

**IDENTIFYING ENTREPRENEURIAL OPPORTUNITIES:
COGNITION AND CATEGORIZATION IN NASCENT ENTREPRENEURS**

by

Matthew J. Karlesky

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Business Administration)
in the University of Michigan
2015

Doctoral Committee:

Professor Emeritus Kathleen M. Sutcliffe, Chair
Professor Gerald F. Davis
Associate Professor Jeffrey G. Sanchez-Burks
Professor James D. Westphal
Professor Oscar Ybarra

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To Kelly, Chris, Mom and Dad

ACKNOWLEDGEMENTS

Although this dissertation bears my name, it is a product of many people. Over the past several years my research – indeed, my work throughout graduate school – has been supported and improved by an entire community of family, friends, and colleagues, without whom this dissertation would be impossible.

I owe an incredible debt of gratitude to my advisor and friend, Kathie Sutcliffe. Kathie, you encouraged me when I needed encouragement, pushed me when I needed pushing, and stuck with me through what was, at times, a very trying process. You have been a much better advisor to me than I have been a student. I cannot thank you enough for everything you have done for me.

My dissertation committee offered immensely helpful feedback, guidance and advice that went far beyond the nuts and bolts of research. Jerry Davis, Jeffrey Sanchez-Burks, Oscar Ybarra, and Jim Westphal made great contributions to the ideas in this dissertation, and my interactions with them have shaped my scholarly life in profound ways. It is a rare opportunity to have so many smart people dedicating their time and energy to help improve one's work, and I will be forever grateful for their willingness to serve on my committee.

Over the course of my time at Michigan, many members of the Department of Management and Organizations helped me to be successful. Suntae Kim and Kristina Workman, my cohort mates, are more than colleagues; they are lifelong friends. I cannot

imagine having gone through such a grueling program without them. Similarly, Flannery Stevens, Adam Cobb, Chak Fu Lam, Laura Rees, Samir Nurmohamed, Chris Myers, Johan Chu, Maddy Ong and Yong Hyun Kim all supported me, gave me advice, and let me vent on occasions too many to count. I feel lucky to have been part of a group with such genuine camaraderie.

A number of faculty members also helped me enormously, in coursework, in research, and in life. I am especially grateful for the support of Dave Mayer and Sue Ashford. Dave went far beyond his job description in helping me succeed as a student at Michigan, serving as an advisor, a reader for my second-year paper, and a friend who lent an ear when times were stressful. Sue encouraged me, and gave me confidence that I could be successful in our field. She was always in my corner, and I will never forget how much that meant to me during my time at Michigan.

It is difficult to express how much my family has done for me. Pops, you gave me two pieces of advice that got me through grad school. First, when times were tough, you told me to just put one foot in front of the other, and I did. And second, when I lacked confidence, you told me that success in academic life isn't just about intellectual ability, but about the emotional capacity to deal with stressful situations. Without your sense of perspective, my time in graduate school would have been immeasurably more difficult. Mom, you are an endless source of love and support. I cannot tell you how much I appreciate your confidence in me, your baked goods, and your love of Michigan football. All of these things make me smile, and those smiles kept me going strong for six years of graduate school. Chris, I will always associate my time at Michigan with our mutual love of scotch, which began on our trip to Scotland in 2012. When I had a rough

day at work, you told me to have a dram and relax. When I had a great day, you told me to have a dram and celebrate. I appreciate so much that we'll always be close as brothers and friends even though we might live far away.

Finally, I owe an incredible amount of my success in graduate school to my partner, Kelly. Kelly, it is hard to express just how much you have shaped my life. Many good things have happened to me in the past six years, but the best by far is you. Thanks for everything, amigo.

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ABSTRACT

Scholars, practitioners, and policy-makers share a common interest in understanding entrepreneurship. However, while research on entrepreneurship has burgeoned in recent years, our understanding of how people identify opportunities – a critical first step in the entrepreneurial process – remains relatively limited (Shane, 2012). Indeed, extant research lacks consensus about the basic nature and definition of opportunities, rendering the literature on opportunity identification both theoretically fragmented and empirically underdeveloped.

To address this problem, my dissertation uses an exploratory sequential mixed method design (Creswell, 2013) to develop a detailed understanding of the opportunity identification process. In the first phase of research, I conducted interviews with nascent entrepreneurs in an inductive, qualitative study. These interviews yielded two important findings. First, entrepreneurs tend to view opportunities as new technology-market combinations. This view is consistent with previous research suggesting that opportunities emerge when entrepreneurs perceive ‘matches’ between new means of supply and markets where those means of supply can be introduced (Gregoire & Shepherd, 2012). Second, my interviewees described three cognitive processes through which such opportunities are identified: analogistic thinking, recombination, and distinction-making. Of these, distinction-making was the most prevalent process

reported, and it appears to be closely related to opportunity identification among both nascent entrepreneurs and managers in existing firms.

In the second phase of research, I theorized that distinction-making – the process of creating and refining new categories of information, objects and events – facilitates opportunity identification by enabling people to identify potential ‘fit’ between technologies and markets. I conducted a series of three experimental studies to more closely examine the relationship between distinction-making and opportunity identification. Results indicate that distinction-making is positively related to the number of opportunities people identify for generating new technologies, as well as the number of opportunities they identify for applying existing technologies to new markets. Distinction-making is also positively related to the innovativeness of those opportunities, where innovativeness is judged by other relevant actors in the entrepreneurial process. Moreover, the data indicate that distinction-making facilitates opportunity identification by enabling higher levels of domain-specific information processing in the domain in which the opportunities lie.

This dissertation contributes to the entrepreneurship literature by introducing a new theoretical lens for understanding how people identify opportunities, an essential but understudied stage in the entrepreneurial process. In addition, although much of the research on opportunity identification is found in the entrepreneurship literature, my experimental findings suggest that the cognitive processes underlying the identification of opportunities are not necessarily unique to entrepreneurs. Finally, my dissertation highlights distinction-making as a concept that can make meaningful contributions to broader research on categorization outside the context of entrepreneurship.

CHAPTER 1. INTRODUCTION

Entrepreneurship, n. The pursuit of opportunity beyond resources controlled.

