

provide more opportunities for real-time learning than more logistical, planning-based strategies (Brown & Eisenhardt, 1997; Eisenhardt & Martin, 2000; Eisenhardt & Tabrizi, 1995). Experiential strategies are strategies that involve "rapidly building intuition and flexible options in order to learn quickly about and shift with uncertain environments" and include the use of rapid design iterations, frequent testing, and frequent milestones (Eisenhardt & Tabrizi, 1995: 91). Frequent testing allows developers to rapidly build knowledge about their technology and to ground that knowledge in factual and concrete data. Also, frequent testing often means frequent small failures. This not only helps clarify what is working and what is not, but it does so in a way that is incremental and less costly (Eisenhardt & Tabrizi, 1995). Similarly, several scholars have advocated for the use of experimentation in innovative efforts. For example, Thomke and colleagues suggest that 'real-time' experimentation can help innovators fail early and often to increase learning (Thomke, 2001). Furthermore, while experimentation is often associated with technical development (e.g., Thomke, von Hippel, & Franke, 1998), it is increasingly seen as a approach for managing more strategic decisions and directions as well (Nicholls-Nixon, Cooper, & Woo, 2000; Thomke, 2003).

Finally, many scholars have suggested that frequent, repeated interactions with real customers and stakeholders help firms make sense of the changing nuances of the market and the ecosystem and provide the data necessary to iterate on product designs in real-time (e.g., "flexible design") (Adner, 2006; Beckman & Barry, 2007; Bhattacharya et al., 1998; Leonard & Rayport, 1997; MacCormack et al., 2001). For example, when product developers regularly test prototypes with potential users, the resulting data allows them to more quickly and accurately fine-tune their offering (Chhatpar, 2007).

What all of the approaches above have in common is that they are deliberate (i.e., innovators proactively seek or design an opportunity to learn), they are analytical (i.e., innovators gather and analyze concrete data), and they are reality-based (i.e., innovators gather first-hand data from experiences with the actual technology or environment). Moreover, insofar as they involve creating and testing data, they appear to have potential for reducing the equivocality of experience. They also all occur in 'real-time.' That is, they are not off-line experiments or tests, but rather occur in the course daily operations. In this sense, they are somewhat improvisational (Eisenhardt & Tabrizi, 1995).

Although there are many definitions of improvisation (Berliner, 1994; Kamoche & Cunha, 2001; Miner, Bassoff, & Moorman, 2001) most encompass the idea that activities are improvisational to the extent that their design and implementation are proximate in time (Moorman & Miner, 1998b). Improvisation can help organizations solve unexpected problems (e.g., Rerup, 2001; Weick, 1993) or leverage unexpected opportunities (e.g., Baker et al., 2003) and is often suggested to be an important capability for entrepreneurial ventures (Baker & Nelson, 2005; Hmieleski & Corbett, 2008). However, while improvisation can be viewed as a type of short-term, real-time learning, Miner and colleagues (1990) point out that improvisation involves little or no reflection and tends not to generate long-term knowledge. This is problematic for entrepreneurs since they must continually build their knowledge base, not just solve problems – and improvisation does not necessarily create good data for learning (Miner et al., 2001).

For entrepreneurs, this suggests that while experiential strategies such as prototyping and flexible design allow managers to quickly incorporate real-time

information into emerging offerings (Brown & Eisenhardt, 1997; Eisenhardt, 1989c; Eisenhardt & Tabrizi, 1995; Krishnan & Bhattacharya, 2002; MacCormack et al., 2001; Thomke, 1997), these practices are more likely to build knowledge when they are not entirely improvisational, but rather are deliberately designed to incorporate the more analytical elements of experimentation and testing (Thomke et al., 1998; Thomke, 1998). Collectively, I refer to these practices as "experiential learning strategies" which I define as "practices which incorporate the regular collection of real-time, real-world data with the use of explicit analytical processes to observe, interpret and assimilate those data into ongoing decisions." For entrepreneurs, this means engaging with the real world in real-time but doing so in a very deliberate and analytical way. As one very experienced entrepreneur commented:

> "You've got to jump in …get as much information as possible in as little time and for as little money as possible…In big companies you succeed by not making mistakes. In a little company you succeed by getting through the mistakes as fast and as cheaply as possible…[You need to] set up some little goals that are only an arm's throw away and if you can't hit those, step back and say, "Am I doing something wrong? Am I asking the wrong question?

Entrepreneurs' experiential learning strategies

Insofar as experiential learning strategies are a means of imposing order on an equivocal world, they may be akin to enactment. That is, according to Weick, "enacting involves shaping the world…as well as stirring the world so that it yields what we then treat as 'answers'" (Weick, 2006: 1729). Experiential learning strategies allow entrepreneurs to wade in and stir their world, creating "answers" to which they can then respond and adjust. The findings of Study 1 suggest that some entrepreneurs may be better than others at stirring their world. In particular, some respondents described

situations in which they deliberately designed real-time experiences for learning with the explicit intention of producing data and ultimately, increasing their knowledge. For example, one respondent described how they tested an innovative new research instrument:

> "Sara[8] was an expert at breaking the instrument …But that kind of feedback was critical, because …if [engineers] don't get it they will make assumptions that something works and it doesn't….They developed the software and they thought about how people would use it ... And then we sent them over to observe Sara using it and they were horrified. She wants to do what? …and Sara would merrily be collecting data at ten--five thousand events a second …which brought the software crashing to its knees because software developers never do that…But Sara would do what she wanted to do…. She is not an engineer. She is a scientist who wants to take data and turn it into new discoveries. We had the same thing literally going on across the hall right now in manufacturing. I've got one of my scientists … merrily breaking the things everybody thinks are done. And he'll be like, "It's not meeting this spec." And people will be like, "No, no. It's gotta be meeting the spec," and he's like, "Look, it's not." You know? And that's what I mean by accurate feedback and a week ago everybody was, "Oh yeah, these are working really well," except that we didn't have the right code in there and so there was some wiggle room in terms of how good it had to be met. So when people were looking at it making a judgment call everybody's giving themselves a little more grace than they actually have. So yesterday we were able to quantify exactly what it needed to do to pass. And lo and behold, there was a lot more work to be done."

I have suggested that one of the key sources of change is incomplete knowledge. (Because entrepreneurs start off with less than perfect knowledge (Alvarez & Barney, 2005), as they learn, their understanding of the contingencies they face changes, motivating them to adjust their strategy, operations, goals, etc. (Sarasvathy, 2001).) Experiential learning strategies are likely to facilitate the shaping process by rapidly building knowledge, which in turn, can reduce the disruption associated with change. More specifically, I am suggesting that experiential learning strategies build certainty

[8] Names have been changed to preserve anonymity

about the organizational environment, allowing entrepreneurs to make fewer, smaller and more positive changes.

Essentially, incomplete knowledge exists when there is uncertainty – when possible outcomes and their probability are unknown (Duncan, 1972; Knight, 1921; Milliken, 1987). Entrepreneurs experience a great deal of uncertainty (Alvarez & Barney, 2005), arising from many different components of the environment (Bourgeois, 1985; Downey & Slocum, 1975; Milliken, 1987). For example, Duncan (1972) suggests that environmental uncertainty arises from internal components (e.g., personnel, unit interactions, goals) as well as external components (e.g., suppliers, customers, competitors). Similarly entrepreneurs face uncertainty within their venture (e.g., uncertainty with respect to technical development, expertise required) as well as from the external environment (e.g., uncertainty with respect to market conditions, competitive environment). [9]

Experiential learning strategies build certainty and reduce the effects of change in (at least) three ways. First, by testing ideas, designs and approaches rapidly, entrepreneurs can build up knowledge about different components of their environment (e.g. their target market, suppliers, likely technical hurdles) early and fast, reducing uncertainty and potentially avoiding the *need* for large changes. That is, with increased certainty, the likelihood of needing to make adjustments is reduced (i.e., less overall

[9] This construction of uncertainty is somewhat similar to Milliken's "state" uncertainty (Milliken, F. J. 1987. 3 Types of Perceived Uncertainty About the Environment - State, Effect, and Response Uncertainty. ***Academy of Management Review***, 12(1): 133-143.) in that it considers how certain organizational actors feel about the state of the environment. However, whereas state uncertainty corresponds to the inability to predict what the external environment will *do*, uncertainty about the environment as conceptualized here corresponds to lack of knowledge *about* the entire task environment (internal and external). In this sense, it is closer to ignorance, or "a lack of knowledge, education or awareness" (Merriam-Webster dictionary, 2010). Conversely, in this conceptualization knowledge refers to the creation of certainty about different aspects of the environment.

change). Second, because experiential learning strategies involve frequent, rapid learning, any changes in knowledge are likely to be incremental and the resulting change efforts are likely to involve smaller, less disruptive adjustments (Eisenhardt & Tabrizi, 1995). Finally, because experiential learning strategies involve a deliberate and systematic approach to learning, entrepreneurs may be better able to interpret their experience accurately or with more certainty and have to make fewer risky decisions. In other words, by reducing equivocality, experiential learning strategies build certainty in ways that may improve the *quality* of change decisions. As a result, change decisions are more likely to result in expected (and presumably positive) rather than unexpected outcomes. This is consistent with anecdotal evidence from the first study, in which respondents associated "bad" changes with incomplete or equivocal information. Based on these arguments, I hypothesize:

> Hypothesis 7: More frequent use of experiential learning strategies will be associated with smaller overall change in the venture.
>
> Hypothesis 8: More frequent use of experiential learning strategies will be associated with less disruption from change.
>
> Hypothesis 9: More frequent use of experiential learning strategies will be associated with higher levels of performance.

Furthermore, I have argued that experiential learning strategies reduce the effects of change and improve performance as a result of building more certainty (i.e., knowledge) about the venture's internal and external environment[10]. Thus, I hypothesize:

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[10] Alternatively, this can be conceptualized as "improving performance as a result of reducing uncertainty." However, since theoretically I am referring to knowledge *building* and empirically this is tested using a measure of certainty (not uncertainty), I have retained the positive phrasing.

Hypothesis 10: The relationship between experiential learning strategies and overall change in the venture will be mediated by certainty about the organizational environment.

Hypothesis 11: The relationship between experiential learning strategies and disruption from change will be mediated by certainty about the organizational environment.

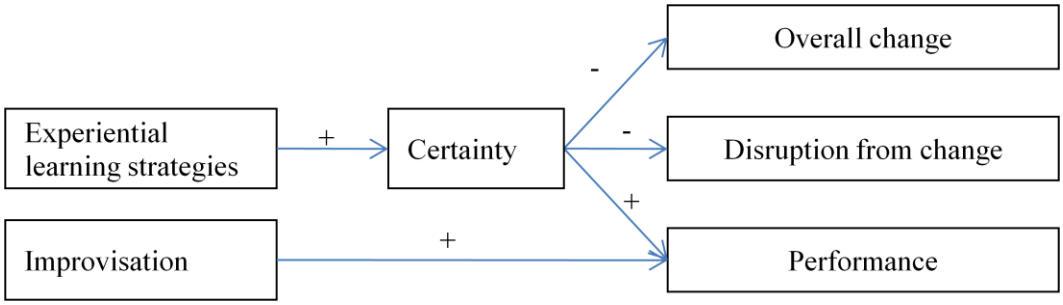
Hypothesis 12: The relationship between experiential learning strategies and levels of performance will be mediated by certainty about the organizational environment.

Finally, I have suggested that improvisational approaches may be beneficial to entrepreneurs insofar as they are a means of problem-solving. Therefore, I hypothesize:

Hypothesis 13: More frequent use of improvisational approaches will be associated with higher levels of performance.

However, given that improvisation does not necessarily facilitate knowledge building, I would not expect improvisational approaches to reduce overall change or disruption from change efforts. Please see Figure 4.3

Figure 4.3 The effects of experiential vs. improvisational strategies on change, disruption and performance



CONCLUSION

Based on the findings of Study 1, I have suggested that the process by which opportunities are shaped is essentially a process of change. As entrepreneurs learn from experience, feedback and advice, their own knowledge not only grows, but often changes.

That is, they may come to perceive the contingencies they face and the likely effectiveness of planned strategies and goals differently over time. Furthermore, given the dynamic and uncertain nature of the context in which innovative entrepreneurship occurs (McMullen & Shepherd, 2006; Shepherd et al., 2000), entrepreneurs are frequently confronted with unexpected events. As a result of both these forces for change, entrepreneurs may be motivated to change their operations and even the opportunity, multiple times throughout the early stages of a venture's emergence. However, the change process can be highly costly insofar as it tends to be disruptive and time-consuming – costs that a new, resource-constrained firm can ill afford to pay. On the other hand, when conditions are uncertain and dynamic, the failure to adjust and adapt as needed is also costly (Alvarez & Barney, 2005; Barnett & Pratt, 2000; Bhattacharya et al., 1998; Shepherd et al., 2000). How then can entrepreneurs engage in a change process, while at the same time, limit the costs of change?

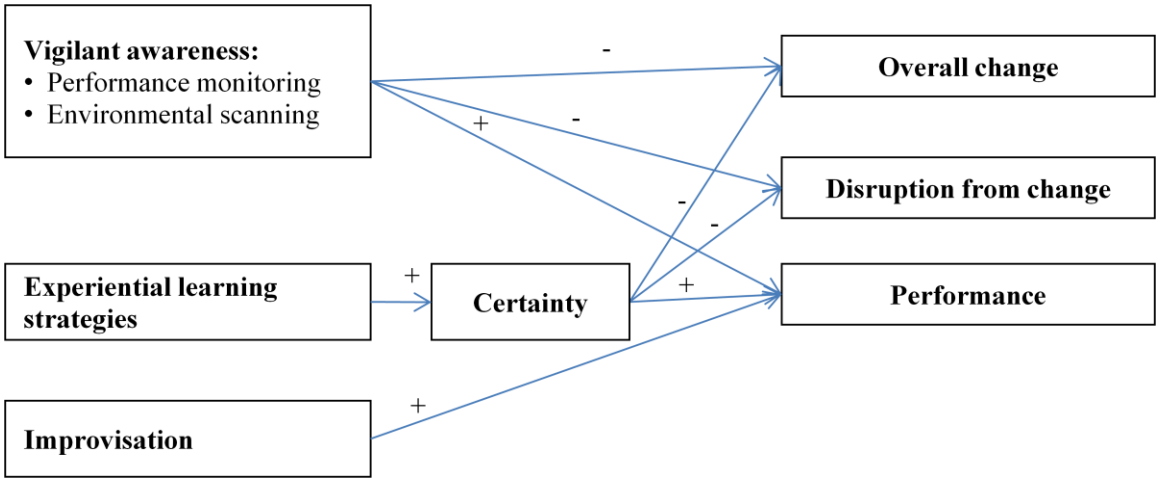
The findings of the first study suggest that change effects are most disruptive when change comes unexpectedly, takes a long time to recognize and implement or is based on inaccurate information. Therefore, to the extent that entrepreneurs engage in practices that allow them to anticipate or prevent unexpected events, recognize the need for change early and make changes quickly and based on unequivocal information, they may be less likely to feel the disruptive effects of change – while still maintaining flexibility and adaptability.

In this chapter I have suggested a model of practices that may facilitate the shaping process by managing the effects of change. In particular, I have suggested that building and maintaining a vigilant awareness of real-time operations (i.e., performance

monitoring) and environmental conditions (i.e., environmental scanning) may help entrepreneurs prevent unexpected events and recognize the need to change early, before problems escalate. As a result, change efforts may require smaller adjustments and fewer resources. Also, by regularly collecting real-world data and using analytical processes to observe, interpret and assimilate those data into ongoing decisions (i.e., experiential learning strategies), entrepreneurs may be better able to learn from experience. Experiential learning strategies reduce the disruption associated with change by reducing equivocality and thus improving the quality of change decisions. In addition, experiential learning strategies create opportunities for learning early and often, resulting in more frequent, but smaller, more incremental adaptations which are likely to be less disruptive than large shifts later in the process. I have also suggested that because in order to manage change, entrepreneurs must build knowledge not just solve-problems, experiential learning practices are likely to be more effective in managing change effects than improvisational approaches.

In summary, in order to successfully navigate the shaping process, entrepreneurs must both create and adapt to change while simultaneously managing its effects. I have suggested that their ability to do this arises from an emphasis on the present – on maintaining a vigilant awareness of real-time experience and developing means of effectively learning from and in the moment. Please see Figure 4.4 for the full model.

Figure 4.4 Proposed model of practices facilitating the shaping process



CHAPTER 5. A SURVEY OF PRACTICES TO MANAGE CHANGE IN THE OPPORTUNITY SHAPING PROCESS (STUDY 2)

The findings of Study 1 suggested that opportunities emerge as founders shape their ventures to match their evolving knowledge and changing environmental realities. Given these findings, in Chapter 4 I proposed that entrepreneurs who maintain a vigilant awareness of their operations and environment, and who utilize experiential learning strategies may experience less disruption from change efforts, ultimately, enjoying better performance. The purpose of Study 2 was to test these hypotheses. To that end, I designed and conducted a survey of entrepreneurs and a sample of their investors.

METHODS

Sample

The sample for this study was drawn from a population of new technology-based firms. I defined "new" as an entrepreneurial venture that was less than 10 years old and had not "exited" (i.e., been sold, closed down, or made an initial public offering). The 10-year cutoff is consistent with other research on new ventures (Covin & Slevin, 1990) and by excluding firms that had existed, I ensured that firms were truly 'startups.' There is no consistent definition of a technology based firm (Bollinger, Hope, & Utterback, 1983; Storey & Tether, 1998) but most definitions encompass the idea that such a firm is one that is reliant or based upon technology in exploiting business opportunities (Granstrand, 1998). I focused on technology-based firms in an effort to eliminate from the population many other kinds of self-employment that would not fall into my definitions of innovative entrepreneurship (e.g., owners of restaurants, dry-cleaning services, single-

proprietorship consultancies, etc.). This is not to say that all technology-based firms are innovative, but by limiting my population in this way, I've eliminated many that are not.

Three types of sources provided the population for this study: venture capital firms, angel investors, and incubators/economic development agencies. Venture capitalists are full-time professional investors who invest for a particular fund or set of funds (Hellmann & Puri, 2000). They provide to new firms increasing levels of capital over a limited time frame in exchange for some level of ownership and control of the business. Generally, the investment takes the form of private stock in the venture or a legal instrument which can be converted to stock. Angel investors are independently wealthy individuals who invest in new businesses in return for some level of ownership and/or control as well as expectations of a high rate of return on their investment (Hellmann & Puri, 2000). Finally, incubators are organizations that have been created "to support and accelerate the development and success of affiliated ventures," often with the help of local or national economic development agencies (Scillitoe & Chakrabarti, 2010: 155). For example, incubators in this study included one affiliated with the University of Michigan and another was affiliated with the state of Michigan. Incubators provide a wide-range of support including small levels of financial assistance, advice and expertise, and office or plant space.

I recruited entrepreneurs through these sources for several reasons. First, venture capitalists, angel investors, and other institutional investors often invest in technology based firms (GlobalInsight, 2005) and similarly, technology based firms are more likely to receive external funding than other types of firms (Reynolds, 2007b). Thus, by recruiting through these sources, I was better able to increase the proportion of

respondents involved in technology ventures. Second, by recruiting through investors, I was able to get performance data about a subsample of the firms from their investors in addition to the performance ratings provided by entrepreneurs directly. Third, because the investors provided me with a personal introduction to the respondents, I was able to maintain a relatively high response rate. This varied by source. Venture capitalists and angels tended to provide more limited lists but response rates were very high (often 75% -100%). Incubators provided much larger lists but as the relationships involved were far less personal, the response rates were lower.

The final reason I worked through investors is more subjective. By developing a sample from investors, I was more confident that the firms involved were real, going concerns, which is one of the great difficulties of researching emerging firms. An individual can incorporate a venture with nothing more than a name and social security number, and many people do. Some so-called 'new ventures' are nothing more than an individual's pet idea that he or she has been vaguely considering for many years. In fact, some studies suggest that one out of every five entrepreneurs is involved in the start up process forever (Shane, 2008)[11]. On the other hand, even well-funded, full-time ventures may have little to show in terms of sales, products, etc for many years so limiting a sample to those with revenues, for example, would over constrain the sample. By recruiting through investors, I was able to limit my sample to individuals who had at least passed the hurdle of discussing or presenting their ideas to investors. [12]

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[11] Although this data defined entrepreneurship very broadly to include "self-employment" and others who were only involved in a venture part-time.

[12] My intention was not to recruit only entrepreneurs who *received* funding. Rather, the investors (angels, VCs, incubators) provided lists of entrepreneurs with whom they had had some association. For example, some entrepreneurs had presented their ideas to the investors, but failed to receive funding. Others were

I sent the survey to 424 entrepreneurs and received 179 completed surveys, of which 139 were useable (see Screening, below). Thus, my final sample size was 139.

Survey design and administration

The surveys used in this study were designed to assess the constructs described in the model proposed earlier. To accomplish this, I used two surveys. The first was a very small survey for Venture Capitalists and Angels in which they were asked to assess the performance of several of their ventures (Survey Instrument for Investors). The second was a larger survey in which entrepreneurs were asked to report on the practices and performance of their firm (Survey Instrument for Entrepreneurs). The full survey instruments are provided in Appendices D and E. Following recent trends in survey administration, the surveys were distributed via email and administered online (Thompson, Surface, Martin, & Sanders, 2003). Upon completion, the data were automatically submitted to an electronic database. I used multiple-item 7 point Likert-like scales and when possible, used or modified existing scales that have been validated in previous literature (see description of measures below).

Survey item development and testing. The surveys necessitated a fair amount of scale development. Many of the constructs in the surveys, though not new to the literature, have not been operationalized or developed into validated scales. For example, Eisenhardt and colleagues' work on experiential development strategies suggest specific practices (Eisenhardt & Tabrizi, 1995) but no scale has been developed. Similarly, Thomke and colleagues' work on experimentation (Thomke & Fujimoto, 2000; Thomke

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entrepreneurs whom the investors were aware of and were following more informally. Thus, performance and success still varied, but the ventures themselves were relatively "real."