Howard Stevenson, HBS (Eisenmann, 2013)

Scholars, practitioners and policy-makers share a common interest in understanding entrepreneurship. Although most new ventures ultimately fail (Shane, 2008), entrepreneurship is widely viewed as an engine of economic growth, competitiveness and innovation (Schumpeter, 1942; Timmons & Spinelli, 2008; Wessner, 2008). Recent data suggest that entrepreneurial activity is growing. Among Americans, the percentage of adults involved in startups reached 13% in 2012, a record high since the Global Entrepreneurship Monitor began tracking entrepreneurial activity in 1999 (Pofeldt, 2013). Rates of entrepreneurship are similarly robust in developing economies. Seventeen percent of adults in Latin America and the Caribbean, and 28% of adults in Sub-Saharan Africa are actively engaged in early-stage entrepreneurial activity (Xavier, Kelley, Kew, Herrington, & Vorderwulbecke, 2013). Although in some cases entrepreneurs are driven by necessity – that is, because they cannot find other work - most nascent entrepreneurs claim to start new ventures because they perceive favorable business opportunities. Moreover, 41% of *all* adults surveyed reported seeing good opportunities to start a firm in the area where they live, including those in less developed countries (Xavier et al., 2013). However, while interest in entrepreneurship has burgeoned in recent years, our understanding of *how* people identify opportunities – a critical first step in the entrepreneurial process – remains relatively limited (Shane, 2012).

In this dissertation I explore a fundamental, but complex question: How do people identify new opportunities? This question is fundamental because opportunity identification is viewed as the starting point from which all else in the entrepreneurial process follows (Baron, 2004; Shane & Venkataraman, 2000), and complex because intense debates surround related questions such as “what constitutes an opportunity” and “where do opportunities come from” (Grégoire, Shepherd, & Lambert, 2010b). However, while scholars have coalesced around the concept of “opportunity” as the defining characteristic of entrepreneurship research (Alvarez, Barney, & Young, 2010), the process of identifying opportunities is not unique to the traditional entrepreneurial context. For example, members of established organizations attempt to discern opportunities for organizational growth (Jackson & Dutton, 1988), and social entrepreneurs look for opportunities to generate value through social change (Martin & Osberg, 2007).

Despite the prevalence of this phenomenon in practice, however, our theoretical understanding and empirical analyses of how people identify opportunities are underdeveloped. As an area of scholarly research, the literature on opportunity identification has been described as a “scattering of descriptive studies rather than as a systematic research program of theory testing and development” (Gaglio & Katz, 2001; Gruber, MacMillan, & Thompson, 2013). More recently, Gregoire and colleagues echoed this sentiment, noting that there is a growing chasm between theorizing about how people identify opportunities and efforts to empirically study the phenomenon (Grégoire, Shepherd, & Lambert, 2010b). In part, the literature on opportunity identification has been slow to develop because of an ongoing debate about the very nature of

opportunities. Whereas a realist perspective views opportunities as objective phenomena that exist independent of individual action, a constructionist perspective holds that opportunities are subjective and created through processes of enactment. In light of these conflicting assumptions about the nature of opportunities, the two perspectives have different implications for how people identify those opportunities. Additionally, research on opportunity identification faces several methodological challenges. For example, many previous empirical studies rely on entrepreneurs' retrospective accounts of the opportunity recognition process. In addition to limiting the generalizability of their findings beyond the entrepreneurial context, such studies are susceptible to recall and selection biases, censored data, and demand characteristics issues. I address these theoretical and empirical challenges by adopting an evolutionary realist perspective, which I describe in greater detail in the next chapter.

Theoretically, my dissertation advances a model of opportunity identification that draws on the concept of distinction-making (Langer, 1989; Weick & Sutcliffe, 2006). Distinction-making refers to the process of creating and refining new cognitive categories - that is, making distinctions among objects, events, and information in one's environment. In contrast to existing research which focuses on recognizing patterns and similarities among entrepreneurial opportunities (Baron, 2006; Baron & Ensley, 2006; Grégoire & Shepherd, 2012). I will argue that actively differentiating objects and events as *dissimilar* to each other enables opportunity identification in two ways. First, distinction-making aids the development of ideas for new and potentially valuable technologies. Second, the process of distinction-making engenders more fine-grained perceptions of potential markets into which those technologies can be introduced. Thus, I

will argue that distinction-making is a key mechanism that enables people to identify potential “fit” between technologies and the markets in which they can be applied (Alvarez et al., 2010).

This dissertation will contribute to the literature on entrepreneurship by elucidating an important cognitive mechanism that enables people to identify opportunities, a critical but understudied step in the entrepreneurial process. Although much progress has been made in understanding the association between cognition and opportunity identification, key questions remain about *how* and *why* some cognitive processes facilitate the identification of opportunities (Grégoire, Barr, & Shepherd, 2010a). In addition, my dissertation represents an instance of a more fundamental phenomenon. People vary in how they categorize and make distinctions among information in their environments, and those distinctions have real implications for how people think and behave. By exploring distinction-making as a mechanism for opportunity identification, my dissertation research is part of a broader exploration into how people conceptualize their environments, and how those conceptualizations influence cognition and behavior.

The remainder of this dissertation will proceed as follows. In Chapter 2, I review the major perspectives on entrepreneurial opportunities and situate my work in the broader literature on opportunity identification. Chapter 3 reports findings from qualitative interviews with both entrepreneurs and managers in established organizations, aimed at understanding their opportunity identification process. Chapter 4 introduces the concept of distinction-making and my theoretical contribution to the literature on entrepreneurship and social cognition, and presents three experimental studies examining

the relationship between distinction-making and opportunity identification. Finally, Chapter 5 outlines the contributions my research makes to the literatures on entrepreneurship and social cognition, its implications for practice, and suggestions for future research.

CHAPTER 2. REVIEW OF LITERATURE ON OPPORTUNITIES

Opportunity, n. A time, condition, or set of circumstances permitting or favorable to a particular action or purpose.

Oxford English Dictionary

In this chapter, I begin by reviewing several different definitions of opportunities. I then delineate three perspectives on the nature of entrepreneurial opportunities, including relevant literature on opportunity identification. Finally, I discuss theoretical and empirical limitations in the literature on opportunities and how I will address them in my dissertation.

Defining opportunity

Before exploring how people identify opportunities, it is important to clearly define what exactly constitutes an opportunity. As noted above, the concept of “opportunity” has been closely associated with entrepreneurship in recent years. However, scholars vary in their definitions of opportunities, due in part to the fact that research on opportunities spans academic disciplines and epistemological traditions. I note here that while I will review many such definitions in the present chapter, I will adopt a specific definition of opportunities in Chapter 3 that emerges from my qualitative interviews.

From an economic perspective, entrepreneurial opportunities generally refer to situations that hold the potential for new economic value (Alvarez & Barney, 2007; Kirzner, 1997; Schumpeter, 1934). Schumpeter outlined five forms of entrepreneurial

opportunities: the introduction of new 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, and the creation of a new type of industrial organization (Casson, 1982; Schumpeter, 1934). Similarly, drawing on the work of Casson, Shane (2000) defined entrepreneurial opportunities as “opportunities to bring into existence new goods, services, raw materials, and organizing methods that allow outputs to be sold at more than their cost of production” (p. 451). Hills and colleagues (Hills, Lumpkin, & Singh, 1997) referred to opportunities as either the possibility to create new businesses or significantly improve the position of an existing business, in both cases resulting in new profit potential.¹

Other scholars emphasize the role of the market in their definitions of opportunities. Choi and Shepherd (Choi & Shepherd, 2004), for example, suggest that opportunities exist when there is customer demand for a new product. Likewise, Kaish and Gilad (Kaish & Gilad, 1991) define opportunities as market gaps resulting from disequilibrium. In definitions like these, opportunities are defined as unmet demand that currently exists in a particular market, although the potential for economic profit is not made explicit.

An alternative conceptualization of opportunities was developed in the literature on managerial and organizational cognition, independent of research on entrepreneurship. For instance, in their study of how managers discern threats versus opportunities, Jackson

¹ While entrepreneurial opportunities are often associated with the creation of economic value, opportunities need not be economic in nature. For example, the emerging field of *social* entrepreneurship is less focused on the creation of economic value than on the creation of social value, though the two are not mutually exclusive (Grégoire, Barr, & Shepherd, 2010a; Martin & Osberg, 2007). Nonetheless, social entrepreneurs arguably rely on the identification of opportunities just as much as the more traditionally conceptualized economic entrepreneur.

and Dutton (1988) define opportunities as cognitive schema that are internally constructed by individuals. Specifically, they suggest that opportunities are perceived as “positive issues” representing a high potential for gain without loss and feelings of control over the issue at hand. Similar definitions have since been applied to entrepreneurship research. Consistent with the idea that opportunities are psychologically constructed, Gregoire, Shepherd, and Lambert (2010b) define “opportunity beliefs” as subjective beliefs that an opportunity exists for the willing and able. And, in a similar vein, Gartner and colleagues (Gartner, Shaver, & Liao, 2008) define opportunities as “positive situations that are controllable” (p. 304). This definition follows closely from Stevenson and Jarillo (Stevenson & Jarillo, 1990), who viewed opportunities as “future situations that are both desirable and feasible.” Stevenson and Jarillo go on:

“Thus, opportunity is a relativistic concept; opportunities vary among individuals and for individuals over time, because individuals have different desires and they perceive themselves with different capabilities...Perceptions of both desires and capabilities are only loosely connected to reality. But, in any case, the essence of entrepreneurship is the willingness to pursue opportunity, regardless of resources under control” (p. 23).

These varied definitions of opportunity preview the debate between realist and constructionist perspectives that I discuss in the next section. That is, while several of the aforementioned definitions imply that opportunities exist objectively in the marketplace, others assume that opportunities are subjective psychological perceptions that vary across individuals, and within individuals over time. In the next section, I will review the realist

and constructionist perspectives on opportunities, and I will introduce evolutionary realism as an alternative approach that attempts to reconcile the two perspectives.

Three perspectives on opportunities

The fundamental nature of opportunities is a subject that has generated much debate in the field of entrepreneurship, and the debate permeates both theoretical and empirical research on opportunity identification. In part, this debate stems from fundamental differences in philosophy of science (Alvarez et al., 2010; Alvarez & Barney, 2008). Indeed, although the tension between realist and constructionist paradigms is at the core of research on opportunities (McMullen & Shepherd, 2006), it is embedded in a larger debate about realism and constructionism in the social sciences more broadly (Moldoveanu & Baum, 2002). Here, I review this debate in the literature on entrepreneurship and opportunities, highlighting the emergence of *evolutionary realism* as a promising approach for reconciling the differences between realism and constructionism.

Realism

To date, the literature on entrepreneurial opportunities has been dominated by a realist perspective. Grounded in economics, the realist perspective holds that opportunities are characterized by the potential for generating new economic value, which results from market imperfections. For example, Schumpeter (1942) suggested that opportunities arise when an exogenous shock to the current economic market makes it more efficient to recombine existing goods in a new way. Entrepreneurs are those individuals who recognize and exploit such opportunities in pursuit of profit. Similarly, Kirzner (1997) argued that individuals have different beliefs about the value of certain

resources or combinations of resources. Based on the assumption that actors in a given market possess asymmetric information (Hayek, 1945), some people are able to recognize opportunities that others might not see. Although this perspective acknowledges that individuals differ in the perceptual processes that facilitate opportunity identification, the opportunities themselves are viewed as objective phenomena to be discovered. Indeed, it is assumed that opportunities exist whether or not they are discovered and exploited (Shane & Venkataraman, 2000).² More recently in the entrepreneurship literature, this perspective has come to be known as the individual-opportunity nexus approach (Shane, 2003), which suggests that the heart of entrepreneurship lies at the nexus of individual capabilities and objective market opportunities.

Following the realist perspective advanced by Kirzner, Alvarez and colleagues note that opportunities are “represented as if they have material properties and defined parameters that exist independent of the perceptions of individuals” (Alvarez et al., 2010). Thus, opportunities exist in “reality.” The role of the entrepreneur is to identify such opportunities and “claim” those that hold potential to generate economic value (Casson, 1982; Shane, 2003). This line of thinking is manifest in the concept of *entrepreneurial alertness* (Kirzner, 1997). A great deal of research has centered on the concept of alertness, which is suggested to be a distinctive set of perceptual and cognitive processing skills that facilitate opportunity identification. Specifically, Kirzner defined it as “alertness to changed conditions or to overlooked possibilities.” Shane (2003) argues

² Although the realist perspective is most closely associated with the field of economics, the same logic holds for alternative forms of opportunity. For example, like opportunities for the creation of economic value, opportunities for the creation of social value (via social entrepreneurship) would be considered objective phenomena.

that alertness rests on cognitive capabilities such as intelligence and creativity. These capacities can help entrepreneurs identify new solutions to market needs, or to generate ideas for new products and services that do not yet exist (Busenitz, 1996).