& Reinertsen, 1998) and Rice and colleagues' work on implementing a learning plan (Rice et al., 2008) all offer specific steps for work processes, but again, to my knowledge, there is no existing scale that captures experiential learning strategies as a whole. For other constructs, such as improvisation, some scales exist but are contextually inappropriate and thus had to be adapted.

As was discussed in Chapters 2 and 3, very few studies have explored entrepreneurial processes and survey studies are rare. Similarly, in their review of new product development research, Brown and Eisenhardt (1995) comment that the "creative processes by which senior managers and others match firm competencies with market needs to create an effective product concept…has been virtually unexplored" (374). As a result scale development in these contexts is extremely limited. Therefore, to build scales for the seven primary constructs in my study (i.e., performance monitoring, environmental scanning, experiential learning strategies, improvisation, overall change to venture, disruption from change, and venture performance), I drew on both existing theory and inductive approaches, which, according to Hinkin (1998), are appropriate when existing literature does not include enough information to develop the basis for a construct. I discuss the specific approaches and sources for construct items below (see Measures).

Using established guidelines (Singleton & Straits, 1999; Warwick & Lininger, 1975), I aimed to write items that were clear and concise. I pretested the items for the investor survey on one venture capitalist and two angel investors and pretested the items for the entrepreneur survey on 6 entrepreneurs. In both cases, I asked the respondents to comment on whether the items were sensible given their context, whether the wording of

any of the items was unclear and I asked them to identify items that were conceptually inconsistent with the constructs they were intended to measure (Hinkin, 1998). Based on their feedback, I made modifications to some items and dropped others. Given the small sample size, it was necessary to evaluate validity and reliability post-measurement (Nardi, 2003) (see below).

Participant recruitment. Respondents were recruited through investors, so there were two stages of recruiting. I used a snowball sampling approach to recruiting investors starting with lists of investors provided by the Zell Lurie Institute at the Ross School of Business and the Tucson Angels. I or a representative from Zell Lurie or the Tucson Angels sent an email to each of these investors explaining the study and requesting their participation (see Appendix F for a sample email). From these investors, I also solicited names of other investors or lists of other investors. In the second stage of recruiting, I sent emails to entrepreneurs requesting their participation in the survey (see Appendix G for a sample email).

I used several means to improve response rates. First, most investors sent a pre-notice email to the entrepreneurs. Pre-notice letters tend to increase response rates (Dillman, 2000), perhaps because they increase the salience of the survey when it arrives. Also, since the pre-notice letters came from a known associate, the legitimacy and sponsorship of the study were highlighted. A sample of the pre-notice email is included in Appendix H. Second, the cover-letter email containing the survey was designed in accordance with Dillon's suggested approach (2000) in that the salutation was personalized and the usefulness and importance of respondents' participation was emphasized. Third, I offered respondents a summary report of the study findings. Finally,

I sent a follow up reminder to non-respondents approximately two weeks after the initial email.

MEASURES

Throughout the survey, respondents were asked to report on the venture's activities in the past 12 months. In my pretests I found that 12 months was a good time frame because it was recent enough that respondents had no difficulty remembering activities in that time, but long enough to allow for the possibility of changes to the venture and its operations. With a few exceptions (e.g., 'age'), all items were measured on a 7-point Likert type scale.

Independent variables

Performance monitoring was measured using a four-item scale designed to assess the extent to which venture teams set and monitored internal guidelines for performance. Respondents were asked to indicate how often in the past 12 months members of your executive team engaged in the following activities. Response options ranged from "Less than quarterly" to "almost daily" on a 7 point scale. The four items were "We compared actual performance data to planned performance goals," "We reviewed the extent to which we were on track to accomplish planned milestones," "We compared actual costs to our expected burn rate (i.e., monthly operating expenses)" and "We benchmarked our process or offering against competitors."

Environmental scanning was measured using a 7-item scale developed from the qualitative data from Study 1 and existing literature on environmental scanning. To develop this scale, I first searched the qualitative data for common external sources of feedback, advice and information that respondents used for gathering information about

the environment. As was mentioned in Chapter 3, these were both human sources (e.g., industry experts) and archival sources (e.g., websites, "google-alerts," journals). I then reviewed studies in which environmental scanning was measured (e.g., Daft et al., 1988; Danneels, 2002; Sutcliffe, 1994) to look for additional sources. Finally, I reviewed the list with entrepreneurs during the pre-testing and as a result of their feedback, added an additional source ("other entrepreneurs") and grouped several internet sources together ("weblogs, online communities or web alerts.") In addition to these two sources, the final list of 7 items included "customers / potential customers," "individual industry experts or consultants," "industry associations, trade shows or conferences," "competitors, their websites, publications or offerings," and "business or trade journals."

There are several methods of rating environmental scanning including *frequency* and *interest* in scanning different sources (Farh, Hoffman, & Hegarty, 1984; Hambrick, 1982). Because my theorizing emphasizes scanning to maintain an awareness of a frequently changing environment, I used the frequency method (Hambrick, 1982). Therefore, respondents were asked to indicate "how often in the past 12 months members of your executive team sought feedback, advice or information from the following sources." Response options ranged from "less than quarterly" to "almost daily."

Experiential learning strategies was measured using a 9-item scale developed for this study based on conceptual guidance from innovation and new product development literatures. Recall that my definition of experiential learning strategies is "practices which incorporate the regular collection of real-time, real-world data with the use of explicit analytical processes to observe, interpret and assimilate those data into ongoing decisions." To create an initial list of such practices, I was first considered the

nature of experiential strategies as described by Eisenhardt and Tabrizi (1995). This resulted in three items: "We had frequent development milestones," "We conduct tests of our technology or offering frequently during the development process," and "Our development process involves creating many, frequent iterations of our technology or offering." However, I have suggested that experiential learning strategies are characterized not only by frequency and real-world interactions, as emphasized in Eisenhardt and colleagues' work (Brown & Eisenhardt, 1997; Eisenhardt & Martin, 2000; Eisenhardt & Tabrizi, 1995), but also by a very deliberate and analytical approach to learning. Drawing on the studies of learning plans in new product development, (Rice et al., 2008; Sykes & Dunham, 1995), I included three items to capture the idea of planned learning: "Before trying something new, we discussed the criteria by which we would judge our results," "We carefully evaluated ideas before trying them" and "After trying something new, we always carefully analyzed how it went." Drawing on studies of real-time experimentation (Nicholls-Nixon et al., 2000; Thomke, 1998), I included two items to capture deliberate testing of alternatives: "We deliberately created experiments to learn more about our market or operations" and "When we were unsure of the right approach, we methodically designed ways to test alternatives." Finally, because it was a phrase commonly used by several entrepreneurs in my sample to emphasize their analytical approach to development, I included the item "When deciding among different approaches or choices, we were very data driven." Respondents were asked to indicate on a 7-point scale, the extent to which they engaged in these activities in the past 12 months. Response options ranged from "Not at all" to "To a very great extent."

Improvisation was measured using a 5-item scale adapted from Moorman and Miner (1998a) with conceptual guidance from other improvisation scholars (Kamoche, Cunha, & da Cunha, 2003; Miner et al., 2001). These items included: "Our actions followed a strict plan (reverse coded)," "When faced with uncertainty, we tended to jump in and try something," "We didn't spend a lot of time reflecting on why we have achieved the outcomes that we have," "We relied on trial-and-error learning, " and "Moving ahead quickly was often given precedence over detailed planning." Respondents were asked to indicate on a 7-point scale, the extent to which they engaged in these activities in the past 12 months. Response options ranged from "Not at all" to "To a very great extent."

Mediating variable

Certainty was measured using an 8-item scale adapted from scales developed by Duncan (1972) and Rice (2008). These scales were designed to assess respondents' certainty about different components of the internal and external organizational environment. The items were: "We know who will be our target market(s)," "We know what suppliers, if any, we will require in order to be successful," "We are aware of and fully understand any existing competitors' solutions," "The scientific/technical knowledge underlying our offering is complete and correct," "We have identified the most likely scientific/technical hurdles we will face," "We know what regulatory/legal issues we will need to address," "Our team has the skills needed to achieve our current goals" and "We can get the funding we need." Respondents were asked to indicate on a 7-point scale, the extent to which they felt certain about these aspects of their venture. Response options ranged from "Not at all certain" to "Very certain."

Dependent variables

There were two sources for the dependent variables. First, I asked entrepreneurs to report on their overall change to the venture and disruption from that change. In addition, I included an index measure of their satisfaction with different aspects of their performance. Second, for a subset of the sample (60 respondents), I gathered data from an affiliated investor. These data included the investor's overall satisfaction with the venture's performance and an index measuring their satisfaction with different aspects of the venture's performance. Thus, for the theoretical construct of "venture performance" I included three different empirical measures which are labeled "perceived performance (reported by entrepreneurs)," "overall performance (reported by investors)," and "satisfaction with performance (reported by investors)." I describe each of these dependent measures below.

Overall change (reported by entrepreneur) to the venture was measured using a 5-item scale developed inductively for this study from the qualitative data. The five items included, "We are moving ahead exactly as we planned (reverse coded)," "We have taken this venture in a new direction," "Our approach to pursuing this venture has changed," "Our overall value proposition has changed" and "We have changed our overall vision of the opportunity we are pursuing." Respondents were asked to indicate on a 7-point scale, the "extent to which you agree with the following statements about your activities in the past 12 months." Response options ranged from "Strongly disagree" to "Strongly agree."

Disruptiveness of change (reported by entrepreneur) was measured using a 9-item scale developed inductively for this study from the qualitative data. The nine items were designed to reflect the dimensions of change effects noted in the qualitative study

(timeliness and disruption to operations). The items included: "The changes did not disrupt our timeline," "We should have figured out that changes were needed sooner," "It took us/is taking us a long time to implement these changes," "The need for these changes was unexpected," "We were able to make the changes very easily," "This change resulted/will result in significant changes to our operations," "These changes disrupted or delayed our financing," "We needed/will need a very different skill set to implement these changes" and "These changes caused much disruption." Respondents were given the instructions "Consider the most significant changes you have made in the past 12 months. Indicate the extent to which you agree with the following statements about those changes." Response options ranged from "Strongly disagree" to "Strongly agree" on a 7-point scale.

Perceived performance (reported by entrepreneur) was measured using an 8-item index of performance. In the early stages of a venture, financial criteria are generally poor indicators of performance since many firms have few if any sales and tend to be using rather than creating capital. Therefore, respondents were asked to rate their satisfaction with five aspects of performance (product development, market development, personnel development, efficient use of resources, harvest/exit readiness) drawn from Higashide & Birley's (2002) scale for non-financial performance criteria, which itself was modified from Sapienza (1992). The remaining three items (research/technical problem solving, investors' confidence, achieving milestones and goals) were developed from the qualitative study to include criteria more specific to the early stages of a start-up. Respondents were instructed: "Given where you are in the new venture process, how satisfied are you with your organization's performance with respect to: [each of the

criteria].” Response options ranged from “Very dissatisfied” to “Very satisfied” on a 7-point scale.

Overall performance (reported by investor) was measured using a two-item scale developed for this study. In an effort to control for the performance variance that naturally arises from ventures being at different stages of their development (i.e., very early start-ups vs. more mature startups) or on different types of growth paths (i.e., very high-growth potential vs. more modest-growth potential), investors were asked to rate the target venture with respect to the venture stage and their own expectations. The two items in this measure were: “Compared to all the companies you have invested in, how successful would you say this venture is *at this stage of development*” (response options ranged from “much less successful” to “far more successful”) and “Compared to your initial *expectations* for this venture (when you first invested), how well has it done so far overall?” (response options ranged from “fell far below expectations” to “far exceeded expectations”). Response options ranged along a 7-point scale.

Satisfaction with performance (reported by investor) was measured using a 10-item index of non-financial performance criteria. Five of the items were identical to items from the entrepreneurs’ performance index (product development, market development, efficient use of resources, achieving milestones and goals, research/technical problem solving). The remaining five were developed for this study to capture elements of managing uncertainty (ability to manage unexpected events, ability to learn from feedback and experience, ability to avoid or prevent surprises, ability to adapt operations or strategy when necessary, perseverance). Respondents were asked to rate

how satisfied they were with the venture's performance on each of these criteria. Response options ranged from "Extremely dissatisfied" to "Extremely satisfied" on a 7-point scale.

Control variables

Industry. Respondents were asked to indicate their primary industry choosing from the following list: Pharmaceuticals and medicine, Computer & Internet software, Medical devices, Finance & Insurance, Manufacturing, Professional, scientific or technical services, Computer hardware or electronics, Other (Please Specify). After all the data were collected, I analyzed the "other" answers and assigned them to categories if sufficient information was available. In the analyses for hypothesis testing, I eliminated any ventures that were non-technical and then dichotomized the data so that respondents were categorized as medical (pharmaceuticals and medicine, medical devices) vs. other technical. I chose these categories because firms involved in medical industries, including medical devices, are more highly regulated than other types of firms. For example, they must get FDA approval and meet stringent Medicare reimbursement guidelines (Chatterji, 2009; Radinsky, 2004). Although all the firms in my final sample were technology-based and involved in dynamic and uncertain industries, regulated firms may be less able to engage in some of the more flexible shaping processes I've discussed.

Sources of funding. Respondents were asked to indicate the nature and extent of external funding they had received. According to Timmons…. Respondents were asked to indicate how many, if any, rounds of external funding they had received from Institutional Investors (e.g., VCs), Angel Investors, Grants, Bank Financing, Friends/family not included in other categories and Other sources (respondents were asked to specify). Since Venture Capitalists and Angel investors often have a more

'hands-on' involvement in shaping the venture than would other types of investors (e.g., banks) (Barry, 1994; Busenitz, Fiet, & Moesel, 2004; Hellmann & Puri, 2000), I controlled for this potential limitation to shaping process by dichotomizing the data so that respondents were categorized as having received VC or Angel funding or not.

Total external capital. Respondents were also asked to indicate how much total external capital had been invested in the venture to date. Responses included 0, < $50K, $51-100K, $101K-250K, $251K - 500K, $501K - 750K, $751 - $1Million, > $1Million and <$3Million, > $3 and < $5Million, >$5Million and < $10 Million, > $10 Million and < $50Million, and > $50 Million.

Age of firm. Respondents were asked to indicate in what year the venture was incorporated and age was calculated based on this year.

Geographic location. Respondents were asked to choose the U.S. state in which their headquarters were located (or "Outside U.S."). Any firms located outside the U.S. were dropped from the sample. I then categorized the data into Northeast, Southeast, Midwest, Southwest, and West.

Size of executive team. Respondents were asked to indicate how many people (including themselves) were on the executive management team. Based on feedback from the pretest, the executive team was defined as "individuals who are officers OR individuals who both own an equity stake in the venture and are actively involved in its strategic management."

Age of respondent. Respondents were asked to indicate their age in years.

Gender of respondent. Respondents were asked to indicate their gender.

Respondent's title. Respondents were asked to indicate their current title. The choices provided were: Board Member, CEO, President, Other C-Suite Officer (please specify), Vice President or Sr. Vice President, Other. For hypotheses testing, the responses were dichotomized into two categories CEO/President or Other.

Screening

To make sure that firms had not exited, respondents were asked to indicate if their firm had existed in any of the following ways: closed down, sold to another firm, IPO or other (please specify). Two ventures had been sold, one had had an IPO and 2 had other kinds of exits. These were all dropped from the sample. Respondents were asked if they were members of the executive management team (using the same definition of executive management team as above). Two respondents were not and these were dropped from the sample. In three cases I received surveys from more than one member of a venture. In these cases I dropped the survey from the lower ranking team member.

In addition, 12 cases were dropped because the firms represented were more than 10 years old. Thirteen cases were dropped because the firms were not technology-based. Three firms were dropped because they were not headquartered in the United States. This left a final sample of 139 new ventures, 59 of which were matched with investor data[13].

ANALYSIS OVERVIEW

I began the analysis by checking for missing data. I then assessed the reliability of the scales using Cronbach's alpha and exploratory factor analysis (EFA). Cronbach's alpha assumes a unidimensional factor structure. Exploratory factor analysis is used to

[13] Several of the cases were dropped for multiple reasons (e.g., not technology-based and more than 10 years old) which accounts for the fact that the sum of the dropped cases is more than the difference between the original and final samples.

determine if this assumption is valid or if a multidimensional structure better fits the data. I used principal axis factoring (PAF) because many of my scales have not been validated. Under these circumstances PAF is the appropriate approach because the researcher cannot assume that all of the variance of a measure is explained by the factors that emerge (Russell, 2003; Widaman, 1993). Since this study, as with most social science research, involves constructs that are unlikely to be truly orthogonal, it was appropriate to use an oblique rotation which allows factors to be correlated (Conway & Huffcutt, 2003). I used Promax rotation. I used hierarchical regression to test the hypotheses.

RESULTS

System-missing data and items in which respondents selected "not applicable" were coded as missing for hypothesis testing. There was almost no missing data for the control variables. Age of respondent and age of firm were each missing one response. Performance monitoring, certainty, overall change and change effects had no missing data because these were required questions. Environmental scanning, experiential learning strategies, improvisation and satisfaction with performance all had less than 5% missing data. In the investor surveys, overall satisfaction with performance had no missing data and the performance index had less than 1% missing data. Having reviewed the pattern of missing data, I decided not to impute values. Imputing values can be risky in any case and given how little data was missing it did not seem necessary.

I sent the survey to 424 entrepreneurs and received 179 completed surveys. This represents a 42% response rate which is much higher than the 27% average for surveys in entrepreneurship (Bartholomew & Smith, 2006). However, the response rate varied depending on the source. Of the 105 surveys sent through venture capitalists, 88 were

completed representing an 84% response rate. The remaining 319 were sent through incubators. Of these 92 were completed, representing a response rate of 29%. I sent the investor survey to 22 investors and received 90 completed surveys from 20 investors. Not all investor surveys were matched with completed entrepreneurial surveys (i.e., some investors filled out surveys about ventures from whom I was never able to get an entrepreneur survey and vice versa). There were a total of 73 matches prior to screening. After dropping responses as described above, I was left with a sample of 139 surveys from entrepreneurs and 59 matching investor surveys.

Because this was an online survey, the only information available about non-responders was their email address and (in some cases) their name and the name of the venture. Thus, very little can be analyzed about non-responders.

Reliability: Independent variables

Performance Monitoring. The four items used to measure monitoring were correlated (ranging from .35 to .77). An exploratory factor analysis (using principal axis factoring and promax rotation) indicated that there is indeed one factor (eigenvalue 2.54) which explains 63.5%. The factor loadings ranged from .46 to .87. The alpha for the scale was .79. However, the "Benchmarking" item had the lowest correlation and factor loading and dropping it created an alpha of .84. An exploratory factor analysis of the three remaining items had an eignenvalue of 2.27 which explained 75.7% of the variance. These results support the reliability of the 3-item performance monitoring scale. Therefore, for hypothesis testing, I dropped the benchmarking item and used the three-item measure of performance monitoring.

Environmental Scanning. The seven item scale used to measure environmental scanning was designed as an index of *different* sources for information and advice. As such, there was no reason to expect that the individual items would be highly correlated

and in general they were not. For example, entrepreneurs may value other entrepreneurs as sources of insight and advice about the process of developing a new venture (Buttner, 1993) and use journals and websites for industry data. My hypothesis suggests that those entrepreneurs who *do* make use of multiple sources are likely to benefit, but since the motivations underlying these behaviors can be quite different, there is no reason to believe entrepreneurs who use more of one, will also use more of the others. The data reflected this in that correlations were moderate to non-existent. Of these, the strongest correlations (.35 - .48) were between business or trade journals and industry associations, competitor sources, and websites. The alpha for all seven items was .71.

Experiential Learning Strategies. The 9 items used to measure experiential learning strategies were all correlated except for the item, "Our development process involves creating many, frequent iterations of our technology or offering" which had low to no correlation with the other items. The remaining correlations ranged from .29 to .59 but most were above .40. An exploratory factor analysis (using principal axis factoring and promax rotation) of the remaining 8 items indicated that there is indeed one factor with an eigenvalue of 4.15 which explains 51.9% of the variance. Factor loadings ranged from .55 to .75. The alpha for the 8-item scale was .86. These results support the reliability of the scale. Therefore, for hypothesis testing, I used the 8-item measure of experiential learning strategies.

Improvisation. The five items used to measure improvisation were moderately correlated except for the item "We didn't spend a lot of time reflecting on why we have achieved the outcomes that we have." The remaining correlations ranged from .25 to .53. An exploratory factor analysis (using principal axis factoring and promax rotation) of the remaining 4 items indicated that there is indeed one factor, however the factor loading for the item "Our actions followed a strict plan (reverse coded)" was low (.35) and an analysis of

Cronbach's alpha indicated the scale was stronger without it. After dropping these two items, an exploratory factor analysis (using principal axis factoring and promax rotation) of the three remaining items indicated that there is still one factor with an eigenvalue of 1.93 which explains 64.5% of the variance. Factor loadings ranged from .58 to .89. The alpha for the three-item scale was .72. Since this indicates good reliability, for hypothesis testing I used the three-item improvisation scale.

Reliability: Mediating variable

Certainty. The 8 items used to measure certainty about the internal and external environment were all moderately correlated except for the item, "We can get the funding we need" which had low to no correlation with the other items. The remaining correlations ranged from .20 to .66 but most were above .35. An exploratory factor analysis (using principal axis factoring and promax rotation) of the remaining 7 items indicated that there is indeed one factor with an eigenvalue of 3.20 which explains 45.8% of the variance. Factor loadings ranged from .46 to .70. The alpha for the 8-item scale was .80. These results support the reliability of the scale. Therefore, for hypothesis testing, I used the 7-item measure of certainty.

Reliability: Dependent variables

Overall change (reported by entrepreneur). The five items used to measure overall change in the venture were moderately correlated with correlations ranging from .28 to .73, but most were above .50. An exploratory factor analysis (using principal axis factoring and promax rotation) indicated that there is indeed one factor with an eigenvalue of 3.20 which explains 64.0% of the variance. Factor loadings ranged from .48 to .85. The alpha for scale was .86. These results support the reliability of the scale.

Disruptiveness of change (reported by entrepreneur). The nine items used to measure the disruptiveness of change were weakly to moderately correlated, with

correlations ranging from .18 to .48, but most were above .35. An exploratory factor analysis (using principal axis factoring and promax rotation) indicated that there is indeed one factor with an eigenvalue of 3.73 which explains 41.4% of the variance. Factor loadings ranged from .48 to .75. The alpha for scale was .82. These results support the reliability of the scale.

Perceived performance (reported by entrepreneur). Entrepreneurs' satisfaction with their own performance was measured using an index of eight items. These items were meant to capture performance along a variety of dimension and therefore correlations were not expected to be high, which was the case. The items were all weakly to moderately correlated, with the exception of two pair-wise correlations between research/technical problem-solving and market readiness and research/technical problem-solving and investor confidence. The remaining correlations ranged from .19 to .54 but most were above .30. Although it was not anticipated that there would be a single underlying factor, an exploratory factor analysis (using principal axis factoring and promax rotation) supported a single-factor solution, with an eigenvalue of 3.32 which explains 41.5% of the variance. Factor loadings ranged from .42 to .67. The alpha for scale was .80. These results support the reliability of the scale.

Overall performance (reported by investor). Because only two items were used to measure investor's satisfaction with venture performance, it is appropriate to use correlation as a measure of reliability. The two items were highly correlated (.87) which suggests good reliability for the scale.

Satisfaction with Performance (reported by investor). Investor's satisfaction with the venture's performance was measured using an index of ten items. These items were meant to capture performance along a variety of dimension and therefore

correlations were not expected to be high. As it turned out, they were quite strongly correlated. Although correlations ranged from .30 to .80, most were above .45. Although it was not anticipated that there would be a single underlying factor, an exploratory factor analysis (using principal axis factoring and promax rotation) supported a single-factor solution, with an eigenvalue of 5.71 which explains 57.1% of the variance. Factor loadings ranged from .53 to .90. The alpha for scale was .91. These results support the reliability of the scale.

Tests for discriminant validity

I conducted several exploratory factor analyses to determine if conceptually related constructs were empirically independent. First, I assessed the discriminant validity of performance monitoring and environmental scanning since both of these reflect attempts to build environmental awareness. Although I view environmental scanning as an index, rather than a scale, it is still important to determine whether or not the behaviors included are conceptually distinct from those of performance monitoring. An exploratory factor analysis (using principal axis factoring and promax rotation) resulted in a three-factor solution explaining 61.9% of the variance. The first factor, with an eigenvalue of 2.94 loaded the performance monitoring items with factor loadings from .64 to .88. The second factor, with an eigenvalue of 1.99 loaded four of the environmental scanning items ("Individual industry experts or consultants," "Industry associations, trade shows or conferences," "Other entrepreneurs" and "Customers / potential customers.") Factor loadings ranged from .43 to .69. The third factor, with an eigenvalue of 1.26 loaded the remaining environmental scanning items ("Weblogs, online communities or web alerts," "Competitors, their websites, publications or offerings" and "Business or trade journals.") Factor loadings ranged from .63 to .70. This suggests that performance monitoring is

distinct from environmental scanning, but that there are two different approaches to environmental scanning. The first appears to reflect an emphasis on sources that are close to the venture's specific market or industry, whereas the second are more general or distal sources of information. The two environmental scanning items were moderately correlated (.486) but the neither was strongly correlated with performance monitoring (correlations were .11 and .26). Because the 7 items of environmental scanning are correlated with each other and conceptually and empirically distinct from those of performance monitoring, for the purposes of hypothesis testing, I retained all 7 items of environmental scanning as a single index. However, in the discussion section of this chapter I conduct a post hoc analysis to obtain a more fine-grained understanding of how these two different approaches to environmental scanning may affect the proposed model.

I next assessed the discriminant validity of experiential learning strategies and improvisation since they both pertain to organizing in real-time. An exploratory factor analysis (using principal axis factoring and promax rotation) resulted in a two-factor solution explaining 58.1% of the variance. The first factor, with an eigenvalue of 3.97 loaded the experiential learning strategies items with factor loadings from .58 to .74. The second factor, with an eigenvalue of 1.84 loaded the improvisation items with factor loadings from .59 to .90. These results suggest that experiential learning strategies and improvisation are indeed distinct factors. Moreover, the factor correlation matrix suggests that they are not highly correlated (-.288).[14]

[14] Although the four behaviors are not conceptually similar, I did conduct an exploratory factor analysis of all four variables as well, in case there were similarities I had not considered. The EFA came out precisely the same way as the two separate EFAs. Performance monitoring, two approaches to environmental scanning, experiential learning strategies and improvisation all loaded onto separate factors.

Finally, I assessed the discriminant validity of overall change to the venture and disruptiveness of change since they both pertain to change efforts. An exploratory factor analysis (using principal axis factoring and promax rotation) supported a two-factor solution explaining 50.5% of the variance. The first factor, with an eigenvalue of 5.29 loaded the disruptiveness of change items and one item from overall change ("we are moving ahead exactly as planned (reverse coded)") with factor loadings from .37 to .83. The second factor, with an eigenvalue of 1.78 loaded all the overall change items with factor loadings from .28 to .86. The factor correlation matrix suggests the two factors are moderately correlated (.54). These results suggest that overall change and disruption from change are indeed distinct factors however, because they are correlated and one item cross-loaded, for hypothesis testing I did not use both variables in any one regression.

Descriptive statistics

Table 5.1 contains the means, standard deviations, and reliabilities (Cronbach's alpha) for the variables created from the survey. I concluded, based on my analysis of the means, standard deviations and histograms that these data had sufficient variance for analysis and were approximately multivariate normal.

Several observations about the descriptive data are noteworthy. Most of the firms (73%) had received venture capital or angel funding. This finding is not surprising given my sampling strategy which drew much of the sample directly from venture capitalists and angel investors (though not all had invested in the firms they provided). The figure listed for total external capital refers to a scale not a total amount of funding. On average, respondents reported obtaining between $500K and $1Million from external sources. The data break down as follows: approximately 42% received between $0 and $1M,

approximately 24% received between $1M and $5M, approximately 13% received between $5M and $10M and the remaining approximately 21% received over $10M. The age of the firms ranged from less than 1 year to 10 years with an average of 4.76 years. The size of the executive team ranged from 1 to 11 with an average of 3.79. The vast majority of the respondents (93%) were male which is consistent with the field technology-based entrepreneurship (Shane, 2008).

Table 5.1 Means, standard deviations and reliabilities for survey variables

	N	Mean	Std. Deviation	Cronbach's Alpha
Performance Monitoring	139	4.47	1.34	0.84
Environmental Scanning	139	3.48	1.06	0.71
Experiential Learning Strategies	138	5.22	1.05	0.86
Improvisation	139	4.53	1.45	0.72
Certainty	139	5.75	0.78	0.80
Overall Change	139	3.77	1.55	0.86
Disruptiveness of Change	139	3.58	1.12	0.82
Perceived performance (reported by entrepreneurs)	139	5.12	0.99	0.80
Overall Performance (reported by investors)	59	4.17	1.61	0.87
Satisfaction with performance (reported by investors	59	5.08	1.17	0.91
Industry (1 = medical, 0 = other)	139	0.36	0.48	
Received VC or Angel funding (1 = yes, 0 = no)	139	0.73	0.45	
Total external capital	139	6.37	3.22	
Age of firm	138	4.76	2.57	
Size of executive team	139	3.79	1.84	
Age of respondent	138	48.75	9.96	
Gender of respondent	139	0.93	0.26	
CEO or President (1=yes, 0=no)	139	0.81	0.40	
Location Midwest (1=yes, 0=no)	139	0.54	0.50	
Location Northeast (1=yes, 0=no)	139	0.11	0.31	
Location Southwest (1=yes, 0=no)	139	0.12	0.33	
Location West (1=yes, 0=no)	139	0.20	0.40	
Location Southeast (1=yes, 0=no)	139	0.03	0.17	

Another pattern of note is that on average, respondents did not report that their ventures had undergone large amounts of change or disruption from change (although this varied quite a bit). It may be that change is not as common as I suggest. However, another possibility is that entrepreneurs are so accustomed to change as a normal part of the venturing process that their responses are anchored in an already highly dynamic context. Thus, relative to what they perceive as the 'norm' they have experienced only moderate change and disruption. In any case, for this study the average amount of change

is not as important as the variance in that change and change disruption, which is significant.

In the scales used for performance monitoring and environmental scanning, "4" represents a frequency of once/month. Thus respondents reported that on average they engaged in performance monitoring a little more often than once/month and on average engaged in environmental scanning a little less often than once/month.

Another pattern of note is that on average, respondents tended to be more analytical (use experiential learning strategies) than improvisational. This is somewhat counter to the popular notion of entrepreneurs as being highly improvisational, intuitive, and risk-taking (Shane, 2008). Rather, on average, they appear to engage more in very deliberate, systematic approaches to managing the uncertainties they face. This may also explain why, on average, they feel quite certain about their venture environment.

Finally, it is risky to compare the investors' ratings of performance with the entrepreneurs' ratings of performance in this table since the former is based on only 59 cases and the latter represents the average for all 139 entrepreneurs. That said, while investors appear to be slightly less pleased with performance than entrepreneurs, overall they are more pleased than not.

I also grouped the data into the 59 cases for whom I was able to collect performance data from investors and the 80 cases that did not include investor data and compared their means on the independent, mediating and dependent variables. The only variable that differed significantly was performance monitoring. Investor-evaluated entrepreneurs tended to engage in slightly more performance monitoring (m=4.8) than those who were not evaluated by investors (m=4.2) (t = .856, p=.005). This likely reflects

the fact that all of the investor-rated entrepreneurs were involved with venture capitalists or angels whereas some of the other entrepreneurs were not. In other words, entrepreneurs who are externally funded are likely to have more stringent performance monitoring requirements and thus engage in monitoring more often.

Table 5.2 contains the correlation matrix of all variables. Most correlations are quite low with a few exceptions. Investor's overall ratings of performance and their satisfaction with performance are highly correlated (.696) which is to be expected since they are essentially two measures of the same thing (venture performance). Overall change to the venture and disruptiveness of change are moderately correlated (.526) which is in line with my theorizing. Organizations that experience a great deal of change are more likely to be disrupted by that change. Interestingly, entrepreneurs' perceived performance is negatively correlated with disruption from change (-.474) but less so with overall change (-.273) which also supports the idea that while change can be detrimental to performance, it is the disruption that arises from it that is most problematic. Finally, investors overall performance ratings for ventures are negatively associated with change (-.328) and disruptiveness from change (-.274) suggesting that change can have a negative effect on investor evaluations as well.

Table 5.2 Correlations of Study 2 variables

	Performance monitoring	Environmental Scanning	Experiential Learning Strategies	Improvisation	Certainty	Overall Change	Disruptiveness of Change	Perceived Performance (Ent's)	Overall Performance (Investors)
Environmental Scanning	.229**								
Experiential Learning Strategies	.248**	.069							
Improvisation	.012	.067	-.196*						
Certainty	.076	-.014	.256**	-.294**					
Overall Change	-.275**	.034	-.252**	.121	-.201*				
Disruptiveness of Change	-.190*	-.067	-.296**	.128	-.311**	.526**			
Perceived Performance (Ent's)	.231**	.259**	.424**	-.093	.322**	-.283**	-.474**		
Overall Performance (Investors)	-.045	.061	.035	.118	.092	-.328*	-.274*	.362**	
Satisfaction with Performance (Investors)	-.343**	-.160	-.101	.003	.084	-.243	-.332*	.161	.696**
Industry	.049	-.028	.219**	-.198*	-.116	-.090	-.027	.053	.010
VC/Angel funding	.234**	.010	-.035	.146	-.081	-.017	.030	.074	.196
External Capital	.198*	.037	.086	.044	-.137	-.177*	-.044	.053	.254
Age of firm	.096	.028	-.074	.032	.087	.116	.140	-.218*	-.085
Exec Team Size (log)	.207*	.118	.037	-.062	.121	.045	-.073	.156	.180
Age of Respondent	.044	-.090	.223**	-.235**	.188*	-.128	-.180*	.066	.090
Gender	.007	-.198*	.041	.044	-.038	.028	-.040	.029	-.096
CEO or President	.180*	.245**	.089	-.010	.211*	-.039	-.042	.200*	-.182
Midwest	-.233**	-.140	-.010	.028	-.086	-.070	.076	-.184*	-.085
Northeast	.093	-.003	.034	-.170*	.026	.060	.061	.001	-.071
Southwest	.012	.003	-.025	-.045	-.034	.057	-.015	.010	.025
West	.196*	.175*	.026	.069	.079	.006	-.118	.171*	-.001
Southeast	.026	-.002	-.047	.156	.087	-.031	-.025	.116	.224

Table 5.2 Continued

	Satisfaction with Performance (Investors)	Industry	VC/Angel funding	External Capital	Age of firm	Exec Team Size (log)	Age of Respondent	Gender	CEO or Preside nt
Industry	.040								
VC/Angel funding	.242	.023							
External Capital	.184	.165	.484**						
Age of firm	-.086	-.012	.158	.242**					
Exec Team Size (log)	-.191	.015	.187*	.369**	.211*				
Age of Respondent	.098	.364**	.033	.074	.100	.122			
Gender	.059	-.023	.017	-.037	-.151	.018	.041		
CEO or President	-.039	-.087	.107	.063	.040	-.075	.021	.004	
Midwest	.237	.121	-.178*	-.239**	-.125	-.455**	.001	.022	.021
Northeast	-.198	-.019	.161	.270**	.060	.191*	.016	.097	-.064
Southwest	-.050	.086	-.116	-.112	-.063	-.010	.114	-.151	-.150
West	-.157	-.190*	.147	.137	.125	.364**	-.135	.001	.156
Southeast	.132	-.039	.106	.101	.084	.149	.061	.048	-.024

Table 5.2 Continued

	Midwest	Northeast	Southwest	West
Northeast	-.377**			
Southwest	-.404**	-.130		
West	-.544**	-.175*	-.187*	
Southeast	-.186*	-.060	-.064	-.086

* p<.05, **p<.01

Hypothesis testing: hierarchical regressions

I began by conducting regressions of the independent, mediating and dependent variables on the control variables. Table 5.3 presents these results. Being in a medical industry positively predicted the use of experiential learning strategies. There are three possible reasons for this. First, many of the entrepreneurs who go into the medical industries are scientists and therefore familiar with and accustomed to using more analytical methodologies for research and development. Second, and related, ventures in the medical industries are often research and development oriented, for example, many are started for the purpose of developing and commercializing inventions arising from basic research. Development efforts therefore are an offshoot of research efforts, with the corresponding emphasis on empirical approaches to learning. Finally, because these industries are regulated, entrepreneurs are required to more closely track and measure their development efforts.

Ventures that had received VC or Angel funding tended to have higher performance ratings from investors. This finding is likely an artifact of the sampling strategy. Investors were only rating ventures that had received funding. In theory, however, there may be other explanations. First, there may be some reverse causality at play. Angels and VCs tend to invest in better performing ventures. However, the reverse argument can also be made. Ventures who receive funding from VCs and Angels acquire additional benefits that contribute to their *ability* to perform well. For example, VCs and Angels provide access to expertise, network connections and of course, capital. It is perhaps more interesting to note that VC and Angel funding did not predict

entrepreneurs' own ratings of performance, which suggests another possible explanation for the relationship between funding and VC's performance ratings – cognitive dissonance. VCs were rating firms in which they had invested and might conceivably be overly optimistic about the performance of those firms.

External capital negatively predicted certainty and overall change. The effect on certainty is so small as to be possibly meaningless. However, it was interesting to note that several of the respondents in my sample commented on the pressure of receiving money from investors and the great responsibility it implied. It is conceivable that as entrepreneurs receive more money, they become less cocky and more careful about the certainty of their ventures. The relationship between external capital and change is more easily explained, though as with VC funding, the causality likely runs both ways. Investors tend to invest in stages. As ventures develop and pass certain milestones, investors are willing to put in more capital. Thus, as ventures become more stable, they are also likely to attract more investments. On the other hand, more capital implies more slack resources. My qualitative data suggested that entrepreneurs often made changes when they faced unexpected events. In those cases, they often had to redirect their limited resources in order to respond and adapt. For example, when a partnership failed, one respondent had to make up the resources internally and as a result had to shut down development on a new product line. He simply ran out of money and had to choose between the two projects. Higher levels of funding may make such choices unnecessary, allowing entrepreneurs the ability to ride out some of the ups and downs of changing markets without having to take drastic change actions.

The age of the firm positively predicted overall change and disruption from change and negatively predicted performance. Age of firm may predict overall change for a couple reasons. First, it may be that in the early stages, ventures have not yet committed enough to a particular direction for change to be very salient. As they get older, it becomes clearer what was planned versus what is happening. Also, as I suggested in my theorizing, the longer firms wait to make changes, the bigger those changes tend to be. Small tweaks in strategy or partnerships early on may prevent the need for large changes later. The relationship between age of firm and disruptiveness of change emerges directly from this line of reasoning. As firms develop, they invest resources in a particular direction or strategy. If that direction is changed early on, it may cause little disruption, but the older the firm, the more disruption is likely to result from change efforts[15]. Finally, it is difficult to say from this regression if age of firm is responsible for the lower performance ratings or whether change is the common underlying factor causing both disruption and poorer perceived performance. However, a direct reason that age of firm may predict poorer performance arises from the statistics of new ventures. Most fail. The older the firm is, the closer its founders may be to realizing that it is not going to succeed. As firms get closer to that 10-year cut off, many founders may be realizing that their initial optimism was not well founded.

[15] Please recall that the measure for 'disruptiveness of change' asked respondents to report on changes made in the past year and how disruptive those changes were. In other words, this is not a cumulative measure (e.g., older firms have had more time to accumulate disruptions). Rather, it is a measure of how disruptive were changes made in the past year. For older firms, changes were more disruptive than they were for younger firms.

The age of the respondent positively predicted experiential learning strategies (albeit in a tiny way) and negatively predicted improvisation. This may suggest that mature entrepreneurs are more likely than young ones to lead their venture in more systematic and analytical ways, perhaps as a result of previous experience. Age of respondent also positively predicted certainty and investors' satisfaction with performance and negatively predicted disruptiveness of change. All of these may indicate the tendency of more mature entrepreneurs to perform better as leaders.

Gender negatively predicted environmental scanning, indicating that women-led ventures engage in more scanning than male-led ventures. However, given how few women were in the sample, I would be cautious about generalizing this.

Being the CEO or President (as opposed to another member of the top management team) positively predicted performance monitoring and environmental scanning. Recall that the questions refer to the team behaviors not personal behaviors so this finding indicates that respondents who were CEOs or Presidents viewed their ventures as engaging in more monitoring type behaviors than respondents who were not CEOs or Presidents. Top managers may simply be more aware of the kind of monitoring behavior going on. It is also possible that they, themselves, engage in more of this behavior and thus perceive the overall level of monitoring as being higher. Being the CEO or President also positively predicted certainty which may reflect the fact that top managers likely have a better understanding of the overall venture than other individuals. Being the CEO or President also positively predicted perceived performance (by the

entrepreneur) which may simply be an indication of greater pride and investment in the venture.

Finally, ventures located in the northeast were less likely to engage in improvisational behaviors. This may be an artifact of the small sample size, reflecting a random decrease in improvisation in the few New England ventures in my sample. It is also conceivable that the New England culture is less congenial to improvisational approaches. Control variables that were significant in predicting at least one variable were kept in the analysis for hypothesis testing.