Several empirical studies have attempted to operationalize and measure alertness as a predictor of opportunity identification and entrepreneurial behavior.³ For example, in a survey of 100 successful entrepreneurs, Hills (Hills, 1995) found that entrepreneurs see themselves as having “a special alertness to opportunity.” Busenitz (1996) reported a similar finding. Using both survey and interview techniques in 176 newly emerging firms, his research demonstrated that entrepreneurs exhibit greater “general alertness” than managers by spending more non-business time searching for opportunities. More recently, Ozgen and Baron (Ozgen & Baron, 2007) added that individuals vary in their alertness to opportunities as a function of informal industry networks and participation in professional forums. Despite these findings, however, other scholars argue that empirical studies of alertness have had fundamental problems with operationalization and research design (Gaglio & Katz, 2001). For example, Gaglio and Katz (2001) claim that researchers often confound opportunities and *successful* opportunities, both theoretically and operationally. “The journey from feasible opportunity to successful opportunity,” they write, “must be explained by a theory of entrepreneurship” (p. 107). Thus, although entrepreneurial alertness has been theorized to play an important role in helping people identify opportunities, scholars have a relatively limited understanding of what alertness specifically entails, how to operationalize it, and whether it is actually predictive of successful opportunity identification.

³ Appendix A summarizes recent empirical research on opportunities and opportunity identification.

In addition to entrepreneurial alertness, a number of studies in the realist tradition suggest that *active search* plays an important role in opportunity identification (Baron, 2006; Shane, 2003). If opportunities exist as objective phenomena, as the realist perspective suggests, individuals who seek out relevant information are better positioned to identify those opportunities. Empirically, entrepreneurs have been found to be more likely than managers to actively search for opportunities and potential sources of profit (Kaish & Gilad, 1991; Teach, Schwartz, & Tarpley, 1989). Similarly, a study of entrepreneurs belonging to the Chicago area Entrepreneurship Hall of Fame found that entrepreneurs were more likely to identify opportunities by actively searching for information from unique sources rather than using publicly available information such as newspapers and trade publications (Hills & Shrader, 1998). Indeed, from the realist perspective, the majority of research on opportunities suggests that people are more likely to identify opportunities when they actively seek them out.

Knowledge of the opportunity domain is a third factor suggested to influence opportunity identification from the realist perspective.⁴ Assuming that opportunities are objectively observable, having knowledge about what exactly to look for is essential for identifying those opportunities. For example, Shane's (2000) case study of eight new ventures emerging from the Massachusetts Institute of Technology suggested that prior knowledge of customer needs significantly enhanced entrepreneurs' abilities to generate innovative, potentially valuable solutions to those needs. Likewise, in an experiment with 73 entrepreneurs, Haynie, Shepherd, and McMullen (Haynie, Shepherd, & McMullen, 2009) found that entrepreneurs are attracted to opportunities that are

⁴ Although research on prior knowledge is most often associated with the realist tradition, prior knowledge has been investigated as contributing factor in the psychological construction of opportunities (Alvarez & Barney, 2007; Grégoire, Barr, & Shepherd, 2010a; Kirzner, 1997; Schumpeter, 1934).

complimentary to their existing knowledge. Moreover, knowledge of the domain is not only important for identifying opportunities, but also for evaluating those opportunities. In an online experiment with MBA and undergraduate students, Dimov (Dimov, 2007) found that knowledge of the opportunity domain was positively related to an individual's intention to exploit a particular opportunity. It is also worth noting that in the related field of creativity, "domain-relevant knowledge" has been theorized to form the expertise against which individuals judge the viability of new ideas or solutions (Amabile, 1983).

The realist perspective is also evident in social-structural research on opportunity identification. For example, Singh and colleagues (Singh, Hills, Hybels, & Lumpkin, 1999) explored the effects of network size, weak ties, and structural holes on entrepreneurial opportunity identification. In a study of 256 IT consulting entrepreneurs, they found that network size and the number of weak ties in an entrepreneur's network were significantly and positively related to the number of new venture ideas identified and opportunities recognized. Additionally, Arenius and De Clercq (Arenius & De Clercq, 2005) found a negative effect of network cohesion on entrepreneurs' perceptions of opportunities. Implicit in these studies is the assumption that opportunities are objectively observable, and social-structural variation is suggested to be the main driver of opportunity identification (Singh, 2000).⁵

⁵ It should also be noted that sociologists have begun to explore entrepreneurship from an institutional perspective. The notion of "institutional entrepreneurship" constitutes an emerging, but vibrant area of research. Despite the use of the term entrepreneur, though, this research is only loosely related to opportunity identification. Rather, institutional entrepreneurship refers to the "activities of actors who have an interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones" (Casson, 1982; Maguire, Hardy, & Lawrence, 2004; Schumpeter, 1934). Nonetheless, the concept of opportunity identification is not absent from the literature. Garud and colleagues (Garud, Hardy, & Maguire, 2007; Shane, 2000) note that institutional entrepreneurship is most closely associated with DiMaggio (DiMaggio, 1988; Hills et al., 1997), who argued that "new institutions arise when organized actors with sufficient resources *see in them an opportunity* [emphasis added] to realize interests that they value highly."

The majority of extant research on entrepreneurial opportunities is characterized by the realist perspective. However, an alternative approach suggests that opportunities are socially constructed. Indeed, the constructionist perspective implies a different set of assumptions about the nature of opportunities, which are reflected in research on opportunity identification. In the next section, I review recent research that exemplifies the constructionist perspective on entrepreneurial opportunities.

Constructionism

In contrast to realism, a constructionist perspective on opportunities suggests that environments are characterized by ambiguous and equivocal information. Opportunities are not objective, but rather are created when individuals interpret their environments and give them meaning that differs from others' interpretations (Alvarez et al., 2010). In other words, this perspective suggests that opportunities may not exist at all until people act to create them (Alvarez & Barney, 2007; Baker & Nelson, 2005). The notion of opportunity construction follows the assumptions of prior work on opportunities and threats in research on strategic issues (Dutton, 1992; Dutton & Jackson, 1987; Jackson & Dutton, 1988). Opportunities are viewed as subjective phenomena that result from a person's interpretation of information in his or her environment, and the action he or she takes as a result of that interpretation.

As noted above, Jackson and Dutton (1988) use the concept of psychological schema to understand how people make sense of ambiguous information and interpret it as either an opportunity or a threat. "Schema" is a general term that refers to internal knowledge structures that organize information about objects, people, and events. Because people vary in how they interpret information, individuals are likely to differ in

the extent to which they characterize a particular situation as representing an opportunity. According to Gartner et al. (2008), “the identification of opportunities stems from the perceptions of decision makers, and these individuals will use cognitively based frameworks for generating explanations for the decisions... Opportunities are, therefore, a consequence of making sense of situations” (p. 302). Taken a step further, Gruber, MacMillan and Thompson (Gruber et al., 2013) argue that understanding the nature and extent of the “subjective” opportunity of the firm is important in explaining or predicting the actions of particular firms.

Following the constructionist perspective, Gregoire and colleagues (Grégoire & Shepherd, 2012; Grégoire, Shepherd, & Lambert, 2010b) developed and empirically tested the concept of *opportunity beliefs*, which refer to people’s subjective perceptions that an opportunity exists for individuals with the relevant qualities and means to exploit it. For example, Gregoire and Shepherd (2012) investigated how entrepreneurs formed beliefs about opportunities for technology transfer. Using an experimental design with 149 entrepreneurs, they found that entrepreneurs believed such opportunities existed when they perceived both “superficial” and “structural” similarities between technologies and markets. Mitchell and colleagues (Mitchell et al., 2002; 2004) offer a similar interpretation of the constructionist approach, which they call *entrepreneurial cognition*. Although it has yet to be tested empirically, theoretical research on entrepreneurial cognition focuses on “the knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth” (Mitchell et al., 2002, p. 97). Like other constructionists have argued, opportunity beliefs and entrepreneurial cognitions are suggested to vary from person to person.

In addition to the above perspectives on opportunity identification, a nascent literature on opportunity creation (Barton, 2010; Singleton & Straits, 1999) suggests that entrepreneurial opportunities are emergent and dynamic, created as entrepreneurs manage uncertainties and make decisions about a given set of resources (Sarasvathy, 2001). Indeed, according to Shane (2008), most new ventures diverge from their initial plans. Research on opportunity creation follows the constructionist perspective in the sense that opportunities are developed subjectively through individual perceptions and the actions that emerge from those perceptions. That is, opportunities do not emerge from objective imperfections in existing markets, but instead emerge out of the enactment process itself (Weick, 1979).

Although less mature in the entrepreneurship literature than the realist perspective, constructionism has grown in recent years. However, as Alvarez and colleagues (2010) suggest, one of the major limitations of the constructionist perspective is that it largely fails to predict whether or not opportunities are valid outside of the individual's reality. That is, while understanding subjective perceptions about opportunities might help to explain individual actions and behaviors, it does not tell us whether other actors agree that an opportunity exists in a particular situation. In the next section, I review an emerging approach to the study of opportunities that has potential to reconcile the fundamental differences between realist and constructionist perspectives on opportunities.

Evolutionary realism

Scholars have suggested various ways to reconcile the fundamental differences between realism and constructionism in the entrepreneurship literature. For example,

Sarasvathy and colleagues (Sarasvathy, Dew, Velamuri, & Venkataraman, 2010) suggested a taxonomy of opportunity identification that spans the realist and constructionist perspectives. The underlying logic of this approach is that opportunities exist in multiple forms, ranging from those that are relatively objective to those that are more subjectively constructed. The implication is that some opportunities are, in fact, more objectively identifiable than others. In this taxonomy, opportunity *recognition* refers to matching sources of supply and demand that already exist, and thus has to do with the exploitation of existing markets. More generally, the term “recognition” is most often associated with the realist perspective, which suggests that opportunities exist objectively and need only to be recognized by entrepreneurs. Opportunity *discovery* characterizes situations in which either supply or demand already exists, but the other does not. In this case, the non-existent side must be “discovered” before it can be matched with its existing counterpart. Opportunity *creation* has to do with the creation of new markets, where neither supply nor demand exist in obvious ways.⁶

Most of the extant literature on entrepreneurial opportunities views the realist and constructionist perspectives as irreconcilable, and lively debates regarding the merits of each perspective are ongoing (Ramoglou, 2012; Shane, 2012; Venkataraman, Sarasvathy, Dew, & Forster, 2012). At best, the two perspectives represent different underlying phenomena (e.g., Sarasvathy et al., 2010). However, a third perspective has begun to emerge. This perspective, referred to as evolutionary realism, combines the strengths of both realist and constructionist approaches (Azevedo, 1997; 2002; McKelvey, 1999). Based on the work of Donald Campbell (Campbell, 1974), the *evolutionary realist*

⁶ Other scholars (Dyer, Gregersen, & Christensen, 2008; for a review see Martin & Osberg, 2007) use the term *opportunity recognition* to broadly refer to all three of these processes.

perspective holds that opportunities may be constructed by individuals, but they are endorsed by others through social cross-validation. Alvarez, Barney and Young (2010) describe evolutionary realism thusly:

“Incorporating the constructionist perspective, the first assumption is that opportunities in this view do not exist independent of individual action... However, incorporating a realist perspective, these actions are then tested against an objective reality for validity. In this case, even though we acknowledge that markets are socially constructed, the reaction of the market will be viewed as a check on opportunity validity” (p. 30).

For example, consider the role of venture capitalists in the entrepreneurial process. An entrepreneur might believe he or she has identified an opportunity to generate value in a particular market, but venture capitalists could either agree or disagree that it represents a legitimate opportunity. In this way, venture capitalists serve as a mechanism for validating opportunities. Other actors, such as potential customers, serve a similar role. Opportunities are viewed as valid to the extent that external relevant actors perceive them to be so. Similarly, Dimov (2007a) argues that opportunities are simply creative ideas that have been vetted through an evaluative process.