Table 5.3 Regression results for control variables

	Performance Monitoring	Environmental Scanning	Experiential Learning Strategies	Improvisation	Certainty
(Constant)	3.16**	4.25**	3.80**	6.71**	5.26**
	(1.12)	(.88)	(.89)	6.71	(.63)
Industry	.27	.13	.40*	-.43	-.22
	(.26)	(.21)	(.21)	(.28)	(.15)
VC or Angel Funding	.48	-.07	-.25	.50	-.12
	(.29)	(.23)	(.23)	(.31)	(.17)
External Capital	.00	-.02	.03	.03	-.06*
	(.04)	(.04)	(.04)	(.05)	(.03)
Age of Firm	.01	-.01	-.05	.02	.02
	(.05)	(.04)	(.04)	(.05)	(.03)
Size of Team (log)	.64	.60	-.05	-.56	.54
	(.64)	(.50)	(.50)	(.68)	(.36)
Age of Respondent	.00	-.01	.02*	-.03*	.02**
	(.01)	(.01)	(.01)	(.01)	(.01)
Gender	.03	-.89*	.14	.36	-.24
	(.46)	(.37)	(.37)	(.50)	(.26)
CEO or President	.60*	.71*	.24	-.20	.44**
	(.29)	(.23)	(.23)	(.31)	(.17)
Midwest	-.21	-.21	.17	-1.12	-.41
	(.70)	(.55)	(.55)	(.75)	(.40)
Northeast	.22	.01	.34	-2.07*	-.17
	(.74)	(.58)	(.58)	(.79)	(.42)
Southwest	.22	-.03	.04	-1.10	-.46
	(.76)	(.60)	(.60)	(.81)	(.43)
West	.37	.13	.46	-1.14	-.33
	(.71)	(.56)	(.56)	(.76)	(.40)
R-square	.146	.147	.122	.165	.184
Adj r-square	.063	.065	.036	.084	.105
F-values	1.767	1.787	1.421	2.045*	2.330**
Sample size	137	137	136	137	137

Unstandardized regression coefficients are shown with standard errors in parentheses

*p<.05, **p<.01, ***p<.001

Table 5.3 (continued)

	Overall Change	Disruptiveness of Change	Perceived Performance (entrepreneurs)	Overall Performance (investors)	Satisfaction with Performance (investors)
(Constant)	4.67**	4.47**	5.41**	3.15	2.81
	(1.30)	(.96)	(.80)	(2.19)	(1.56)
Industry	-.09	.08	.19	.14	.05
	(.31)	(.23)	(.19)	(.47)	(.33)
VC or Angel Funding	.26	.20	.09	3.76**	2.41*
	(.34)	(.25)	(.21)	(1.43)	(1.02)
External Capital	-.13*	-.04	-.01	.12	.13
	(.05)	(.04)	(.03)	(.09)	(.07)
Age of Firm	.12*	.09*	-.11**	-.14	-.06
	(.05)	(.04)	(.03)	(.08)	(.06)
Size of Team (log)	-.19	-.07	.59	.55	-1.71
	(.74)	(.54)	(.46)	(1.33)	(.95)
Age of Respondent	-.02	-.03*	.01	.03	.04*
	(.01)	(.01)	(.01)	(.03)	(.02)
Gender	.21	-.08	-.09	-1.81	-.67
	(.54)	(.40)	(.33)	(1.08)	(.77)
CEO or President	-.09	-.06	.54**	-2.08	-.90
	(.34)	(.25)	(.21)	(1.13)	(.81)
Midwest	.03	.22	-.89	-.79	-.33
	(.82)	(.60)	(.50)	(.94)	(.67)
Northeast	.66	.37	-.69	-1.47	-1.34
	(.86)	(.63)	(.53)	(1.03)	(.74)
Southwest	.50	.19	-.70	-1.00	-.72
	(.88)	(.65)	(.54)	(1.13)	(.80)
West	.05	-.22	-.42	-.83	-.40
	(.82)	(.61)	(.51)	(.89)	(.63)
R-square	.109	.099	.187	.299	.323
Adj r-square	.023	.012	.109	.116	.147
F-values	1.267	1.138	2.383**	1.634	1.831
Sample size	137	137	137	59	59

Unstandardized regression coefficients are shown with standard errors in parentheses

*p<.05, **p<.01, ***p<.001

Hypotheses 1 – 9 concerned the effects of performance monitoring, environmental scanning, and experiential learning on overall change to the venture, disruptiveness of change and venture performance. Hypotheses 10-12 concerned the mediating effects of certainty on the relationship between experiential learning and overall change to the venture, disruptiveness of change and venture performance. Hypothesis 13 concerned the effects of improvisation on performance. Please see Table. 5.4 for a summary of the Hypotheses.

Table 5.4 Summary of hypotheses

Hypothesis 1:	More frequent use of performance monitoring will be associated with smaller overall change in the venture.
Hypothesis 2:	More frequent use of performance monitoring will be associated with less disruption from change.
Hypothesis 3:	More frequent use of performance monitoring will be associated with higher levels of performance.
Hypothesis 4:	Higher levels of environmental scanning will be associated with smaller overall change in the venture.
Hypothesis 5:	Higher levels of environmental scanning will be associated with less disruption from change.
Hypothesis 6:	Higher levels of environmental scanning will be associated with higher levels of performance.
Hypothesis 7:	More frequent use of experiential learning strategies will be associated with smaller overall change in the venture.
Hypothesis 8:	More frequent use of experiential learning strategies will be associated with less disruption from change.
Hypothesis 9:	More frequent use of experiential learning strategies will be associated with higher levels of performance.
Hypothesis 10:	The relationship between experiential learning strategies and overall change in the venture will be mediated by certainty about the organizational environment.
Hypothesis 11:	The relationship between experiential learning strategies and disruption from change will be mediated by certainty about the organizational environment.
Hypothesis 12:	The relationship between experiential learning strategies and levels of performance will be mediated by certainty about the organizational environment.
Hypothesis 13:	More frequent use of improvisational approaches will be associated with higher levels of performance.

Hypotheses 1 – 9 were tested through a series of regressions. In the first model, I regressed each of the dependent variables (overall change, disruptiveness of change, perceived performance, overall performance (rated by investors) and satisfaction with performance (rated by investors)) on the controls. In the second model, I added Performance Monitoring. In the third model, I replaced Performance Monitoring with Environmental Scanning. In the fourth model, I replace Environmental Scanning with Experiential Learning Strategies. The fifth model included the controls and all three practices. Please see Table 5.5.

The investor data are not strictly independent since each investor provided performance data for multiple entrepreneurs. To evaluate how this might affect the outcomes, I conducted ANOVA tests of overall performance and satisfaction with performance (the two investor rated variables). The between group variance for overall performance was not statistically different from the within group variance, which suggests that these data can be treated as independent. There was a small group effect for satisfaction with performance ($F=1.928$, $p<.05$). Therefore, in all hypotheses involving satisfaction with performance (including post hoc tests), I repeated the analyses using a mixed model including a random effect for investor grouping. In all cases, the outcomes were virtually identical.

Table 5.5 Regression results for hypotheses 1 - 9

	Overall Change				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
(Constant)	4.58***	5.75***	4.30**	5.54***	5.75***
	(1.26)	(1.26)	(1.40)	(1.33)	(1.39)
Industry	-.09	.00	-.10	-.01	.02
	(.31)	(.29)	(.31)	(.31)	(.29)
VC or Angel Funding	.27	.42	.27	.24	.45
	(.34)	(.33)	(.34)	(.33)	(.33)
External Capital	-.13*	-.13*	-.13*	-.13*	-.13**
	(.05)	(.05)	(.05)	(.05)	(.05)
Age of Firm	.12*	.12*	.12*	.11*	.12*
	(.05)	(.05)	(.05)	(.05)	(.05)
Age of Respondent	-.02	-.02	-.02	-.02	-.02
	(.01)	(.01)	(.01)	(.01)	(.01)
Gender	.21	.22	.26	.27	.39
	(.54)	(.52)	(.55)	(.53)	(.52)
CEO or President	-.08	.11	-.12	.00	.09
	(.34)	(.33)	(.35)	(.33)	(.33)
Midwest	.07	-.05	.09	.17	.09
	(.80)	(.77)	(.80)	(.78)	(.76)
Northeast	.67	.73	.68	.78	.82
	(.86)	(.82)	(.86)	(.84)	(.81)
Southwest	.53	.57	.54	.57	.63
	(.87)	(.84)	(.87)	(.86)	(.83)
West	.05	.18	.04	.18	.25
	(.82)	(.79)	(.82)	(.81)	(.78)
Performance Monitoring		-.34***			-.35***
		(.10)			(.10)
Environmental Scanning			.06		.13
			(.13)		(.13)
Experiential Learning Strategies				-.28*	-.18
				(.13)	(.13)
R^2	.109	.185	.110	.147	.221
Adjusted R2	.030	.106	.024	.064	.131
F	1.387	2.348**	1.283	1.771	2.458**
ΔR^2		.076	.002	.031	.105
F for ΔR^2		11.629***	.234	4.486*	5.450**
Sample Size	137	137	137	136	136

Unstandardized regression coefficients are shown with standard errors in parentheses

Changes in R^2 are from model 1.

*p<.05, **p<.01, ***p<.001

Table 5.5 continued

	Disruptiveness of Change				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
(Constant)	4.44***	4.99***	4.77***	5.47***	5.85***
	(.92)	(.95)	(1.02)	(.97)	(1.05)
Industry	.08	.12	.09	.19	.21
	(.22)	(.22)	(.22)	(.22)	(.22)
VC or Angel Funding	.20	.28	.20	.13	.20
	(.25)	(.25)	(.25)	(.24)	(.25)
External Capital	-.04	-.03	-.04	-.03	-.03
	(.04)	(.04)	(.04)	(.04)	(.04)
Age of Firm	.09*	.09*	.08*	.07	.08
	(.04)	(.04)	(.04)	(.04)	(.04)
Age of Respondent	-.03*	-.03*	-.03*	-.02*	-.02*
	(.01)	(.01)	(.01)	(.01)	(.01)
Gender	-.08	-.08	-.15	-.05	-.07
	(.40)	(.39)	(.40)	(.39)	(.39)
CEO or President	-.05	.04	.00	.01	.09
	(.25)	(.25)	(.26)	(.24)	(.25)
Midwest	.24	.18	.21	.29	.23
	(.59)	(.58)	(.59)	(.57)	(.57)
Northeast	.37	.40	.37	.46	.47
	(.63)	(.62)	(.63)	(.61)	(.61)
Southwest	.20	.22	.20	.22	.23
	(.64)	(.63)	(.64)	(.62)	(.62)
West	-.22	-.16	-.21	-.10	-.07
	(.60)	(.60)	(.60)	(.59)	(.59)
Performance Monitoring		-.16*			-.11
		(.08)			(.08)
Environmental Scanning			-.07		-.03
			(.10)		(.10)
Experiential Learning Strategies				-.27**	-.23*
				(.09)	(.10)
R^2	.099	.130	.103	.154	.170
Adjusted R2	.020	.046	.016	.071	.074
F	1.250	1.548	1.118	1.863*	1.770*
ΔR^2		.031	.004	.056	.072
F for ΔR^2		4.440*	.550	8.078**	3.488**
Sample Size	137	137	137	136	136

Unstandardized regression coefficients are shown with standard errors in parentheses
Changes in R^2 are from model 1.

*p<.05, **p<.01, ***p<.001

Table 5.5 continued

Perceived Performance (entrepreneurs)

	Model 1	Model 2	Model 3	Model 4	Model 5
(Constant)	5.66***	5.24***	4.78***	4.21***	3.47***
	(.78)	(.80)	(.85)	(.77)	(.83)
Industry	.19	.16	.17	.03	.01
	(.19)	(.19)	(.19)	(.18)	(.17)
VC or Angel Funding	.07	.02	.09	.18	.17
	(.21)	(.21)	(.21)	(.19)	(.19)
External Capital	.00	.00	.00	-.01	-.01
	(.03)	(.03)	(.03)	(.03)	(.03)
Age of Firm	-.11**	-.11**	-.11**	-.09**	-.09**
	(.03)	(.03)	(.03)	(.03)	(.03)
Age of Respondent	.01	.01	.01	.00	.00
	(.01)	(.01)	(.01)	(.01)	(.01)
Gender	-.08	-.08	.09	-.12	.02
	(.33)	(.33)	(.34)	(.31)	(.31)
CEO or President	.49*	.43*	.36	.41*	.29
	(.21)	(.21)	(.21)	(.19)	(.20)
Midwest	-1.01*	-.97*	-.95*	-1.07*	-1.01*
	(.50)	(.49)	(.49)	(.45)	(.45)
Northeast	-.73	-.76	-.73	-.86	-.85
	(.53)	(.53)	(.52)	(.49)	(.48)
Southwest	-.78	-.80	-.76	-.79	-.78
	(.54)	(.54)	(.53)	(.50)	(.49)
West	-.40	-.45	-.43	-.58	-.60
	(.51)	(.51)	(.50)	(.47)	(.46)
Performance Monitoring		.12[16]			.03
		(.06)			(.06)
Environmental Scanning			.19*		.16*
			(.08)		(.08)
Experiential Learning Strategies				.38***	.36***
				(.08)	(.08)
R^2	.177	.200	.214	.313	.341
Adjusted R2	.104	.123	.138	.246	.265
F	2.436	2.582**	2.814**	4.667***	4.474***
ΔR^2		.023	.037	.140	.168
		3.632[17]	5.915*	25.091***	10.308***
Sample size	137	137	137	136	136

Unstandardized regression coefficients are shown with standard errors in parentheses

Changes in R^2 are from model 1.

*p<.05, **p<.01, ***p<.001

[16] p<.06

[17] P<.06

Table 5.5 continued

	Overall Performance (Investors)				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
(Constant)	3.18	3.29	3.01	2.73	2.92
	(2.17)	(2.38)	(2.45)	(2.24)	(2.58)
Industry	.14	.15	.14	.07	.09
	(.46)	(.47)	(.47)	(.47)	(.48)
VC or Angel Funding	3.76*	3.79*	3.76*	3.91**	3.98**
	(1.41)	(1.44)	(1.43)	(1.43)	(1.48)
External Capital	.13	.13	.13	.14	.13
	(.09)	(.09)	(.09)	(.09)	(.09)
Age of Firm	-.13	-.13	-.13	-.13	-.13
	(.08)	(.08)	(.08)	(.08)	(.08)
Age of Respondent	.03	.03	.03	.03	.03
	(.03)	(.03)	(.03)	(.03)	(.03)
Gender	-1.89	-1.91	-1.85	-1.91	-1.94
	(1.05)	(1.08)	(1.10)	(1.05)	(1.12)
CEO or President	-2.09	-2.05	-2.09	-2.42*	-2.34
	(1.12)	(1.18)	(1.13)	(1.19)	(1.25)
Midwest	-.92	-.94	-.91	-.87	-.91
	(.87)	(.90)	(.89)	(.88)	(.91)
Northeast	-1.50	-1.49	-1.50	-1.46	-1.45
	(1.02)	(1.03)	(1.03)	(1.02)	(1.05)
Southwest	-1.08	-1.06	-1.09	-1.20	-1.15
	(1.10)	(1.13)	(1.11)	(1.11)	(1.15)
West	-.79	-.79	-.81	-.79	-.79
	(.88)	(.89)	(.89)	(.88)	(.90)
Performance Monitoring		-.03			-.07
		(.23)			(.25)
Environmental Scanning			.03		.01
			(.19)		(.21)
Experiential Learning Strategies				.16	.17
				(.19)	(.20)
R^2	.296	.296	.297	.307	.309
Adjusted R2	.131	.113	.113	.127	.089
F	1.798	1.615	1.616	1.700	1.403
ΔR^2		.000	.000	.011	.012
F for ΔR^2		.014	.024	.733	.264
Sample size	59	59	59	59	59

Unstandardized regression coefficients are shown with standard errors in parentheses

Changes in R^2 are from Model 1.

*p<.05, **p<.01, ***p<.001

Table 5.5 continued

	Satisfaction with Performance (Investors)				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
(Constant)	2.70	4.06*	3.24	2.92	4.16*
	(1.60)	(1.68)	(1.80)	(1.66)	(1.83)
Industry	.08	.18	.08	.11	.18
	(.34)	(.33)	(.34)	(.35)	(.34)
VC or Angel Funding	2.41*	2.70*	2.41*	2.34*	2.68*
	(1.04)	(1.02)	(1.05)	(1.06)	(1.05)
External Capital	.09	.07	.09	.09	.07
	(.06)	(.06)	(.06)	(.06)	(.07)
Age of Firm	-.07	-.07	-.08	-.08	-.08
	(.06)	(.06)	(.06)	(.06)	(.06)
Age of Respondent	.02	.03	.02	.03	.03
	(.02)	(.02)	(.02)	(.02)	(.02)
Gender	-.43	-.69	-.57	-.42	-.71
	(.78)	(.76)	(.81)	(.78)	(.80)
CEO or President	-.85	-.38	-.86	-.69	-.35
	(.83)	(.83)	(.83)	(.88)	(.89)
Midwest	.09	-.15	.06	.07	-.16
	(.65)	(.63)	(.65)	(.65)	(.65)
Northeast	-1.27	-1.21	-1.26	-1.29	-1.22
	(.75)	(.73)	(.76)	(.76)	(.74)
Southwest	-.49	-.23	-.46	-.43	-.21
	(.81)	(.80)	(.82)	(.83)	(.82)
West	-.50	-.45	-.45	-.50	-.45
	(.65)	(.62)	(.65)	(.65)	(.64)
Performance Monitoring		-.35*			-.34
		(.17)			(.18)
Environmental Scanning			-.09		-.01
			(.14)		(.15)
Experiential Learning Strategies				-.08	-.02
				(.14)	(.14)
R^2	.276	.338	.282	.280	.339
Adjusted R2	.106	.166	.095	.093	.128
F	1.626	1.959*	1.509	1.493	1.610
ΔR^2		.063	.007	.005	.063
F for ΔR^2		4.355*	.441	.300	1.400
Sample size	59	59	59	59	59

Unstandardized regression coefficients are shown with standard errors in parentheses

Changes in R^2 are from Model 1.

*p<.05, **p<.01, ***p<.001

Hypothesis 1 predicted that performance monitoring would be negatively associated with overall change to the venture. As can be seen in models 2 and 5 in the overall change column of Table 5.5, this hypothesis was supported. Hypothesis 2 predicted that performance monitoring would be negatively associated with disruption from change. This hypothesis was supported in model 2 of the disruptiveness of change column but not in model 5 (when the other practices were added in). Hypothesis 3 predicted that performance monitoring would be associated with higher levels of performance. As can be seen in model 2 of the perceived performance column, although there was a positive association, the effect was not significant at the .05 level (p=.06). Furthermore, this effect disappeared in the full model. Similarly, with respect to investors' satisfaction with performance, hypothesis 3 was supported in model 2 but not in model 5 (when all practices were included). There was no significant association between performance monitoring and investors' ratings of overall performance. Thus, Hypothesis 3 is not supported.

Hypothesis 4 predicted that environmental scanning would be negatively associated with overall change to the venture. As can be seen in models 3 and 5 in the overall change column of Table 5.5, this hypothesis was not supported. Similarly, there was no support for Hypothesis 5 predicting that environmental scanning would be negatively associated with disruption from change (models 3 and 5 in the disruptiveness of change column). Hypothesis 6 predicted that environmental scanning would be positively associated with venture performance. As can be seen in models 3 and 5 of the perceived performance column, this hypothesis was supported with respect to entrepreneurs' own perceptions of performance. However, environmental scanning had

no effect on investors' ratings of performance (models 3 and 5 in the two investor ratings of performance). Thus, hypothesis 6 was partially supported.

Hypothesis 7 predicted that experiential learning strategies would be negatively associated with overall change to the venture. As can be seen in the overall change column, this hypothesis was supported in model 4 but not 5 (when all practices were included). Hypothesis 8 predicted that experiential learning strategies would be negatively associated with disruption from change. As can be seen in models 4 and 5 of the disruptiveness of change column, this hypothesis was supported. Finally, Hypothesis 9 predicted that experiential learning strategies would be positively associated with performance. As can be seen in models 4 and 5 of the perceived performance column, this hypothesis was supported with respect to entrepreneurs' own perceptions of performance. However, experiential learning strategies had no effect on investors' ratings of performance (models 4 and 5 in the two investor ratings of performance). Thus, hypothesis 9 was partially supported.

In summary, these regressions suggest that performance monitoring predicts less overall change, environmental scanning predicts better performance and experiential learning predicts both less disruption from change and better performance.

It is also interesting to note that the age of the firm was positively associated with disruptiveness of change but that this effect went away when experiential learning strategies were included in the model. Again, recall that disruptiveness of change is not cumulative over the course of a firm's lifetime (which might otherwise explain why older firms reported more disruption). Rather, this measure asked respondents to report on changes made in the past year and how disruptive *those* were. This finding appears to

support my theorizing that change is more disruptive for older firms. Furthermore, it appears that experiential learning strategies may alleviate that effect.

Hypotheses 10-12 were tested through a series of regressions based on the guidelines set by Baron and Kenny (1986). According to these guidelines, mediation occurs when four criteria are met: 1) the independent variable (in this case experiential learning strategies) significantly predicts the dependent variable (in this case overall change, disruptiveness of change and performance), 2) the independent variable predicts the mediator (in this case certainty), 3) the mediator predicts the dependent variable (overall change, disruptiveness of change and performance) controlling for the independent variable and 4) the independent variable does not predict the dependent variable, controlling for the mediator. Partial mediation is supported if the first three conditions are met, but not the last condition.

Since experiential learning strategies did not predict either of the investors' ratings of performance, criterion 1 was not met for those aspects of performance and I did not include them in the mediation tests. Thus, the mediation tests included three regressions for each dependent variable. Please see Table 5.6 for the mediation tests.

Model 1 in each of the dependent variable columns (overall change, disruptiveness of change, performance) included experiential learning strategies as the predictor variable. Model 2 included the mediator (certainty) as the predictor variable and controlled for the independent variable (experiential learning strategies). In the last column of the table, certainty was regressed on experiential learning strategies.

Table 5.6 Mediation tests

	Overall Change		Disruptiveness of Change	
	Model 1	**Model 2**	**Model 1**	**Model 2**
(Constant)	5.54***	7.71***	5.47***	7.43***
	(1.33)	(1.57)	(.97)	(1.13)
Industry	-.01	-.14	.19	.07
	(.31)	(.30)	(.22)	(.22)
VC or Angel Funding	.24	.20	.13	.09
	(.33)	(.33)	(.24)	(.24)
External Capital	-.13*	-.15**	-.03	-.05
	(.05)	(.05)	(.04)	(.04)
Age of Firm	.11*	.12*	.07	.08*
	(.05)	(.05)	(.04)	(.04)
Age of Respondent	-.02	-.01	-.02*	-.01
	(.01)	(.01)	(.01)	(.01)
Gender	.27	.14	-.05	-.16
	(.53)	(.52)	(.39)	(.38)
CEO or President	.00	.16	.01	.15
	(.33)	(.33)	(.24)	(.24)
Midwest	.17	-.10	.29	.05
	(.78)	(.78)	(.57)	(.56)
Northeast	.78	.65	.46	.35
	(.84)	(.83)	(.61)	(.60)
Southwest	.57	.32	.22	-.01
	(.86)	(.85)	(.62)	(.61)
West	.18	-.01	-.10	-.27
	(.81)	(.80)	(.59)	(.57)
Experiential Learning Strategies	-.28*	-.19	-.27**	-.19*
	(.13)	(.13)	(.09)	(.10)
Certainty		-.45*		-.41**
		(.18)		(.13)
R^2	.147	.188	.154	.215
Adjusted R^2	.064	.101	.071	.132
F	1.771	2.167*	1.863*	2.577**
Sample size	136	136	136	136

Unstandardized regression coefficients are shown with standard errors in parentheses
*p<.05, **p<.01, ***p<.001

Table 5.6 continued

	Perceived Performance		Certainty
	Model 1	Model 2	
(Constant)	4.21***	2.69	4.79***
	(.77)	(.90)	(.64)
Industry	.03	.12	-.29
	(.18)	(.17)	(.15)
VC or Angel Funding	.18	.21	-.10
	(.19)	(.19)	(.16)
External Capital	-.01	.00	-.05*
	(.03)	(.03)	(.02)
Age of Firm	-.09**	-.10***	.03
	(.03)	(.03)	(.03)
Age of Respondent	.00	-.01	.02*
	(.01)	(.01)	(.01)
Gender	-.12	-.04	-.27
	(.31)	(.30)	(.25)
CEO or President	.41*	.30	.35*
	(.19)	(.19)	(.16)
Midwest	-1.07*	-.88*	-.58
	(.45)	(.44)	(.38)
Northeast	-.86	-.77	-.29
	(.49)	(.47)	(.41)
Southwest	-.79	-.62	-.56
	(.50)	(.48)	(.41)
West	-.58	-.45	-.41
	(.47)	(.46)	(.39)
Experiential Learning Strategies	.38***	.31***	.20**
	(.08)	(.08)	(.06)
Certainty		.32**	
		(.11)	
R^2	.313	.361	.229
Adjusted R^2	.426	.292	.153
F	4.667***	5.292***	3.040***
Sample size	136	136	137

Unstandardized regression coefficients are shown with standard errors in parentheses
*p<.05, **p<.01, ***p<.001

The first condition of the Baron and Kenny method was met as can be seen in each Model 1 of Table 5.6. Experiential learning strategies significantly predicted overall change, disruptiveness of change and perceived performance. Condition 2 was met when experiential learning predicted certainty, as can be seen in the last column of Table 5.6. Condition 3 was also met as can be seen in Model 2 in each of the columns. Certainty predicted overall change, disruptiveness of change and perceived performance controlling for experiential learning strategies. The last condition of Baron and Kenny's method was also assessed in Model 2 of each of the columns. Full mediation is supported if in these models experiential learning was no longer a significant predictor of the outcome variables.

The set of regressions for experiential learning strategies and overall change suggest that all four conditions of the Baron and Kenny method were met. Sobel's test confirmed that certainty mediated the effect of experiential learning on overall change ($Z=-2.00$, $p<.05$). Thus, Hypothesis 10 was supported. The set of regressions for experiential learning and disruptiveness of change suggest that only the first three conditions of the Baron and Kenny method were met. As can be seen in Model 2 of the disruptiveness of change column, experiential learning strategies continued to be a predictor of disruptiveness of change, although as can be seen in the smaller beta coefficient, the effect was reduced. These findings suggest that certainty partially mediates the effects of experiential learning strategies on disruptiveness of change. This was also confirmed with Sobel's test ($Z=2.29$, $p<.05$). Thus, Hypothesis 11 was partially supported. Finally, the set of regressions for experiential learning strategies and perceived performance suggest that while the first three conditions were met, condition four was not

fully met. As can be seen in Model 2 of the perceived performance column, experiential learning strategies continued to be a predictor of disruptiveness of change, although again, the beta coefficient was reduced. These findings suggest that certainty partially mediates the effects of experiential learning strategies on perceived performance. This was also confirmed with Sobel's test (Z=2.19, $p<.05$). Thus, Hypothesis 12 was partially supported.

Hypothesis 13 concerned the effects of improvisation on performance and was tested through a series of regressions. In the first model, I regressed each of the performance measures (perceived performance - entrepreneurs, overall performance – investors, and satisfaction with performance - investors) on the controls. In the second model, I added Improvisation. In the third model, I added the other three practices (Performance Monitoring, Environmental Scanning and Experiential Learning Strategies). Based on these analyses, there was no support for Hypothesis 13. Improvisation does not predict any of the performance measures. Please see Table 5.7. Although it was not hypothesized, I also assessed whether improvisation had an effect on overall change or disruption from change, since my theorizing implied that it should not. Indeed, there was no relationship between improvisation and either of these outcomes. For a summary of the hypotheses and findings, please see Table 5.8.

Table 5.7 Test of hypothesis 13

	Perceived Performance (rated by entrepreneurs)			Overall Performance (rated by investors)		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
(Constant)	5.66***	6.08***	3.74***	3.18	2.43	1.84
	(.78)	(.87)	(.90)	(2.17)	(2.62)	(3.08)
Industry	.19	.16	.00	.14	.15	.10
	(.19)	(.19)	(.18)	(.46)	(.47)	(.49)
VC or Angel Funding	.07	.11	.19	3.76*	3.65*	3.84*
	(.21)	(.21)	(.20)	(1.41)	(1.44)	(1.50)
External Capital	.00	.00	-.01	.13	.13	.13
	(.03)	(.03)	(.03)	(.09)	(.09)	(.09)
Age of Firm	-.11***	-.11***	-.09**	-.13	-.14	-.13
	(.03)	(.03)	(.03)	(.08)	(.08)	(.08)
Age of Respondent	.01	.00	.00	.03	.04	.04
	(.01)	(.01)	(.01)	(.03)	(.03)	(.03)
Gender	-.08	-.05	.04	-1.89	-1.95	-2.02
	(.33)	(.33)	(.31)	(1.05)	(1.07)	(1.14)
CEO or President	.49*	.48*	.28	-2.09	-1.99	-2.26
	(.21)	(.21)	(.20)	(1.12)	(1.15)	(1.26)
Midwest	-1.01*	-1.08*	-1.05*	-.92	-.80	-.74
	(.50)	(.50)	(.45)	(.87)	(.91)	(.96)
Northeast	-.73	-.87	-.93	-1.50	-1.39	-1.31
	(.53)	(.55)	(.50)	(1.02)	(1.05)	(1.07)
Southwest	-.78	-.85	-.82	-1.08	-.87	-.91
	(.54)	(.54)	(.49)	(1.10)	(1.18)	(1.22)
West	-.40	-.48	-.65	-.79	-.71	-.68
	(.51)	(.51)	(.47)	(.88)	(.90)	(.92)
Improvisation		-.06	-.04		.09	.12
		(.06)	(.06)		(.17)	(.18)
Performance Monitoring			.03			-.06
			(.06)			(.25)
Environmental Scanning			.17*			.01
			(.08)			(.21)
Experiential Learning Strategies			.35***			.19
			(.08)			(.20)
R^2	0.177	0.184	.344	0.296	.300	.315
Adjusted R2	0.104	0.105	.262	0.131	.118	.077
F	2.436**	2.329**	4.198***	1.798	1.645	1.321
ΔR^2		0.007	.171		.004	.019
F for ΔR^2		1.129	7.844***		.270	.302
Sample size	137	137	136	137	137	136

Unstandardized regression coefficients are shown with standard errors in parentheses
Changes in R^2 are from Model 1.

Table 5.7 continued

	Satisfaction with Performance (rated by investors)		
	Model 1	**Model 2**	**Model 3**
(Constant)	2.70	2.86	4.61
	(1.60)	(1.94)	(2.20)
Industry	.08	.07	.18
	(.34)	(.35)	(.35)
VC or Angel Funding	2.41*	2.44*	2.74*
	(1.04)	(1.07)	(1.07)
External Capital	.09	.09	.07
	(.06)	(.07)	(.07)
Age of Firm	-.07	-.07	-.07
	(.06)	(.06)	(.06)
Age of Respondent	.02	.02	.02
	(.02)	(.02)	(.02)
Gender	-.43	-.42	-.67
	(.78)	(.79)	(.81)
CEO or President	-.85	-.87	-.38
	(.83)	(.85)	(.90)
Midwest	.09	.06	-.23
	(.65)	(.67)	(.68)
Northeast	-1.27	-1.29	-1.28
	(.75)	(.77)	(.77)
Southwest	-.49	-.53	-.32
	(.81)	(.87)	(.87)
West	-.50	-.52	-.49
	(.65)	(.66)	(.66)
Improvisation		-.02	-.05
		(.13)	(.13)
Performance Monitoring			-.34
			(.18)
Environmental Scanning			-.01
			(.15)
Experiential Learning Strategies			-.03
			(.15)
R^2	.276	.276	.341
Adjusted R2	.106	.087	.111
F	1.626	1.461	1.483
ΔR^2		.000	.065
F for ΔR^2		.021	1.066
Sample size	137	137	136

Unstandardized regression coefficients are shown with standard errors in parentheses
Changes in R^2 are from Model 1.

Table 5.8 Summary of findings

Hypothesis	**Regression findings**
Hypothesis 1: Performance monitoring negatively associated with overall change.	Yes
Hypothesis 2: Performance monitoring negatively associated with disruptiveness of change.	No (significant in reduced model but not in full model)
Hypothesis 3: Performance monitoring positively associated with performance.	No (positive association with investors' satisfaction with performance but only in the reduced model, not the full model)
Hypothesis 4: Environmental scanning negatively associated with overall change.	No (no significant association with overall change)
Hypothesis 5: Environmental scanning negatively associated with disruptiveness of change.	No (no significant association with disruptiveness of change)
Hypothesis 6: Environmental scanning positively associated with performance.	Partial support (positive association with entrepreneurs' perceived performance)
Hypothesis 7: Experiential learning negatively associated with overall change.	No (significant in reduced model but not in full model)
Hypothesis 8: Experiential learning negatively associated with disruptiveness of change.	Yes
Hypothesis 9: Experiential learning positively associated with performance.	Partial support (positive association with entrepreneurs' perceived performance)
Hypothesis 10: Certainty mediates the relationship between experiential learning strategies and overall change.	Yes
Hypothesis 11: Certainty mediates the relationship between experiential learning strategies and disruptiveness of change.	Partial mediation (the effect of experiential learning strategies on disruptiveness of change is reduced but does not become insignificant)
Hypothesis 12: Certainty mediates the relationship between experiential learning strategies and performance.	Partial mediation (the effect of experiential learning strategies on performance is reduced but does not become insignificant)
Hypothesis 13: Improvisation positively associated with performance.	No (no significant association with any measure of performance)

DISCUSSION

This purpose of this study was to explore how four different entrepreneurial practices affected change, disruption from change and overall performance in new ventures. In Chapter 4, I argued that the opportunity shaping process is essentially a change process but while change is a necessary outcome of learning and adaptation, it can be very disruptive to new ventures. Therefore, ventures that organize to manage change and its effects may be better able to shape opportunities and ultimately, enjoy better performance. In particular, I suggested that because the shaping process occurs in a dynamic and uncertain context, ventures that develop a vigilant awareness of changing conditions, both inside and outside their venture, may be more able to catch the need for change early before problems can escalate. Similarly, because an uncertain and dynamic context requires constant learning, entrepreneurs who purposefully design learning into their development processes may be better able to rapidly build certainty about their venture, allowing them to engage in smaller, more incremental (and therefore less disruptive) change efforts. Furthermore, because entrepreneurs must often learn from experience and experience tends to be highly equivocal, learning strategies are likely to be more effective when they are systematic and analytical rather than improvisational.

Overall, the findings of Study 2 support this argument although they also suggest a more refined set of relationships between the practices and outcomes. The full model (when all practices were included in the regressions) suggests that each of these practices has a unique role to play with respect to different outcomes. For example, performance monitoring negatively predicted overall change. This suggests that a vigilance of actual operations may prevent ventures from having to undergo large changes. However,

monitoring may not help ventures reduce the disruption of change once it occurs. Environmental scanning was associated with better performance, but not necessarily as a result of reducing change or the disruption of change. Thus, the mechanisms by which scanning might influence performance are not clear and warrant further investigation. In the full model experiential learning strategies were negatively associated with disruption from change and positively associated with performance but had no effect on overall change. Given that many changes occur as a *result* of learning (as shown in the first study) this finding seems sensible. Experiential learning strategies may provide entrepreneurs with the knowledge and certainty they need to make better change decisions and to engage in change efforts in more systematic, predictable (less disruptive) ways. Thus, while entrepreneurs may learn that change is needed, those changes are more readily implemented when they are based on concrete analysis and learning. This argument is further supported by the mediation tests which suggest that certainty mediates the relationship between experiential learning and outcomes. Finally, improvisation did not seem to benefit entrepreneurs with respect to these outcomes.

The analyses also raised several questions. First, as mentioned above, the role of environmental scanning is not totally clear. Second, while I have analyzed change, disruption and performance as separate outcome variables, I have not explored their relationship to one another. This may be of particular interest with respect to the investors' ratings of performance. Based on my analysis to this point, investors seemed to be moved by very little that entrepreneurs actually did. That is, in the full model none of the entrepreneurial practices had an effect on investors' ratings of performance. It is possible, therefore, that investors' are concerned less with the behaviors of entrepreneurs

and more with their outcomes. Finally, the role of improvisation, if any, is not yet clear. In the following sections I address each of these questions. Then, based on the findings of this study, I propose and discuss a refined model.

Post hoc analysis of environmental scanning

Earlier I hypothesized that because a variety of information sources provide a variety of environmental sensors, scanning a *broad* set of external sources may be particularly important to entrepreneurs' ability to build and maintain awareness. This argument is consistent with a "requisite variety" approach to managing complex situations. That is, the law of requisite variety asserts that the variety of a system such as an organization, team, or individual, must be as great as the variety of the environment that it is trying to regulate (Ashby, 1956). For entrepreneurs, this would suggest that they need access to a broad enough spectrum of information and expertise to allow them to meet the demands of their particular venture and venture environment. Thus, it is not surprising that frequent environmental scanning (as averaged across a wide variety of sources) was associated with better perceived performance.

However, while it is often assumed that random variety is "requisite," in fact, the type of variety that is brought to bear is also critical (see Dimov, Shepherd, & Sutcliffe, 2007). Requisite variety is that which provides insight into an organization's particular environment and ongoing activities. In other words, requisite variety is not just any variety, but also relevant variety. Broader is not always better. For example, while talking to marine biologists would broaden the environmental scanning activities of a software entrepreneur, it is unlikely to provide relevant information about the software industry.

The data reported earlier suggest that more environmental scanning (across a broad variety of sources) is associated with better performance. I now consider those sources more closely to determine if certain *types* of sources are more useful than others. For example, previous research suggests that while most CEOs seek advice from similar others, especially friends or people within their social network (McDonald & Westphal, 2003), seeking advice from dissimilar others is associated with better performance (McDonald, Khanna, & Westphal, 2008). One reason given for these performance effects is that dissimilar others are more likely to challenge a CEO's assumptions and provide alternate perspectives which can be valuable to problem-solving. However, it may also be that when seeking advice from outsiders, CEOs are more *selective* about the specific kind of expertise they need (rather than simply making due with whatever expertise their friends have to offer). In other words, they seek out and access just the right (or requisite) expertise. For example, Eisenhardt (1989c) found that in gathering information about their operations and environment, higher performing managers gathered advice from many sources but focused their attention on the most experienced executives.

When managers seek out sources of information that have insight into their firm's *specific* context or operations, they may receive more useful information. Sources that have direct knowledge of an organization (e.g., customers or suppliers) may be better able than more distal sources to recognize the implications of environmental trends for the firm. Also, sources that have specific expertise with respect to a venture's industry, operating environment or competitive situation, may be more likely than generic sources to notice or provide information about critical trends or events likely to impact the firm. Thus, the requisite variety argument might suggest that gathering information and

feedback from sources more closely tied to the venture will provide more benefits than would more distal ties.

I tested this argument in two ways. First, in addition to asking entrepreneurs to rate how frequently they used different sources of information, the survey also asked them to rate how useful each source was. This data did not play a part in my central theorizing (and so was not analyzed as part of hypothesis testing) but if offers some descriptive evidence for the requisite variety argument. On average, respondents reported that the most useful external source of information and advice was customers, followed by industry experts, competitors, other entrepreneurs, associations and tradeshows, journals and finally weblogs and other internet sources. See Table 5.9 for a list of sources and mean ratings of usefulness.

Table 5.9 Average "usefulness" ratings for external sources of expertise

	N	Mean	Std. Deviation
Customers	124	5.61	1.430
Industry experts	120	4.62	1.661
Competitors	119	4.04	1.543
Other entrepreneurs	119	3.76	1.745
Associations/Trade shows	117	3.55	1.658
Business and trade journals	115	3.36	1.618
Weblogs, online sources	114	3.08	1.689

This data suggests that sources more closely tied to the venture and their specific industry were perceived as more useful that more distal or generic sources.

I next looked at the frequency ratings again. This time, rather than treating these ratings as an index, I used an exploratory factor analysis to consider whether there were underlying differences in the usage of these different sources. An exploratory factor analysis (using principal axis factoring and promax rotation) indicated a two-factor solution which explained 55.5% of the variance. The first factor, with an eigenvalue of 2.62

loaded four items: customers, industry experts, other entrepreneurs, and industry associations. Factor loadings ranged from .43 to .70. The second factor, with an eigenvalue of 1.27 loaded the remaining three items: weblogs, online communities or web alerts, competitors, their websites, publications or offerings, and business or trade journals. Factor loadings ranged from .62 to .72. Again, the pattern suggests that there is a distinction in usage between sources more closely tied to a venture and more distal sources. That is, customers, industry experts, other entrepreneurs and industry associations and tradeshows are all very closely tied to a venture's specific industry and context. Moreover, because these are all sources with whom an entrepreneur can interact directly, it is more likely that entrepreneurs can specify and retrieve the specific information they need rather than simply receiving whatever is broadcast. In contrast, journals and web sources tend to be more general sources of information, less closely tied to a particular venture or industry. Similarly, competitors, while more specifically tied to a venture, tend to be inaccessible by means other than publically available channels (e.g., websites), which are generally less informative.

Thus, my analyses suggest that sources of expertise and information differ along (at least) one dimension. Some sources appear to be more specific and closely tied to a venture while others are more distal. To determine if this distinction matters with respect to the outcomes of my theorizing, I reran the regressions for hypotheses 4, 5 and 6 (the effects of environmental scanning on the outcome variables) but this time split the environmental scanning variable into two constructs: direct ties (average frequency ratings for customers, industry experts, other entrepreneurs and industry associations) and distal ties (average frequency ratings competitors, journals and web sources).

Although the findings were similar to those of the earlier regressions, they offered an important refinement. That is, as before the only outcome variable predicted by environmental scanning was perceived performance. Interestingly, however, it was only the direct ties that predicted better performance. Distal ties had no effect. Table 5.10 presents the findings for this one outcome variable. As before, model 1 includes the control variables as predictors. In model 2, I add the two new constructs (direct ties and distal ties). In model 3, I add in the remaining practices (performance monitoring and environmental scanning).

Table 5.10 Direct and distal sources for environmental scanning

	Perceived Performance		
	Model 1	**Model 2**	**Model 3**
(Constant)	5.66***	4.64***	3.38***
	(.78)	(.86)	(.85)
Industry	.19	.16	.02
	(.19)	(.19)	(.18)
VC or Angel Funding	.07	.09	.17
	(.21)	(.21)	(.20)
External Capital	.00	.00	-.01
	(.03)	(.03)	(.03)
Age of Firm	-.11***	-.10**	-.09**
	(.03)	(.03)	(.03)
Age of Respondent	.01	.01	.00
	(.01)	(.01)	(.01)
Gender	-.08	.12	.04
	(.33)	(.33)	(.31)
CEO or President	.49*	.30	.25
	(.21)	(.21)	(.20)
Midwest	-1.01*	-.91	-.97*
	(.50)	(.48)	(.45)
Northeast	-.73	-.66	-.80
	(.53)	(.52)	(.49)
Southwest	-.78	-.70	-.73
	(.54)	(.53)	(.49)
West	-.40	-.39	-.56
	(.51)	(.50)	(.46)
Scanning direct ties		.24**	.19*
		(.09)	(.08)
Scanning distal ties		.00	.01
		(.06)	(.05)
Performance Monitoring			.03
			(.06)
Experiential Learning Strategies			.34***
			(.08)
R^2	.18	.22	.33
Adjusted R^2	.10	.14	.25
F	2.44**	2.62**	3.95***
ΔR^2		.06	.18
F for ΔR^2		4.37*	7.76***
Sample size	137	136	136

Unstandardized regression coefficients are shown with standard errors in parentheses
Changes in R^2 are from Model 1
*p<.05, **p<.01, ***p<.001

These results suggest entrepreneurs who make frequent use of sources of information that are uniquely able to provide insight into their specific situation, may be

better able to acquire the kind of nuanced and deep expertise necessary to manage an emerging venture.

This argument is consistent with data from the Qualitative Study. For example, there were several examples of entrepreneurs who, by turning to only one or two generalists for advice, were not able to tap into the specific industry or functional expertise they needed. Sometimes this happened because the entrepreneurs were young and inexperienced and so had few ties to deep experts. Rather, they turned to the people they happened to know – their college advisors, a family friend in the industry or a classmate. As one founder recalls,

> "We had some sort of informal advisors... [My University] doesn't have a business school, but we essentially have a series of three… business and entrepreneurial related [courses] so a faculty member from there, a faculty member from my department just sort of who I was familiar with, just someone who I really respected and then a third faculty member who who's actually also involved in some angel investment groups in the area…"

In other cases, entrepreneurs attempted to find advisors who had more industry expertise, but failed to recognize that experience in an industry does not necessarily equate with expertise in starting a business in that industry. For example, one founder working to create record-keeping software for a medical specialty area, turned to a doctor in that area as his main source of advice and feedback. The founder saw this doctor as a "successful businessman" because he had bought and turned around several medical practices.