Empirical research incorporating the evolutionary realist perspective is scant in the literature on opportunities. However, Shepherd and DeTienne (Shepherd & DeTienne, 2005) offer a clear example. Using an experimental study with 78 MBA students, the authors examined the effects of potential financial rewards and prior knowledge on opportunity identification. Participants were presented with a transcript of comments from a focus group about footwear. Prior knowledge of customer problems and potential rewards were manipulated, and then participants were asked to identify opportunities for addressing customer problems. Two dependent variables were

measured: *number* and *innovativeness* of opportunities identified by participants. Both variables were measured using two independent raters. The raters first evaluated participants' responses independently (*number* was a count of opportunities; *innovativeness* was rated on a Likert-type scale). The raters then discussed the responses together to reach full agreement on their evaluations. Thus, by evaluating the opportunities that participants claimed to have identified, the independent raters served as an objective "check" on opportunity validity.

Although empirical research from the evolutionary realist perspective is sparse in the literature on opportunities, it is not without precedent. Indeed, the same approach characterizes much of the literature on creativity, which is similarly concerned with the introduction of new ideas into a social system like an organization or market. Specifically, evolutionary realism is methodologically manifest in work on creativity through the consensual assessment technique (Amabile, 1996). I will discuss the implications of this approach for research on opportunities more thoroughly in Chapter 4.

Limitations of existing research on opportunities

Scholars have demonstrated a clear interest in entrepreneurship, and particularly in the factors that influence opportunity identification at the early stages of the entrepreneurial process. However, the epistemological debate described above has led not only to different ways of defining opportunities, but also to different empirical approaches to the study of opportunity identification. In this section, I discuss several limitations of existing research on opportunities and opportunity identification, and how my dissertation will address them.

Theoretical limitations

As reviewed above, one limitation of current research stems from a lack of consensus about the very definition of opportunities. Definitions span both academic fields (e.g., economic definitions and psychological definitions) and epistemological traditions (e.g., realism and constructionism). This is a limitation for two reasons. First, different definitions may refer to different underlying phenomena. For example, definitions that focus on the potential for economic value (Choi & Shepherd, 2004; Kaish & Gilad, 1991; Kirzner, 1997; Schumpeter, 1934) generally refer to market-level events and dynamics such as exogenous shocks and disequilibrium. In contrast, definitions that view opportunities as psychological constructions (Gartner et al., 2008; Grégoire, Shepherd, & Lambert, 2010b; Jackson & Dutton, 1988; Stevenson & Jarillo, 1990) tend to emphasize the mental processes that lead individuals to believe opportunities exist, and to consequently act on those beliefs. These phenomena are not only theoretically distinct, but also occur at different levels of analysis.

Second, the lack of consensus about the epistemological nature of opportunities has hindered the advancement of research on opportunity identification (Grégoire, Shepherd, & Lambert, 2010b). These different perspectives on opportunities not only refer to different underlying phenomena; they also imply different approaches to how people *identify* those opportunities. If opportunities are viewed as objective realities, identification invokes processes such as searching for information and knowledge acquisition. If opportunities are psychologically constructed, on the other hand, identification requires individual creativity and enactment. Moreover, the ways in which opportunity identification is operationalized in empirical research varies according to

these different underlying assumptions. Indeed, the lack of consensus about opportunities in theory has translated into methodological disagreement.

Empirical limitations

In addition to the theoretical challenges outlined above, research on opportunity identification faces a number of empirical limitations. One of the most basic limitations stems from the field's almost exclusive focus on entrepreneurs.⁷ Indeed, as Appendix A illustrates, the vast majority of empirical research on opportunities and opportunity identification focuses on populations of entrepreneurs. This is problematic for two main reasons.

First, opportunity identification is merely the first step in a complex process of entrepreneurship. Empirically examining entrepreneurs confounds opportunity identification with other steps in the entrepreneurial process, such as opportunity exploitation. By definition, people who are recognized as entrepreneurs have already taken some sort of action that enables them to be categorized as such. For example, Schwartz and Teach (2000) drew their sample from the National Business Incubator Association. This sample fails to account for individuals who may have identified legitimate opportunities, but chose not to move forward in the entrepreneurial process for other reasons, such as risk aversion. As a result, studies like this might be capturing some variation other than the cognitive processes associated with opportunity identification. Such studies constitute sampling on the dependent variable. While all entrepreneurs must have identified an opportunity in order to be categorized as such, not

⁷ There are a few exceptions in which opportunity identification is empirically tested with populations other than entrepreneurs. For example, DeTienne and Chandler (Choi & Shepherd, 2004; DeTienne & Chandler, 2007) and Dimov (2007a) both conducted experimental research using undergraduate and/or MBA students. However, the vast majority of empirical research draws on samples of entrepreneurs.

all people who identify opportunities become entrepreneurs. For instance, Kacperczyk (Kacperczyk, 2012) found that employees in large and mature firms are more likely to engage in *intrapreneurship* by pursuing opportunities within the context of their existing organization. Thus, if we only look at entrepreneurs, it is possible that we are failing to isolate the cognitive process of opportunity identification from other sources of variation in the population of entrepreneurs.

Second, opportunity identification is not unique to entrepreneurs. Executives, managers, and other members of established organizations also rely on opportunity identification as a key source of growth and competitiveness. However, while the study of opportunities extends beyond the field of entrepreneurship (Dutton & Jackson, 1987; Jackson & Dutton, 1988), relatively little empirical research has explored opportunity identification as a broader phenomenon outside the entrepreneurial context. For example, constructs such as entrepreneurial cognition and entrepreneurial alertness implicitly suggest that entrepreneurs think in ways that are fundamentally different from other people. So, too, do studies that empirically compare entrepreneurs' thinking and behavior to that of managers or executives (Dyer et al., 2008). This approach limits the generalizability of empirical research on opportunity identification to populations beyond entrepreneurs, despite the fact that opportunity identification is a more general human endeavor.