> "He's a big time [medical specialist]…He is one of the best businessmen I know around. He's kind of made a living now of purchasing old practices or practices that aren't doing so hot, kind of wrapping up his formula, if you will, for success and re-branding that practice…so we went out to his house on a Saturday morning and spent probably two hours just getting his brain dump on what the industry looked like, what [medical specialists] want, what their needs were. And that was really our day one, okay we've got an opportunity. We've got a [medical

> specialist], somebody who knows what business is like, somebody who makes a lot of money, and he thinks he can make more money doing it this way. And that's why we can make money on this."

The specialist was an excellent source of information about customer needs, but the founders also used him as their primary business advisor. As they later discovered, starting a software company is nothing like running a medical practice. This advisor simply did not have the requisite expertise the firm needed, nor did they seek a variety of other experts. Ultimately, the business failed.

In contrast, some entrepreneurs were much more careful and selective about their sources of information and advice. Not only did they seek out a variety of perspectives, but these tended to be more specialized sources. For example, in Chapter 4, I described a CEO who had developed a broad set of expert sources (i.e., FDA expert, marketing expert, sales expert, etc.). It may be that those were beneficial to him, not just because they provided a wide range of expertise, but because they each provided a deep expertise into their particular area. In other words, they could provide information about the nuances and specific trends critical to each aspect of his business. Similarly, several respondents reported that they often turned for advice to other entrepreneurs who could help them understand the nuances of starting a new business.

Given that managers have limited time and capacity (Cyert & March, 1963) to seek out and process information, they must balance what and how much they scan with other responsibilities. Therefore, it may be that certain sources are more useful than others for accessing the requisite information and expertise needed. In particular sources that are more directly tied to a specific venture provide entrepreneurs with better access to critical information, for two reasons. First, to the extent that entrepreneurs can interact

with these sources directly, they are more able to specify their informational needs. This is consistent with research suggesting that more direct channels (e.g., face to face) provide richer, more nuanced data (Daft & Lengel, 1984; Daft & Lengel, 1986). Second, sources more directly tied to a venture or its context are likely to have more relevant data for that venture than might be found from more generic sources. Thus, while it still remains unclear what are the specific mechanisms through which environmental scanning improves performance, it seems likely that part of the answer lies in the way that informational needs are met. That is, performance is affected by entrepreneurs' ability to garner information that is directly relevant to their specific situation.

Post hoc analysis of outcome variables

The findings reported above suggest that investors' ratings of performance were unrelated to the entrepreneurial practices examined in this study. Yet, there was variance in investors' ratings. Clearly, some ventures appeared to investors to be doing better than others. One reason for this finding may be that investors simply aren't that aware of entrepreneurs' practices. Rather, what concerns them most is simply performance. In fact, while in theory venture capitalists provide advice and expertise to new ventures many studies suggest that there is a lot less handholding going on than expected (Busenitz et al., 2004; Gifford, 1997; Sahlman, 1990). This is often a simple matter of opportunity cost for VCs. Since most VCs oversee many different ventures, they must allocate their time across them. In addition, not all entrepreneurs look to VCs for operational and business advice, particularly in the case of technology ventures (Barney, Busenitz, Fiet, & Moesel, 1996). Thus, levels of communication between entrepreneurs and their VCs vary. In many cases, VCs may not be closely tracking or even aware of entrepreneurs'

behaviors, at least not to the extent that they could distinguish between teams' behaviors. On the other hand, we do know that VCs pay attention to broader aspects of performance, especially with respect to their expectations (Parhankangas & Landstrom, 2006). Therefore, it seems likely that while entrepreneurial behaviors have not predicted investors' ratings of performance, entrepreneurial outcomes may.

To better understand how the outcome variables may affect investor ratings, I first considered how they may affect one another. I have suggested that change is necessary for new ventures to adapt and shape an opportunity to fit their shifting requirements. On the other hand, it can also be very disruptive. Thus, it is not change itself that is necessarily problematic, but rather its effects. This suggests that change is likely to predict poorer performance only insofar as it is disruptive. In other words, disruption mediates the relationship between change and performance. To test this argument, I conducted an additional set of regressions following the Baron and Kenny (1986) approach to mediation tests. I conducted mediation tests for each of the three performance measures: perceived performance (rated by entrepreneurs), overall performance (rated by investors) and satisfaction with performance (rated by investors). Please see Table 5.11 for the mediation results.

Model 1 in each of the dependent variable columns (perceived performance, overall performance and satisfaction with performance) included overall change to the venture as the predictor variable. Model 2 included the mediator (disruptiveness of change) as the predictor variable and controlled for overall change. In the last column of the table, disruptiveness of change was regressed on overall change.

The first condition of the Baron and Kenny method states that the independent variable must significantly predict the dependent variable. This was assessed in Model 1 for the dependent variable columns of Table 5.11 (perceived performance, overall performance and satisfaction with performance). This condition was met with respect to perceived performance and overall performance but not with satisfaction with performance. This means that mediation is no longer possible with respect to satisfaction with performance. The second condition states that the independent variable must predict the mediating variable. This was assessed in the final column of Table 5.11 which showed that indeed, overall change significantly predicted disruptiveness of change. The third condition of the Baron and Kenny method states that the mediating variable must predict the dependent variable, controlling for the independent variable. This condition was assessed in the second model of the regressions. This condition is only met for the first dependent variable, perceived performance. Finally, full mediation is said to occur if the independent variable (overall change) no longer has a significant effect on the dependent variable (perceived performance) when controlling for the mediating variable. As can be seen in the second model of the Perceived Performance column this was the case. Sobel's test confirmed that disruptiveness of change mediated the effect of overall change on perceived performance ($Z=-3.67$, $p<.000$).

Table 5.11 Mediation tests of outcome variables

	Perceived Performance (rated by entrepreneurs)		Overall Performance (rated by investors)		Satisfaction with Performance (rated by investors)		Disruptiveness of Change
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	
(Constant)	6.41***	7.37***	4.70*	5.29*	3.34*	4.51**	2.72***
	(.80)	(.77)	(2.19)	(2.31)	(1.67)	(1.69)	(.84)
Industry	.18	.22	-.08	-.07	-.01	-.01	.11
	(.18)	(.17)	(.46)	(.46)	(.35)	(.33)	(.19)
VC/Angel Funding	.12	.15	3.30*	3.25*	2.22*	2.11*	.10
	(.20)	(.19)	(1.37)	(1.38)	(1.05)	(1.01)	(.21)
External Capital	-.02	-.02	.13	.14	.09	.11	.01
	(.03)	(.03)	(.08)	(.08)	(.06)	(.06)	(.03)
Age of Firm	-.09**	-.08*	-.08	-.07	-.05	-.04	.04
	(.03)	(.03)	(.08)	(.08)	(.06)	(.06)	(.03)
Age of Respondent	.00	.00	.03	.02	.02	.01	-.02
	(.01)	(.01)	(.03)	(.03)	(.02)	(.02)	(.01)
Gender	-.04	-.10	-1.51	-1.57	-.27	-.38	-.16
	(.32)	(.30)	(1.02)	(1.03)	(.78)	(.75)	(.34)
CEO or President	.48*	.47*	-2.55*	-2.48*	-1.04	-.91	-.02
	(.20)	(.19)	(1.09)	(1.10)	(.84)	(.80)	(.21)
Midwest	-1.00*	-.93*	-.70	-.69	.18	.21	.21
	(.48)	(.45)	(.85)	(.85)	(.65)	(.62)	(.50)
Northeast	-.62	-.58	-.98	-1.01	-1.05	-1.12	.12
	(.52)	(.48)	(1.01)	(1.01)	(.77)	(.74)	(.54)
Southwest	-.70	-.70	-1.12	-1.08	-.51	-.42	.01
	(.52)	(.49)	(1.06)	(1.06)	(.81)	(.78)	(.55)
West	-.40	-.48	-.65	-.71	-.44	-.57	-.24
	(.49)	(.46)	(.84)	(.85)	(.64)	(.62)	(.52)
Overall Change	-.16**	-.03	-.31*	-.24	-.13	.01	.38***
	(.05)	(.06)	(.14)	(.16)	(.11)	(.12)	(.06)
Disruptiveness of Change		-.36*** (.08)		-.18 (.22)		-.36* (.16)	
R^2	.233	.340	.365	.375	.299	.369	.335
Adjusted R2	.159	.271	.200	.194	.116	.187	.271
F	3.142	4.881***	2.208*	2.074*	1.632	2.024*	5.212***
Sample size	137	137	59	59	59	59	137

Unstandardized regression coefficients are shown with standard errors in parentheses
*p<.05, **p<.01, ***p<.001, ^p=.07

These findings suggest that change in the venture is not necessarily problematic for entrepreneurs, but rather insofar as that change causes disruptions to operations, performance is significantly affected. Disruption from change did not mediate the effect of change on investors' ratings of performance. However, it is noteworthy that overall change had a direct negative effect on investors' ratings of overall performance and the significance of this effect disappeared when disruptiveness from change was included in the model. Furthermore, disruptiveness from change had a direct negative effect on investors' satisfaction with performance even controlling for overall change. While these findings do not support the mediation explanation, they do lend credence to the idea that investors' ratings, while unaffected by entrepreneurs' behaviors, are affected by organizational change and disruption.

It may be that significant changes in a venture are a negative signal to investors. As with any firm, new ventures work to develop a structure to match their environment and operating requirements (Donaldson, 1995). The failure to stabilize that structure, as signaled by changes in core aspects of the organization (i.e., technology, goals, market), suggests a failure to achieve reliable operations (Hannan & Freeman, 1984b). Moreover, changes may also undermine a new firm's legitimacy (Delmar & Shane, 2004; Martens, Jennings, & Jennings, 2007). Finally, significant changes to a venture represent a departure from expectations, which again, may result in lower performance ratings by investors (Parhankangas & Landstrom, 2006). Similarly, given that disruptions from change include things like delayed milestones, operational changes and financial problems, it is likely that investors will notice these as deviations from expectations and rate ventures accordingly. In summary, it appears that for entrepreneurs themselves,

change impacts their own perceptions of performance only insofar as it causes disruptions to operations. For investors, who may be less aware of the nuances of change efforts, change itself has some negative connotations and disruptions to operations are similarly important indicators of poor performance.

Post hoc analysis of improvisation

The last construct that warranted further analysis was improvisation. Several studies have suggested that the ability to improvise is a critical for entrepreneurs and others involved in innovation (Baker et al., 2003; Hmieleski & Corbett, 2008; Moorman & Miner, 1998a). However, for the most part, these studies reference the benefits of improvisation to problem-solving, creativity and briccolage (Baker & Nelson, 2005; Vera & Crossan, 2005) rather than to learning (Miner et al., 2001). For this reason, I suggested that improvisation might benefit performance, but not reduce overall change or disruption from change. However, since I found no relationships at all, I was unable to conclude how improvisation affected the shaping process, if at all. To address this, I took a closer look at improvisations' role in the model. If, as I hypothesized, improvisation was not beneficial to learning, there should be either a null effect or negative effect on certainty. In a post hoc analysis I considered this relationship and found that indeed, there was a negative relationship between improvisation and certainty (beta = -.155, s.e. = .046, p=.001). In other words, improvisation appears to be negatively associated with entrepreneurs' certainty about their venture's internal and external environment.

There are two ways to interpret these findings. First, as my theorizing suggested, improvisation may be a poor means of building knowledge. In fact, by "jumping in" and just trying things, entrepreneurs may in fact create more equivocality rather than less. In

this sense, improvisation is in direct contrast with the more systematic and analytical experiential learning strategies. A second interpretation is that causality runs the other way. It may be that when entrepreneurs are uncertain about their venture, they are more likely to try random approaches. This is consistent with a problem noted by some investors who suggested that as entrepreneurs begin to have performance problems, they can become increasingly desperate and start jumping from one strategy to the next. In a sense, they are "thrashing[18]" – taking a great deal of action but building very little knowledge. In any case, it is clear that not only does improvisation fail to facilitate performance, but it is associated with less, not more, certainty about the venture. Whether entrepreneurs improvise as a result of uncertainty or become more uncertain as they improvise more, at least with respect to the results of this study improvisation does not help entrepreneurs build knowledge.

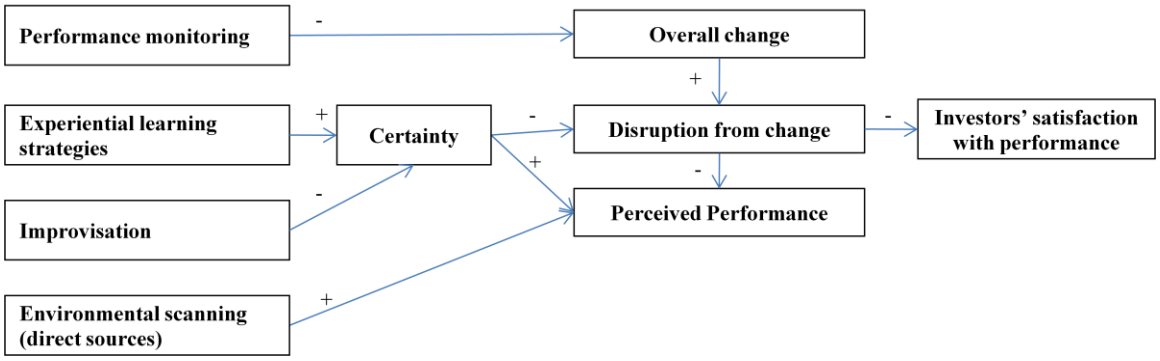
Revised model

The findings of this study suggest a slightly refined model from that which was proposed in the previous chapter. Based on this analysis, it appears that ventures that engage in regular performance monitoring experience less overall change in their ventures. Moreover, the frequent use of direct sources of information and advice about the external environment is associated with better perceived performance. In addition, ventures that engage in experiential learning strategies build more certainty about their venture and as a result, experience less disruption from change and perceive their performance as better overall. In contrast, improvisational approaches are associated with

[18] The term "thrashing" is computer science jargon for a degenerate situation on a system where increasing resources are used to do a decreasing amount of work. There is a great deal of action but the volume of action causes performance to decline.

less certainty about the venture. Finally, while entrepreneurial behaviors do not appear to affect investors' ratings of performance, change to the venture is associated with lower investors' ratings of overall performance and disruptiveness of change is associated with lower satisfaction with performance. Please see Figure 5.1 for a revised model.

Figure 5.1 Revised model of entrepreneurial behavior and outcomes



In summary, the findings of this study suggest that change is both a normal and, at times, disruptive aspect of the new venturing process. Moreover, ventures vary in their ability to manage both the overall amount of change they experience and the disruptiveness of that change. In particular, performance monitoring, environmental scanning (of direct sources of information) and experiential learning strategies allow entrepreneurs to maintain an awareness of changing events and an ability to learn and adapt efficiently.

There are several limitations to this study which qualify the conclusions. First, this study is drawn from a relatively small sample size (though it is not atypical for studies of entrepreneurship (Bartholomew & Smith, 2006)) which presents limitations to statistical power. Furthermore, given the sample size, generalizations to other entrepreneurs, and especially other kinds of entrepreneurs, should be made with care. The

sample size may have been limited by the length of the survey. Since the survey was very exploratory, it was quite long and respondents may have been unwilling to invest their time. Future research will include much shorter, more focused surveys, based on the findings of this initial exploration. This should facilitate response rates.

A second limitation has to do with the potential for single-source bias. Each respondent was acting as an informant for team-level behaviors. Single-source bias may be mitigated by the fact that 1) respondents were generally representing a very small team (median size = 3) and so were not attempting to aggregate the behavior of many people, 2) respondents were reporting on explicit activities rather than beliefs or less salient aspects of the venture's organization and 3) respondents were limited to members of the top management team (mostly CEOs and Presidents) and so were in an organizational position to have good knowledge of team's activities. Nevertheless, it is possible that they were not accurately representing team actions. Future work should collect data from multiple team members to more cohesively capture organizational activities.

A third limitation is the use of a single survey to capture information at one point in time. Therefore, it is not possible to say for certain that the organizing practices studied (i.e., performance monitoring, environmental scanning, experiential learning, improvisation) are causally related to the outcome measures. Future research should measure these practices longitudinally.

A fourth limitation has to do with the interpretation of the regression findings. These findings suggest that certain organizational practices (i.e., performance monitoring, environmental scanning and experiential learning strategies) facilitate the shaping process by reducing change and disruption and improving overall performance. However, it is

also possible that these relationships are an artifact of variation in unmeasured attributes of the environment, such as environmental dynamism or turbulence. In other words, change disruption and performance may be affected by turbulence in the environment and at the same time, it may be the case that the more turbulent the environment, the less monitoring and scanning is possible. One counter-argument for this alternative explanation arises from the work of Eisenhardt (1989a) who found that in more dynamic, fast-paced environments, better performance was associated with more, not less, scanning.

Furthermore, in both the qualitative and quantitative studies, there was variance in the degree to which firms engaged in monitoring and scanning even among those firms experiencing high levels of turbulence. Moreover, lack of monitoring was not associated with less turbulent markets. In other words, there did not appear to be a pattern of monitoring that mirrored environmental turbulence. For example, one of the respondents who engaged in the most critical and regular performance monitoring worked in the highly dynamic life-sciences tools industry and had to contend with changes in technology and markets. On the other hand, one of the least well-monitored firms focused on web-sales of apparel…a relatively stable and less complex industry. Furthermore, the qualitative study included several examples of founders who *learned* to be more vigilant over time, even though the turbulence of their environment had not changed (i.e., decreased). As one respondent recalled, after experiencing the surprise effects of changes in macroeconomic trends, he learned to more carefully monitor the broader business environment.

> "… and that was a big lesson for me … you're a start-up but you have to look at the macro as well. You cannot disregard the macro dynamics and you need to understand and keep your eye always open..."

For several respondents, monitoring appeared to improve over time as they learned how external factors or internal performance could easily escape their notice. This suggests that monitoring is not entirely determined by environmental issues (e.g., turbulence) but is a skill that can be learned, regardless of the environment. However, to fully test for endogeneity, future work would need to include more specific measures of environmental dynamism or turbulence.

In addition, it is likely that as environments become increasingly dynamic, managers must selectively focus on some indicators over others when monitoring performance or the environment. For example, in software development, as the pace of development increases, it can be critical for managers to seek out and select appropriate diagnostic measures (e.g., # of new software defect or 'bugs') to use as indicators of performance rather than monitoring all possible indicators[19]. Future work might consider whether some indicators or metrics are more critical than others and the extent to which knowledge of these affects new product development performance.

[19] I am grateful to Michael Restivo for this insight on new technology development processes and metrics and for his suggestion about this potential extension to my theoretical inquiry.

CHAPTER 6. GENERAL DISCUSSION AND FUTURE DIRECTIONS

The purpose of this dissertation was to address the questions "What is the process by which entrepreneurs shape their emerging opportunities?" and "What organizing practices facilitate that process?" By exploring and explicating the process of opportunity creation in a theory-building, qualitative study, I have suggested that opportunities emerge and are shaped as entrepreneurs learn from experience, seek out and respond to feedback and advice and manage unexpected events. Moreover, I have suggested that this shaping process is facilitated by organizing practices that build awareness of the changing organizational environment and that build knowledge through systematic and analytical approaches to experiential learning. A quantitative, survey study of high-tech entrepreneurial ventures largely supported this theoretical framework.

This research makes several contributions to the field of entrepreneurship. First, it provides some insight into the process of opportunity creation. Much of the previous research in entrepreneurship has focused on inputs and outcomes of the new venturing process, while the process itself remains a black box. In other words, we know that some entrepreneurs are more apt than others to create successful opportunities, but we know very little about what it is that entrepreneurs actually *do*. In much of the research, *action* is missing. Yet, "understanding is enhanced by making explicit the underlying generative mechanisms that link one state or event to another, and in the social sciences, actions constitute this link" (Hedstrom & Swedberg, 1998: 12). By focusing on the actions of entrepreneurs, this dissertation attempts to shed some light on the behavioral mechanisms through which opportunities emerge. Furthermore, the opportunity creation process as explained in this research appears to be quite different from that which is assumed by

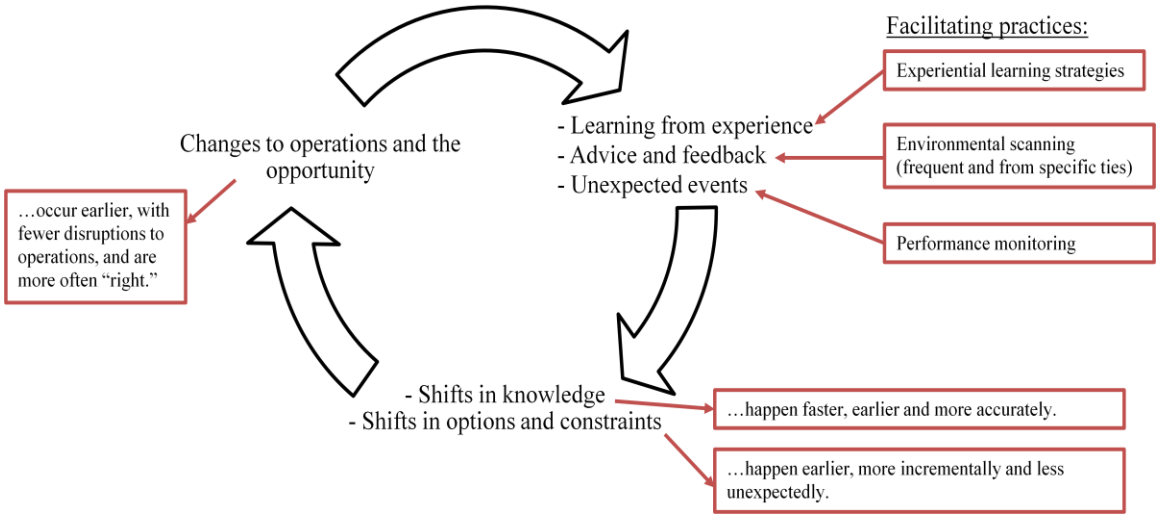
much of the existing research. Rather than assuming that opportunities are designed and then executed (Gartner, 1985; Shane & Venkataraman, 2000), this dissertation suggests that opportunities emerge from a process of simultaneous creation and adaptation.