In addition to these limitations that result from a narrow sampling frame, many previous empirical studies rely on entrepreneurs' retrospective accounts of the opportunity identification process. For example, Dyer and colleagues (2008) conducted exploratory interviews with entrepreneurs and executives. Their protocol included

prompts such as “tell us about the most valuable strategic insight/novel business idea that you’ve generated during your business career.” Similarly, Ucbasaran, Westhead, and Wright (Ucbasaran, Westhead, & Wright, 2009) conducted a survey in which they asked business founders and owners “how many opportunities for creating or purchasing a business have you identified within the last five years?” Such studies are susceptible to an array of recall and selection biases, censored data, and demand characteristics issues (Grégoire, Shepherd, & Lambert, 2010b). This introduces the possibility that individuals retrospectively give meanings to their actions that do not accurately reflect the cognitive processes that occurred at the time in question. For instance, embracing an entrepreneurial identity after successfully exploiting an opportunity might change the way a person thinks about his or her past experiences.

In sum, two major limitations characterize empirical research on opportunity identification. First, using samples that consist entirely of entrepreneurs confounds opportunity identification with other sources of variation, and limits generalizability beyond the entrepreneurial context. Second, research that relies on retrospective accounts of the opportunity identification process is susceptible to biases that make it difficult to unpack the real-time cognitive processes that facilitate the identification of opportunities. To address these empirical limitations in my dissertation, I employ a multi-method research design including both exploratory interviews and experimental manipulations. I use both qualitative and quantitative methods to derive a rich understanding of the opportunity identification process because it is a phenomenon that is both complex and under-theorized (Denzin, 1970; Jick, 1979).

Summary

In this chapter, I reviewed several different ways of defining opportunities, which stem in part from an ongoing epistemological debate about realism and constructionism in research on entrepreneurship. I discussed the basic assumptions of realism, constructionism, and evolutionary realism, and outlined several limitations of research on opportunity identification.

The remainder of this dissertation will proceed as follows. I begin with a qualitative study designed to explore the processes by which entrepreneurs identify opportunities, the aims of which are to better understand how entrepreneurs themselves think about opportunities and to develop a model of the opportunity identification process. Based on these findings, I theorize about the cognitive processes that may facilitate opportunity identification. Finally, I report findings from three experimental studies designed to test the hypotheses that emerged from my theorizing.

CHAPTER 3. QUALITATIVE STUDY

The purpose of the qualitative study reported in this chapter is to explore the question, how do entrepreneurs identify opportunities? Although much extant research has examined this question, the theoretical and empirical limitations discussed in the previous chapter leave scholars with equivocal answers. Indeed, researchers lack consensus on the basic definition of opportunities (Alvarez et al., 2010; Casson, 1982; Shane, 2003), rendering the question of how opportunities are identified difficult to answer. As a result, our collective understanding of the opportunity identification process remains underdeveloped despite its prevalence and practical import among both nascent ventures and established organizations.

Towards that end, this study was designed to examine how entrepreneurs themselves think about opportunities, and in particular to investigate the deliberate processes through which entrepreneurs attempt to identify them. Given the exploratory nature of this study, it was not my intention to test the efficacy of these processes. Rather, the aim of this study was to contextualize the opportunity identification process, and to look for patterns that could inform a set of quantitative studies which explicitly test that process. Taken together, this qualitative study is the first stage in an exploratory sequential mixed methods design (Creswell, 2013) in which I use both qualitative and quantitative methods to derive a detailed understanding of the opportunity identification process.

Methods

Because the literature on opportunity identification lacks a cohesive definition and methodological paradigm, I began with a qualitative approach to contextualize my theorizing and hypotheses. Qualitative methods are particularly useful for exploratory studies to gather thick descriptions (Gephart, 2004) for the purpose of building theory (Glaser & Strauss, 1967). Such methods are well suited “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). This is especially true where there is little existing theory to guide an investigation, as is the case with the literature on opportunities and opportunity identification, specifically.

Data

Since the purpose of this study was to build rather than test theory, my sampling frame is not intended to be representative of the population at large. Rather, respondents were selected using a purposeful sampling approach (Singleton & Straits, 1999). Following the principles of purposive sampling, I identified likely sources of variation in the population to maximize representation across them. These sources of variation include the industry in which the venture operates, the age of the new venture, the entrepreneurs’ prior industry experience, the entrepreneurs’ prior experience with startup ventures, and geographical locale. I was especially careful to include new ventures spanning both “innovator” and “reproducer” organizations, a distinction noted by Aldrich and Kenworthy (Aldrich & Kenworthy, 1999). In contrast to reproducer organizations – which, for example, include firms that reproduce existing practices in a new geographical

location, such as dry cleaners and bakeries – innovator organizations are those started by entrepreneurs whose routines and competencies vary significantly from those of existing organizations. Dyer, Gregersen, and Christensen (2008) echo this distinction, arguing that innovative entrepreneurs are required to identify new ideas or opportunities, whereas others (e.g., “reproducer” entrepreneurs) can succeed through exceptional execution of a previously-identified idea or opportunity. Nonetheless, while innovator organizations are the subject of much academic and public attention, by some estimates reproducer organizations make up 88% of all entrepreneurial activity (Bhide, 2000; Shane, 2003). For this reason, and to limit any biases or sampling error associated with innovative entrepreneurship, it was important to include both types of organizations in my sampling frame.

I conducted interviews with 26 respondents. Seventeen of these interviewees were nascent entrepreneurs actively engaged in the process of starting a new venture, four were established entrepreneurs whose ventures have been in operation for at least four years, and two were managers in business incubators who have experience evaluating the opportunities identified by early stage startups. To supplement entrepreneurs’ own accounts, I also sought data from actors in established organizations who, while not involved in new venture creation directly, have engaged in opportunity identification from within their organizations. These include two middle managers and one executive in established firms who do not consider themselves to be entrepreneurs. My purpose in including managers in established organizations was to explore the notion that similar processes of opportunity identification occur among both managers and entrepreneurs, a possibility often overlooked in extant research.

The sample of entrepreneurs started from two entrepreneurial groups: (1) COOKS, a collection of nascent entrepreneurs in the food industry in Detroit, and (2) SPUR, a business accelerator working with innovative new ventures.⁸ I used a snowball sampling method by asking the interviewees to introduce other entrepreneurs who would be willing to talk about their experiences. Importantly, one of my primary objectives was to recruit participants who are in the earliest stages of the entrepreneurial process. The reason for this was to get as close as possible to the point of opportunity identification – or even to observe it occurring in real time – to avoid the pitfalls associated with retrospective analysis (e.g., recall and selection biases, censored data, etc.). Indeed, several interviewees indicated that their ventures are still in flux with regard to the opportunities they are identifying and attempting to exploit. The seven respondents comprising established entrepreneurs and managers were similarly recruited using a snowball sampling method.