This work also contributes to the entrepreneurship field by highlighting and examining the paradoxical nature of change within the opportunity creation process. My findings suggest that while change is critical for adaptation to dynamic internal and external forces (e.g., new knowledge, new environmental constraints), it can also be detrimental to performance insofar as it causes delays and disruption. These two faces of change are generally addressed separately in the existing literature. On the one hand, many studies embrace change as a means of adaptation. For example, some studies argue that entrepreneurs adjust their goals in response to available resources (Sarasvathy, 2001). Studies of entrepreneurial improvisation and briccolage also emphasize the benefits of flexibility and adaptation (Baker et al., 2003; Baker & Nelson, 2005; Hmieleski & Corbett, 2008). Underlying these studies is an assumption that in order to manage the dynamic uncertainties of a new venture, entrepreneurs must be able to adjust quickly and adroitly. The emphasis therefore, is on adapting to uncertainty rather than reducing it. On the other hand, many other studies explore strategies and tactics that would allow entrepreneurs to avoid change, often through better planning (Delmar & Shane, 2003; Sykes & Dunham, 1995) or better information gathering and knowledge building (Cooper et al., 1995; Ozgen & Baron, 2007; Yli-Renko et al., 2001). This perspective is most evident in the dozens of texts on writing an effective business plan. Underlying these studies is the assumption that ventures can be designed, structured and managed in such a way as to reduce uncertainty and the need for change.

This study brings these two perspectives together to suggest that while change is integral to the shaping process, it can be actively managed in such a way as to reduce its negative effects. Specifically, the findings of Study 1 suggest that the shaping process is a cycle of change. Change occurs when entrepreneurs learn from experience, feedback or advice and when they respond to unexpected events. These experiences lead to shifts in knowledge as well as shifts in the constraints and options entrepreneurs face and as a result, they are motivated to make changes to their operations and opportunities. However, the extent to which this cycle of change is disruptive, varies depending on how quickly, early and accurately entrepreneurs make changes.

The findings of Study 2 suggest that certain behaviors or practices may make this cycle faster, smaller (more incremental) and less disruptive. That is, while learning from experience, gathering feedback and advice and responding to unexpected events appear to drive change, there are more and less effective ways of managing these drivers of change. For example, experiential learning strategies allow entrepreneurs to learn from their experience sooner, faster and more accurately. Feedback and advice is likely to be more helpful and less disruptive if entrepreneurs acquire it frequently and from more direct sources. Finally, unexpected events may be limited or caught earlier if entrepreneurs vigilantly monitor their performance and environment. Overall, these organizing practices appear to reduce change and its negative effects in the shaping cycle. In other words, these practices *both* increase flexibility and reduce uncertainty. Please see figure 6.1 below.

Figure 6.1 Practices that facilitate the shaping process



This research also contributes more broadly to research on managing uncertainty and unexpected events. By focusing on real-time organizing, it goes beyond efforts to reduce risk or eliminate error a priori, to suggest that certain practices allow organizational actors to manage uncertain events as they unfold. In particular, this research suggests that when organizational actors develop a vigilant awareness of their ongoing experience they acquire a more accurate view of a given situation, and are better equipped to adjust and adapt their understanding as events shift. This approach to managing uncertainty in-the-moment is akin to what other scholars have referred to as mindful organizing. These are organizational practices intended to develop "a rich awareness of discriminatory detail and a capacity for action" (Weick et al., 1999, p. 88).

The effects of mindful organizing have been well-documented in high-reliability organizations – organizations that are continually exposed to potential crisis (e.g., nuclear power plants, aircraft carriers) and therefore must sustain high levels of attention and awareness to ongoing activities (Weick & Sutcliffe, 2007). Interestingly, *theories* of mindful organizing describe these processes quite broadly, as a form of dynamic

organizing which allows firms to maintain flexibility and the capability to respond in real time by reorganizing resources and actions as needed (Weick & Sutcliffe, 2007). Empirically, however, most of the research on mindful organizing focuses on reliability and the prevention or minimizing of error in complex systems. For example, scholars have argued that mindful organizing practices may reduce crisis in wildland firefighting (Barton & Sutcliffe, 2009), healthcare (Vogus & Sutcliffe, 2007a; Vogus & Sutcliffe, 2007b) and airline cockpits (Krieger, 2005). However, while reliability is clearly an important outcome, it is not the only benefit of mindful organizing.

This study contributes to the literature on mindful organizing in two ways. First, the findings suggest that building vigilance and awareness of real-time events may not only prevent problems, but may also contribute to overall performance outcomes. Thus, there is empirical evidence that at least some of the behaviors associated with mindful organizing are critical to outcomes other than reliability. Second, while this study does not address mindful organizing directly, it does suggest that the benefits of mindful organizing practices likely extend into the realm of innovation and entrepreneurship. Although new high tech ventures may seem to be far from the highly structured world of air-craft carriers and nuclear power plants, this study suggests that there may be underlying similarities. In particular, while new ventures may not perceive themselves as striving for reliability, entrepreneurs, like wild land firefighters, must achieve reliable functioning in the face of great uncertainty and dynamic conditions. Future work should consider more directly if and how mindful organizing practices contribute to entrepreneurs' ability to manage the creation of new opportunities.

Finally, this dissertation may contribute to the practice of entrepreneurship, which now, more than ever is an issue of significant economic importance. In particular, venture capital and angel backed firms tend to be the most innovative and have the highest growth potential of all entrepreneurial firms. Firms that received VC funding account for 12% of the total private sector workforce (Shane, 2008) and over 16% of US GDP (GlobalInsight, 2005). More importantly, these percentages are growing, suggesting that increasingly our economic growth will rely on the continued success of VC-backed firms. In many ways these are the seedlings of our economic future. However, like seedlings, these same firms have a very high mortality rate, with the majority failing within 7 years (Shane, 2008). In other words, the tremendous growth is coming from only a fraction of the firms – those that succeed. With this dissertation, I do not claim to explain or predict overall venture performance. However, the ability to manage deep uncertainty and equivocality is one critical aspect of their success. Moreover, a deeper understanding of the organizing practices that facilitate the shaping process may allow venture capitalists and other investors to determine earlier in the process if new ventures are heading in the right direction. In other words, rather than waiting for a venture to either run out of money or successfully exit, both entrepreneurs and investors may be able to take stock of their actions, not just their outcomes, and make adjustments to their practices before conclusions are foregone.

FUTURE RESEARCH DIRECTIONS

This dissertation has taken an exploratory and inductive approach to understanding the opportunity creation process. While the current study furthers our understanding of what has previously been a "black box" in the literature, it also raises several questions. In particular, future research should strive to both refine and continue to test the current model as well as to expand that model to include an examination of the antecedents driving the organizing practices described earlier.

Refining the model

The two studies of this dissertation, in combination, suggest a cyclical shaping process model, enhanced or hindered by the organizing practices of the entrepreneurs involved. One goal of future work is to further refine and test this model using longitudinal data. To do this, I will continue to use both qualitative and quantitative methods. Many of the ventures studied in these studies have volunteered to continue to participate in research. Regular interviews combined with much shorter, more focused, surveys may provide an even clearer picture of the shaping process and the specific practices that facilitate that process over time. Experiential learning strategies appear to be particularly important to this process and future studies should refine and strengthen this construct to be used as an index of entrepreneurial behaviors.

Another piece of the model that warrants closer attention is the type and magnitude of change that new ventures experience. In this study, change has been categorized quite roughly as either a change to opportunity or a change to operations. Yet, as was discussed in the coding process, these changes can also be further broken down into changes to the market, product, pricing model, commercialization model, partnerships, etc. By collecting additional data over time, it may be possible to consider how the different practices affect entrepreneurs' ability to manage different kinds of change.

Similarly, magnitude of change was measured using a variety of statements such as "Our overall value proposition has changed." What is less clear is *how* that value proposition differed from the initial proposition and to what extent. This may be a critical dimension of change because it is almost never the case that an approach is entirely new.

That is, change generally represents some combination or overlap of old and new[20]. Monitoring performance, scanning and experiential learning strategies may all help entrepreneurs manage the magnitude of this overlap. For example, if scanning and performance monitoring allow entrepreneurs to calibrate how well an approach is working and experiential strategies help them pinpoint exactly how an approach is affecting certain outcomes, they may be better able to craft changes that address specific performance gaps while still retaining the benefits of the old approach. On the other hand, if they have no sense of why an approach is not working, any new approach may be closer to a 'stab in the dark' – not a carefully crafted combination of old and new. William James suggests "the maximum of attention may then be said to be found whenever we have a systematic harmony or unification between the novel and the old. It is an odd circumstance that neither the old nor the new, by itself, is interesting: the absolutely old is insipid; the absolutely new makes no appeal at all. The old in the new is what claims attention- the old with a slightly new turn" (James, 1906: 108).

Similarly, it may be that for entrepreneurs, the "absolutely old" (or no change) precludes adaptation and the absolutely new (or complete change) change disconnects from all that is working. Thus, it may be that change is most effective for entrepreneurs when they are able to achieve a "systematic harmony" between the novel and the old. A closer examination of change efforts over time, using both quantitative and qualitative data, may provide more insight into how entrepreneurs manage the overlap between old and new.

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[20] I am grateful to Karl Weick for this insight and for suggesting this aspect of change as a potential avenue for further research.

Antecedents to the model

Another set of questions raised by this research has to do with the likely antecedents to the practices explored here. This study suggests that performance monitoring, environmental scanning and experiential learning strategies are all important to the management of uncertainty but as of yet, I've said little about what drives these behaviors. Future research should address this. In particular, the qualitative and quantitative findings point to two potentially generative avenues of research – the role of team expertise and the role of situated humility. I describe each of these below.

Requisite variety of team expertise. Earlier I argued that many entrepreneurial teams suffer from a lack of sufficient expertise (which is one reason it is so critical to seek it externally). However, teams vary with respect to the amount and type of expertise they have. Moreover, *requisite variety* of expertise is likely to be just as important within a team as it is externally, particularly with respect to the practices described in this study. First, because it takes knowledge to build knowledge, teams with more expertise overall and more kinds of expertise may be more likely to engage in experiential learning strategies. In their study of absorptive capacity, Cohen and Levinthal (1990) suggest that a firm's ability to absorb and build upon new information is constrained or facilitated by existing knowledge, routines and structures. Moreover, groups composed of individuals possessing diverse knowledge sets and perspectives have access to more cognitive elements than homogenous groups (e.g., Amabile, Barsade, Mueller, & Staw, 2005; Haragon & Sutton, 1997; Leonard & Swap, 1999). Thus, teams with a requisite variety of expertise are more likely to have the cognitive tools necessary to engage in experiential learning strategies. Second, a requisite variety of experts may also facilitate a team's

ability to engage in vigilant monitoring. In the presence of diverse perspectives, people are more likely to challenge one another to think more divergently and challenge assumptions (Leonard & Swap, 1999; Nemeth, Connell, Rogers, & Brown, 2001). Similarly, differing sets of expertise and world-views may provide broader and deeper sensors for changes in performance and the environment. Finally, a broader set of worldviews and functional expertise may increase teams' likelihood and ability to seek external feedback. A variety of experts are likely to have very different information networks thus increasing the overall set of informational sources for a team. Future work should consider what constitutes a requisite variety of expertise on a venture team and how this affects the practices associated with the shaping process.

Situated humility. Another factor that may facilitate the opportunity shaping process arises from how entrepreneurs view themselves in relation to the emerging situation. When individuals view a situation as inherently unpredictable, recognizing that they cannot have a complete understanding of ongoing events, they are more likely to seek out opportunities to learn about the situation as it unfolds (Barton & Sutcliffe, 2009). I refer to this attitude as "situated humility." It arises not out of personal insecurities, but rather from the acceptance that, however confident they are in their own skills and abilities, *the venture* is so uncertain that no-one can be fully knowledgeable under the circumstances.

Humility, in this case, does not mean to be meek or feel inferior any more than "brave" means to feel no fear. Rather, I draw on a Kantian view of humility in which, as Grenberg (2005:17) puts it, one views oneself as "a dependent and corrupt but dignified rational agent." In other words, to be humble is to honor one's worth and capabilities

while still recognizing the fundamental limits of those. In this case, however, I make no claims as to personality or trait but rather view this humility as a situated cognition in that it represents an interaction of cognitive schemas with an organizational context (Lant, 2002). Individuals who embody situated humility may be cocky or arrogant in other situations. However, with respect to their new venture, they are careful about their limitations and their limited knowledge. Importantly, because it is not a personality trait, situated humility can exist alongside optimism and efficacy. In fact, many founders spoke of confidence or lack of fear in the same breath as letting go of ego or the belief that you know best.

> "These are folks that are not egomaniacs…[they] are very sound, very confident in their abilities on one hand, but are very willing to cooperate … rather than enforce or convey a message that they know best."

> "You've got to pay attention to everything and not be afraid….If you check your ego at the door I think you get a lot farther."

This combination of humility about the situation but confidence in one's own abilities may help explain one of the paradoxes of entrepreneurship – that of perseverance vs. flexibility. On one hand, in order to persevere in the face of great odds entrepreneurs must have high levels of confidence in themselves and their ideas. Indeed, empirical studies suggest that entrepreneurs, like most individuals, tend to be overly optimistic about the likelihood of success when that success is based on their own skills (Camerer & Lovallo, 1999; Cooper et al., 1988). Some studies even suggest that entrepreneurs have higher than average risk propensities (Stewart & Roth, 2001) (though see Brockhaus, 1980 for an exception). Such confidence and optimism might be required to maintain the persistence and resilience necessary to see a venture through. On the other hand, the inherent uncertainty of new ventures means that founders are likely to face many

unexpected challenges and problems. The ability to adapt and adjust their direction is critical. Too much confidence in a particular direction, strategy or idea could result in fixation errors or even the failure to notice emerging problems. Studies of very uncertain situations suggest that flexibility and adaptiveness require an emphasis on failure (e.g., constant vigilance for likely problems, considering worst-case scenarios) (Weick & Sutcliffe, 2007). How then, are entrepreneurs to maintain optimism and confidence without becoming blind to the possibility of failure and unable to adjust their plans?

The answer does not appear to lie in moderating confidence levels alone. That is, we might think that successful entrepreneurs are confident but not *over*confident. Unfortunately, empirical studies do not support this idea. Rather, it appears that overconfidence is characteristic of all entrepreneurs (and, indeed, all people) regardless of their likely success (Cooper et al., 1988; Stewart & Roth, 2001)[21]. However, this research generally focuses on entrepreneurs' perceptions of risky circumstances and likely outcomes rather than considering their ability to *manage* the process. It may be, therefore that a humble view of the situation together with a confidence in one's ability to find ways to manage it provide the most benefits. By acknowledging that there is much that they don't know, while maintaining confidence in their ability to learn their way forward, entrepreneurs may be able to generate the benefits of both sides of the paradox. As one founder explained:

> Are we optimistic or not optimistic? That is almost like the wrong question at this point in time. We know it is fraught with risk. In terms of the technology we really don't know. But what we are committed to is that for a period of time we

[21] However, in their study of entrepreneurs' perceived chances of success, Cooper et al. (1988) only compared new ventures that had or did not have the characteristics associated with later success rather than measuring success per se.

> really believe that what we do know and the processes that we can bring to bear …can potentially ferret out a few markers that can allow us to secure an SBIR[22]…So we need some basic data. So that's what we feel comfortable about.

Those who recognize a situation as unknowable do not necessarily disbelieve their own assumptions and experiences. Situated humility is not simply doubt. Rather, they accept that the situation is unfolding and changing. This recognition may be a driver of experiential learning strategies in that it sets up the need for action – for trying things, testing assumptions, conducting experiments. Weick[23] has suggested that managing uncertainty requires more than sensemaking and sense-discrediting. Action is necessary. Situated humility, with its recognition of uncertainty and ambiguity, creates a call to learning through action. Situated humility may also drive performance monitoring and environmental scanning insofar as founders who view a situation as unstable and dynamic are more likely to be vigilant for changing conditions and assumptions.

Future research should consider how to measure situated humility in entrepreneurs. There is no existing scale to measure situated humility as this is a new construct. However, studies of personal humility offer excellent guidelines. For example, personal humility appears to consist of several different components all founded on the belief that an individual can change (Owens, 2009). Similarly, situated humility likely encompasses the view that a situation can change – that events are not stable and predictable. Similarly, personal humility includes a willingness to view oneself accurately, an appreciation of others' strengths and contributions, teachability, and a low self-focus (Owens, 2009). All of these components likely have parallels in situated humility. In addition, however,

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[22] Small business initiative research grant

[23] Personal correspondence

situated humility appears to include a sense of efficacy and confidence. Thus, however it is operationalized, it is likely to include an index of different factors rather than a single characteristic.

Data from the quantitative study not reported here attempted to capture some aspects of situated humility, including the desire to view a situation accurately and the tendency to seek out alternative perspectives on a situation. In general, these behaviors were associated with the tendency to check assumptions more frequently, which was, in turn, associated with better perceived performance. However, the effects of checking assumptions became insignificant when experiential learning strategies were included in the model. Furthermore, the operationalization of situated humility included measures of belief and behavior, making it difficult to untangle the effects of one from the other. Future studies should attempt to isolate and refine this construct prior to analyzing its effects on behavior. Based on anecdotal evidence, however, it seems likely that entrepreneurs who approach the shaping process with situated humility are more likely to engage in behaviors that facilitate that process, such as performance monitoring, environmental scanning and experiential learning strategies.

CLOSING REMARKS

To understand entrepreneurship, we must view it not just as an outcome of discovery, but as an emergent process of creativity and adaptation. To address this gap, I examined the process by which opportunities are created and the organizing practices that facilitate that process. While popular views of entrepreneurship tend to portray entrepreneurs as intuitive, improvisational and passionate and business schools teach fledgling entrepreneurs to plan and analyze, this research suggests that the practice of entrepreneurship falls somewhere in between. The two studies offer a novel theory of opportunity creation as a shaping process, facilitated by organizing practices that contribute to experiential awareness and learning. That is, my findings suggest that entrepreneurs must develop and maintain a vigilant awareness of their changing experience and do so with a

disciplined eagerness to view the situation as it really is, not just as they want it to be. Furthermore, while they must act in the moment, they must also structure the moment so that action leads to learning.

Schumpeter referred to entrepreneurship as the "gales of creative destruction" (1942). While that may accurately reflect new ventures' economic effect, the *process* of entrepreneurship could more accurately be called simply gales of creation. It blows this way and that, following not the rigid, planned process of business development as we are taught in business schools (Gartner, 1985; Kotler, 1991), but rather an emergent and enacted route, pushed and pulled by internal and external forces for change. Entrepreneurs who thrive in these gales are those who can harness the winds, by both embracing and managing change as they shape their emerging opportunity.

APPENDICES

APPENDIX A.
Recruiting email for qualitative study

Dear xyz,

I am working with a Ross Business School, University of Michigan doctoral student, Michelle Barton, who is conducting her dissertation research on the strategies that entrepreneurs use for responding to uncertainty. She focuses on how founders adjust and adapt their emerging ventures in response to unexpected major events such as new knowledge, technological requirements or market situations. I am wondering if you would be willing to be interviewed by her about your experiences. In my experience working with early stage companies, I have found that almost every company had a major surprise in the first couple of years that caused it to change its direction and or its approach to what it was doing. I think Michelle's research would be very useful in helping us to better understand the management of early stage companies.

Michelle is very careful about confidentiality and anonymity. If you agree to be interviewed, she will send you a consent form that details how she manages and protects the data she collects.

I appreciate any help you might be able to give her. Please let me know if you are willing to talk with Michelle, and if so, I will have her get in touch with you directly.

Sincerely,

Appendix B.
Interview protocol for qualitative study

Fill in in advance:

a. Name of company:
b. Name of respondent:
c. Respondent's position (e.g., CEO, etc.):

Biggest goal for next six months:

II. Background

1. Please tell me your elevator speech on what your organization does right now and where you plan to go.
2. How big is your organization currently?
    a. number of employees
    b. TMT (describe)
    c. Sales/Revenues
    d. Capital invested to date and by whom if possible
3. Who is on the top management team?
4. What date (month/year) was the company first incorporated?
5. When did you first become involved in the company?
6. What did you do previous to this?
7. Have you founded or been involved in other entrepreneurial ventures before?

III. Please tell me how the company got started…

1. What was the original goal/strategy of the organization when you first incorporated it? Probe for:
    I. Who else was involved in the first 6 months of the organization? In what capacity?
    II. Who was the original target market and audience?
    III. What was the initial strategy for development? Sales and distribution?
    IV. How was the venture originally organized?
    V. What was the original plan (if any)?

2. How did you develop the venture from there? Probe for:
    I. How was the technology/offering developed? In what stages?
    II. When and how did you seek funding?
    III. Who else became involved and in what capacity
    IV. What stakeholders became involved and how (e.g., customers, distributors)
    V. What advisors did you use and how?

3. Continue to ask "then what" until arrive at present day

4. **When respondents mention a change event, probe for:**
    I. When did you first start thinking about the need/desire for this change?
    II. What instigated the change? (Probe for actions, experiments, experiences)
    III. Had you expected to be in this situation?
    IV. What was most unexpected or unplanned about it?
    V. Who was involved (who brought it to your attention)

VI. What other stakeholders were involved at that time (e.g., VC, incubators, other investors, family members)?
VII. What were your primary concerns and goals before and after the change?
VIII. Did you consider alternative changes?
IX. Before deciding to make the change, what did you do?
X. Did you consult with anyone about this change? Who?
XI. How did you carry out making the change?
XII. How could you tell if it was working or not?
XIII. What was your source of funding at that time?
XIV. What has been the result (so far) of this change?
XV. What was most challenging about this process?
XVI. Was there anything you could have done differently that might have made this go even more smoothly?
XVII. What, if anything, did you learn from this experience?

5. [If time permits]
   I. What is the most uncertain aspect of your business right now? How are you managing that?
   II. While developing this venture, did you ever have to respond to something very unexpected? Describe.

Appendix C.
Sample of coded data

Change events	**Type of change** (analytical codes in parentheses)	**Triggers of change**	**Triggers of change** (analytical codes in parentheses)	**Change effects**
Developed surgical product A for sale to medical device distributor → develops and focuses on different kind of surgical product B for sales directly to hospitals	(product change) (new market) **Opportunity**	After evaluating prototype of original product A, distributor decides not to buy because market isn't big enough	(Learning from deliberate experience) **Learning from experience**	Time consuming delay but since distributor paid to evaluate, financial resources were not lost **Temporal - delay** **Not very disruptive to operations**
Hire sales force to sell surgical product B to hospitals for use by general surgeons →fire sales force and incur $3M cost	(personnel change) **Operations**	General surgeons had liked the product B but upon trying to sell it, discovered that buyers (hospitals) wouldn't pay for it.	(Learning from t-and-e experience) **Learning from experience**	$3 Million wasted Fired sales force and VP of sales **Disruptive to operations**
Licensed product B to a partner to sell to cardiac surgeons rather than general surgeons → Partner no longer has ability to sell	(distribution change) **Operations**	Partner acquired by Firm X who won't sell but doesn't want to give up license	(Unexpected event – partnership failure) **Unexpected event**	Sales of product delayed but acquiring firm pays $2M to hold license **Temporal - delay** **Not very disruptive to operations**
Venture focused on (unsuccessful) product B → develops new product C and prepares plan around this	(product change) **Opportunity**	Realize product B is not selling	(Learning from t-and-e experience) **Learning from experience**	No disruption associated with change **Not very disruptive to operations** **Temporal - unclear**
Board meeting called to see newly developed surgical product C → Founder quickly invents different product D (a few days before meeting)	(product change) **Opportunity**	Product C passes initial tests but unexpectedly fails second round of testing (so inventor feels pressure to come up with something in time for meeting)	(Unexpected event – tech failure) **Unexpected event**	Almost no difficulty. Made this change in 3 days **Not very disruptive to operations** **Temporal - fast**

Appendix C - continued

Change events	**Type of change** (analytical codes in parentheses)	**Triggers of change**	**Triggers of change** (analytical codes in parentheses)	**Change effects**
Enter contracting VC firms for $5M to finance growth of venture → loss of VC funding	(funding change) **Operations**	VCs pull out suddenly	(Unexpected event – partnership failure) **Unexpected event**	Loss of funding ($5M) **Disruptive to operations**
Renegotiate contract with Firm X to distribute 10,000 units/month of product B and hire 52 manufacturing positions → Firm X refuses to purchase product B and manufacturing resources are let go	(personnel change) (distribution change) **Operations**	First mass produced products B don't work as expected. (Respondent notes that they were not field tested)	(Learning from t-and-e experience/ unexpected event – tech failure) **Learning from experience** **Unexpected event**	Fire 52 people, enter litigation, Also lose additional contract **Disruptive to operations** **Temporal - delay**

Appendix D
Survey instrument for investors

1. How many companies have you invested in personally or in your capacity as a venture capitalist/angel investor?
   (Please circle one.)

   1 2-5 6-10 11-15 16-20 21-25 >25

2. Compared to all the companies you have invested in, how successful would you say this venture is *at this stage of development*? (Please circle one.)

Much less successful			About average			Far more successful
1	2	3	4	5	6	7

3. Compared to your initial *expectations* for this venture (when you first invested), how well has it done so far overall? (Please circle one.)

Fell far below expectations			About as expected			Far exceeded expectations
1	2	3	4	5	6	7

4. Overall, how satisfied are you with this venture's performance on each of these criteria?

	Extremely dissatisfied	Dissatisfied	Somewhat dissatisfied	Neither Satisfied nor Dissatisfied	Somewhat Satisfied	Satisfied	Extremely Satisfied
Research/technical problem solving	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Product development	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Market development	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Efficient use of resources	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Achieving milestones and goals	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Ability to manage unexpected events	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Ability to learn from feedback and experience	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Ability to avoid or prevent surprises	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Ability to adapt operations or strategy when necessary	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Perseverance	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Appendix E
Survey instrument for entrepreneurs

Block 1

Thank you for your participation in this survey. Please be assured that **all responses will be kept entirely confidential.** All personal information will be presented only in aggregate form in reports and publications. Individual responses will *not* be identifiable.

If you have questions about the survey please contact me at mibarton@umich.edu.

Thank you for participating! I am genuinely grateful for your help.

Sincerely,
Michelle Barton
PhD Candidate
Stephen M. Ross School of Business
University of Michigan

Part 1

Please answer the following questions with respect to your venture generally. If you are involved in more than one venture, please choose the one you are most familiar with and answer the questions in this entire survey with respect to that venture. If you are no longer involved in the venture, please answer the questions with respect to your most recent year of experience with the venture.

What do you consider to be your primary industry? (check one)

- ○ Pharmaceuticals and medicine
- ○ Medical devices
- ○ Manufacturing
- ○ Computer hardware or electronics
- ○ Computer & Internet software
- ○ Finance & Insurance
- ○ Professional, scientific or technical services
- ○ Other, Please Specify

In what year was your venture incorporated?

Where are your organization's current headquarters?

Appendix E (continued)

Please indicate if your venture has 'exited' in one of the following ways:

- ○ closed down
- ○ sold to another firm
- ○ IPO
- ○ Other (please specify)

Please indicate how many, if any, rounds of EXTERNAL funding your startup has received from each of the following:

	0	1	2	3	4	>4
Institutional Investors (e.g., VCs)	○	○	○	○	○	○
Angel Investors	○	○	○	○	○	○
Grants	○	○	○	○	○	○
Bank Financing	○	○	○	○	○	○
Friends/family not included in other categories	○	○	○	○	○	○
Other (please specify)	○	○	○	○	○	○

Please indicate approximately how much EXTERNAL capital has been invested in your venture to date.

- ○ $0 - $50K
- ○ $51-100K
- ○ $101K-250K
- ○ $251K - 500K
- ○ $501K - 750K
- ○ $751 - $1Million
- ○ > $1Million and <$3Million
- ○ > $3 and < $5Million
- ○ >$5Million and < $10 Million
- ○ > $10 Million and < $50Million
- ○ > $50 Million

Which of the following descriptions <u>most closely</u> matches your startup currently (check only one):

- ○ We are focusing mostly on scientific/basic research and development to create a proof-of-concept.

- We have a proof-of-concept and are developing a prototype of our product/service.
- We are developing a working, marketable product/service but have not yet launched a product/offering.
- We have launched a product/offering but are still getting operations up to scale /speed.
- We are fully launched and operational and are now focusing primarily on growth and expansion.

Please indicate how certain you feel about the following aspects of your venture:

	Not at all certain			Somewhat certain			Very certain
We know who will be our target market(s).							
We know what suppliers, if any, we will require in order to be successful.							
We are aware of and fully understand any existing competitors' solutions.							
The scientific/technical knowledge underlying our offering is complete and correct.							
We have identified the most likely scientific/technical hurdles we will face.							
We know what regulatory/legal issues we will need to address.							
Our team has the skills needed to achieve our current goals.							
We can get the funding we need.							

Please indicate the extent to which your venture's technology or proprietary intellectual property...

	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
...is highly specialized.							
...could be used for many different types of applications.							
...could be adapted for use in several different industries.							

Please indicate to what extent the following statements are descriptive of your startup's environment or industry:

	Not at all			To a moderate extent			To a very great extent
Information can be interpreted in several ways and can lead to different but acceptable solutions.							
Information used in making decisions means different things to different people.							

Appendix E (continued)

There is more than one satisfactory solution for the problems we face.	○ ○ ○ ○ ○ ○ ○
In our industry, customer demand and preferences change frequently.	○ ○ ○ ○ ○ ○ ○
In our industry, the actions of major suppliers (including materials, equipment or labor suppliers) change a lot from year to year.	○ ○ ○ ○ ○ ○ ○
In our industry, the set of key competitors is well-established and stable.	○ ○ ○ ○ ○ ○ ○
Regulatory aspects of this industry are stable.	○ ○ ○ ○ ○ ○ ○
Technological advances in this industry are rapid and sometimes disruptive.	○ ○ ○ ○ ○ ○ ○

Part 2

The following questions ask about your executive management team and other employees.

For the purposes of this survey the executive management team includes:

- **individuals who are officers OR**
- **individuals who both own an equity stake in the venture and are actively involved in its strategic management.**

How many members of the executive team are there currently in your venture?

How many people who are not members of the executive management team are currently employed in your venture...

	Number of current employees (not part of executive management team)
Full time	
Part time	

For each of the following functions and areas of expertise, consider who on the executive management team has the most years of experience in that area and then indicate his or her experience level. (If no one on the team has experience in a particular area, just click "No experience" for that category.)

	No experience			A fair amount of experience			A great deal of experience
Sales	○	○	○	○	○	○	○
Marketing	○	○	○	○	○	○	○

Finance	○	○	○	○	○	○	○
Technical (engineering, R&D, etc.)	○	○	○	○	○	○	○
Operations/manufacturing	○	○	○	○	○	○	○
General management	○	○	○	○	○	○	○
Work experience in our specific industry	○	○	○	○	○	○	○
Work experience with our specific technology.	○	○	○	○	○	○	○

What is the total number of startups (not including this one) that members of your executive management team have founded or been employed by full-time (i.e., add together each member's total number of other startups)?

Part 3

Answer the following questions with respect to your executive management team's actions in the past 12 months.

Please indicate, in the past 12 months, the extent to which you engaged in the following activities.

	Not at all			To a moderate extent			To a very great extent	N/A
We identified what areas of expertise we did not have within the team.	○	○	○	○	○	○	○	○
We explicitly targeted outside individuals who could help us fill in gaps in our expertise.	○	○	○	○	○	○	○	○
Some team members did not have the type or level of expertise that we had expected.	○	○	○	○	○	○	○	○
We worked with customers/potential customers to design or develop our offering.	○	○	○	○	○	○	○	○
We showed early stages of our technology or offering to potential end users for their input.	○	○	○	○	○	○	○	○
In order to learn about something we found ways to try it out in the real world.	○	○	○	○	○	○	○	○

	Not at all			To a moderate extent			To a very great extent	N/A
We used our own preferences and requirements as a way of anticipating what end users and stakeholders may desire.	○	○	○	○	○	○	○	○

Appendix E (continued)

We relied on trial-and-error learning.	○	○	○	○	○	○	○	○
When faced with uncertainty, we tended to jump in and try something.	○	○	○	○	○	○	○	○
Moving ahead quickly was often given precedence over detailed planning.	○	○	○	○	○	○	○	○
When we were unsure of the right approach, we methodically designed ways to test alternatives.	○	○	○	○	○	○	○	○
We carefully evaluated ideas before trying them.	○	○	○	○	○	○	○	○
	Not at all			To a moderate extent			To a very great extent	N/A
When deciding among different approaches or choices, we were very data driven.	○	○	○	○	○	○	○	○
Before trying something new, we discussed the criteria by which we would judge our results.	○	○	○	○	○	○	○	○
We conducted tests of our technology or offering frequently during the development process.	○	○	○	○	○	○	○	○
We deliberately created experiments to learn more about our market or operations.	○	○	○	○	○	○	○	○
We had frequent development milestones.	○	○	○	○	○	○	○	○
After trying something new, we always carefully analyzed how it went.	○	○	○	○	○	○	○	○
	Not at all			To a moderate extent			To a very great extent	N/A
Our development process involved creating many, frequent iterations of our technology or offering.	○	○	○	○	○	○	○	○
Our development process incorporated rapid cycles of feedback from stakeholders (e.g., potential customers, investors, users).	○	○	○	○	○	○	○	○
Our actions followed a strict plan.	○	○	○	○	○	○	○	○
We didn't spend a lot of time reflecting on why we have achieved the outcomes that we have.	○	○	○	○	○	○	○	○

Please indicate how often <u>in the past 12 months</u> members of your executive team sought feedback, advice or information from the following sources. THEN in the last column, indicate how useful that feedback was, on average.

	How often did you go to this source?							How useful was this source?
	Less than quarterly	About quarterly	Every couple months	About monthly	2-3 times a month	About weekly	Almost daily	
Board members	○	○	○	○	○	○	○	
Investors / potential investors	○	○	○	○	○	○	○	
Customers / potential customers	○	○	○	○	○	○	○	

Individual industry experts or consultants							
Other entrepreneurs (outside your venture)							
Industry associations, trade shows or conferences							
Weblogs, online communities or web alerts							
Competitors, their websites, publications or offerings							
Business or trade journals							
Other major external sources of feedback or information (please specify):							

Please indicate how often <u>in the past 12 months</u> members of your executive team engaged in the following activities:

	Less than quarterly	About quarterly	Every couple months	About monthly	2-3 times a month	About weekly	Almost daily
We compared actual performance data to planned performance goals.							
We reviewed the extent to which we were on track to accomplish planned milestones.							
We compared actual costs to our expected burn rate (i.e., monthly operating expenses).							
We benchmarked our process or offering against competitors.							

***<u>In the past 12 months</u>*, how often did you or other members of your executive team engage in the following activities?**

	Never	Very seldom	Seldom	Some times	Often	Very often	Extremely often
We asked others what flaws they saw in our team, marketing plan, financial requirements, strategy, etc.							
We discussed what specific information we did not yet have.							
We explicitly identified what assumptions we were making.							
We discussed alternative approaches or plans.							
When making plans, we spent time discussing our strategic and operational weaknesses.							
When making plans, we explicitly considered our limitations with respect to skills and expertise.							
We deliberately encourage team members to							

express differing points of view.	○ ○ ○ ○ ○ ○ ○

To what extent do you personally agree with the following statements?							
	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
There are aspects of this venture that I do not fully understand.	○	○	○	○	○	○	○
Our situation is constantly changing.	○	○	○	○	○	○	○
No one, including myself, could have a completely accurate picture of our situation.	○	○	○	○	○	○	○
There are many complexities to this venture that make it difficult to predict what will happen.	○	○	○	○	○	○	○
It is unlikely that our business will turn out the way we planned it.	○	○	○	○	○	○	○
I deliberately seek input or advice from people who have different perspectives from my own.	○	○	○	○	○	○	○
Managing this venture requires a continual re-evaluation of what I thought I knew.	○	○	○	○	○	○	○
I discuss our weaknesses and fallibilities with others on the team.	○	○	○	○	○	○	○
I do not hesitate to point out where we have lack expertise.	○	○	○	○	○	○	○
I am confident in our ability to manage this venture.	○	○	○	○	○	○	○
I am confident that we can learn whatever we need to in order to be successful.	○	○	○	○	○	○	○

Part 4

The following questions have to do with changes you have made or experienced in the past 12 months.

Please indicate the extent to which you agree with the following statements about your activities in the past 12 months:							
	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
We are moving ahead exactly as we planned.	○	○	○	○	○	○	○
We have taken this venture in a new direction.	○	○	○	○	○	○	○
Our approach to pursuing this venture has changed.	○	○	○	○	○	○	○

Appendix E (continued)

Our overall value proposition has changed.	
We have changed our overall vision of the opportunity we are pursuing.	

Please indicate to what extent the following have changed in the past 12 months?								
	Did not change			Changed moderately			Changed entirely	N/A
The overall design of our offering								
Our targeted market / customers								
Our approach to sales/distribution								
Our commercialization strategy								
Our approach to development								
Our internal operations								
Our strategy for acquiring funding								

Consider the most significant changes you have made *in the past 12 months*. Indicate the extent to which you agree with the following statements about those changes.							
	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
The changes did not disrupt our timeline.							
We should have figured out that changes were needed sooner.							
It took us/is taking us a long time to implement these changes							
The need for these changes was unexpected.							
We were able to make the changes very easily.							
We made these changes because investors required them.							
This change resulted/will result in significant changes to our operations.							
These changes disrupted or delayed our financing.							
We needed/will need a very different skill set to implement these changes.							
These changes caused much disruption.							
These changes were suggested by investors.							

Please think about the most significant change you have made to this venture in the past 3 years. In one or two sentences, please describe the change:

In one or two sentences, please describe what caused you to make this change (i.e., the situation, event or feedback that made the change necessary and/or desirable):

If this change delayed or disrupted your time line in some way, approximately how long was the delay or disruption?

To what extent do you agree with the following statements about this change?

	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
We made this change quite easily.	○	○	○	○	○	○	○
We made this change quite quickly.	○	○	○	○	○	○	○
This change disrupted our operations and/or timeline.	○	○	○	○	○	○	○
This change delayed or disrupted our financing.	○	○	○	○	○	○	○

Given where you are in the new venture process, how satisfied are you with your organization's performance with respect to:

	Very Dissatisfied			Neutral			Very Satisfied	N/A
Research/technical problem solving	○	○	○	○	○	○	○	○
Product development	○	○	○	○	○	○	○	○
Market development								

Appendix E (continued)

Personnel development	○	○	○	○	○	○	○	○
Harvest/exit readiness	○	○	○	○	○	○	○	○
Investors confidence	○	○	○	○	○	○	○	○
Efficient use of resources	○	○	○	○	○	○	○	○
Achieving milestones and goals	○	○	○	○	○	○	○	○

Part 5

This final section asks a few questions about yourself.

What is your age?

What is your gender?

- ○ Male
- ○ Female

Do you consider yourself to be a founder of this venture?

- ○ Yes
- ○ No

In what year did you first become formally involved in this venture?

In how many startups, besides this one, have you been involved as a founder, board member, or full-time employee?

Appendix E (continued)

Are you a member of the executive management team?
For the purposes of this survey the executive management team includes:
individuals who are officers OR individuals who *both* own an equity stake in the venture *and* are actively involved in its strategic management.

- ○ Yes
- ○ No

What is your current title?

- ☐ Board Member
- ☐ CEO
- ☐ President
- ☐ Other C-Suite Officer (please specify)
- ☐ Vice President or Sr. Vice President (please indicate VP of...)
- ☐ Other (please specify)

THANK YOU!!!!!
If you would like to receive a copy of the findings of the aggregated findings of this study, please enter your email address here.

Appendix F
Sample recruiting email to investors

Dear xyz,

I am writing to ask if you might be able to invest a *half hour* of your time to participate in a research study of entrepreneurial ventures. I am a doctoral candidate at the Ross School of Business, University of Michigan, investigating how entrepreneurs anticipate, monitor and manage the inevitable need for adaptation in very early stage tech ventures. I believe that this study will yield practical insights of use to both entrepreneurs and their investors and I would very much appreciate your help. This should take even *less* than a half hour of your time if I can work with your assistant.

I am hoping that you will be willing to put me in touch with one executive at each of your recent early-stage ventures so that I might request their participation in a 20 minute, online survey about their management practices. (I have received very positive feedback from entrepreneurs about the content of the survey and about the thinking that it provoked.) I would also ask *you* to very briefly rate these ventures so that I can capture your perspective on their performance so far. The responses take no more than 1 minute per company. I am very vigilant about confidentiality and follow strict guidelines for maintaining anonymity. At the conclusion of the study, I will provide a report on my findings across all the ventures studied, as well as their implications for both investors and entrepreneurs.

I am dedicated to conducting research that is relevant to the real world, but of course that means working with real investors and entrepreneurs rather than theories, and as you well know, you are a difficult bunch to get hold of. So I greatly appreciate any help you can provide. This research is professionally conducted, free, timely (focuses on how ventures are adapting in *this* economic context) and oriented on practice not theory. It honestly takes no more than 30 minutes of your time and the findings will be aggregated and reported back to you. Other participants include venture capitalists and professional angel associations all over the U.S.

Please let me know if you can help with this study and if you would like me to follow up with you or with an assistant. Thank you so much.

Sincerely,
Michelle

Appendix G
Sample recruiting email to entrepreneurs

Dear Mr….,

I understand that … gave you a heads up that I would be contacting you. I am a doctoral student at the Ross School of Business, University of Michigan. I am conducting research on the management of new ventures and … suggested that your experiences would be particularly helpful. I am hoping you might be willing to participate in a short, totally confidential, survey. This would take no more than about 20 minutes.

I sincerely believe the best way to improve the understanding and practice of entrepreneurship is to learn from those who are engaged in it, but as you can imagine, you are not an easy bunch to get to. So I would be very grateful if you would be willing to contribute your experience to this survey. Your responses will remain entirely confidential though I will be happy to share with you the aggregated findings of the study. If you have any questions please feel free to contact me at mibarton@umich.edu. Please click the link below or copy it into your browser to go to the survey.

Thank you so much for your time and insight.

Sincerely,

Appendix H
Sample pre-notice email from investors to entrepreneurs[24]

Dear xyz,

I am helping Michelle Barton, a doctoral student at the University of Michigan, Ross School of Business who is conducting research on the management of early stage entrepreneurial ventures. I believe that her study may yield practical insights of use to all of us and I would very much appreciate your responding to an online survey that she will be sending (via email) to you. The survey should take no more than 20 minutes and is completely confidential.

We have a great deal of collective wisdom within our entrepreneurial community and studies such as this one can help us capture and disseminate important knowledge about the management of entrepreneurial ventures. If you can, please spare a few minutes for Michelle. If you cannot, no problem—she knows you're busy.

Sincerely,

[24] I provided investors with the basic email but they tailored it to be more personal and to include assurances that they should only participate if they had time, and so forth.

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