Table 3.1 Qualitative Study Participants⁹

Venture	Location	Age of Venture	Respondent's Role	Gender	Industry Experience	Prior Ventures
Catering	MI	< 1 year	Founder and owner	Female	20 years	None
Gourmet bakery	MI	< 1 year	Founder and owner	Female	5 years	None
Vegan catering	MI	< 1 year	Founder and owner	Female	2 years	None
Mobile app	MI	1 year	Founder and head engineer	Male	1 year	None
Mobile app	CA	2 years	Co-Founder and CEO	Male	4 years	2 new ventures
Consulting	MI	< 1 year	Founder	Female	5 years	None
Online pet store	FL	< 1 year	Founder and CEO	Male	< 1 year	None
Online art education	NJ	3 years	Founder and Creative Officer	Female	12 years	None

⁸ All names of people and organizations are pseudonyms to protect the anonymity of my respondents.

⁹ Data presented as reported by respondents. For example, Age of Venture was reported by the interviewees rather than calculated based on formal dates of incorporation.

Publishing	NJ	< 1 year	Co-Founder	Female	6 years	None
Mobile app	MI	1 year	Co-Founder	Male	1 year	1 new venture
Mobile software	MI	< 1 year	Co-Founder	Male	2 years	None
Retail	MI	3 years	Co-Founder and COO	Male	3 years	None
Mobile app	PA	2 years	Founder	Male	2 years	None
Online music service	MI	< 1 year	Co-Founder	Male	< 1 year	None
Software engineer	MI	< 1 year	Co-Founder	Male	4 years	None
Mobile app	MI	< 1 year	Founder	Male	2 years	None
Mobile app	MI	1 year	Founder and owner	Male	3 years	None
Automobile mechanical	UK	10 years	Founder and CEO	Male	14 years	None
Online retail	PA	7 years	Founder and CEO	Male	7 years	1 failed new venture
Engineering	MI/DC	4 years	Co-Founder	Male	4 years	None
Textiles	MI	5 years	Founder	Male	5 years	1 new venture
Venture capital	MI	4 years	Investor	Male	35 years	None
Business incubator	MI	8 years	Director of Entrepreneurial Services	Female	4 years	None
Cyber-security	MA	18 years	Analyst/Manager	Male	6 years	Worked for several startups, but not as founder
Online retail	MA	9 years	Manager	Male	3 years	None
Software	WA	12 years	VP of marketing	Male	9 years	None

Note: Changes in shading represent different categories of respondents. From the top: Nascent entrepreneurs; established entrepreneurs; incubator/investor; managers and executives in established organizations.

Interview protocol

The interviews involved semi-structured, open-ended questions about the entrepreneurs and the opportunities they have identified. Consistent with much qualitative research, data analysis and collection overlapped (Busenitz, 1996; Eisenhardt, 1989), particularly during the early phases of research while I refined my interview

protocol. To begin creating the protocol, I interviewed three nascent entrepreneurs, one manager in a business incubator, and one manager in an established business. My questions focused on two aspects of opportunity identification. First, I asked respondents to broadly describe their experiences with opportunity identification. For the entrepreneurs, this included descriptions of their current ventures and how they evolved from an initial idea. For the managers, this included their retrospective experiences, and focused largely on how they participated in prior opportunity identification processes in the context of their current organizations. During these interviews, I asked questions about the typical timeline and thought process that goes into identifying opportunities, including whether opportunity ideas emerged through deliberate identification efforts or through “aha moments.” Secondly, I asked the interviewees how they thought about opportunities as being similar to or different from ideas and technologies that already existed in the marketplace, which gradually emerged as a key characteristic of successful opportunities.

The purpose of focusing on these two aspects of opportunity identification was to create a framework for understanding how entrepreneurs came to believe (a) that an opportunity exists, and (b) that the opportunity represents a new and different proposition compared to current offerings in the marketplace. I attempted to elicit as much detail as possible about the opportunities themselves, how they were identified, and how they evolved (or were evolving) in response to the target market.

These interviews shaped my interview protocol in several important ways. First, they offered insight into some of the major steps in the opportunity identification process (e.g., deliberate effort to look for opportunities, crystallization of the idea, refinement in

response to feedback), which resulted in an interview protocol that broadened to include questions beyond simply “opportunity identification.” Second, it became clear during these early interviews that respondents did not necessarily think in terms of “opportunities.” Rather, they tended to talk about new “ideas” and “technologies” that, upon probing, were representative of opportunities. Nonetheless, without explicit questioning, the concept of “opportunity” was largely latent in respondents’ descriptions of their ideas and new ventures.

In light of these initial interviews, I designed my final protocol as a loosely structured investigation into the processes through which entrepreneurs identify and develop new ideas, technologies, and opportunities, broadly defined. As the interviewer, I anchored my questioning by asking the interviewees to take me through the timeline of their new venture and the steps they took to create it (or, in the case of managers, the most recent organizational opportunity they could describe in detail). By asking the interviewees to describe their actions in a step-by-step manner, the resulting data was rich in behavioral information about process rather than only attitudinal (Ajzen & Fishbein, 1977; Hills, 1995). When respondents referenced opportunity identification steps or events, I probed for additional detail. The interview protocol is attached in Appendix B.

Analyses

I began the analyses by iterating between collecting and analyzing data. Going back and forth between the data and my emerging theory, I looked for both patterns and differences across the sample (Eisenhardt, 1989). For example, after analyzing the first several interviews, it became clear that respondents were implicitly describing opportunities as new combinations of technologies and markets. This description is

consistent with recent research arguing that opportunities consist of subjective beliefs that new technology-market combinations can be created through (a) the development and application of new technologies, or (b) the application of existing technologies in new markets (Grégoire & Shepherd, 2012). Because this description of opportunities is both recurrent and identifiable, I considered it a “codable moment” (Boyatzis, 1998). This led me to ask questions focusing on technologies and markets in subsequent interviews as way of understanding opportunity identification.¹⁰

This iterative process continued until I reach theoretical saturation, where no new themes emerged (Glaser & Strauss, 1967). In coding the data, I paid particular attention to how respondents articulated (1) the opportunities they identified, (2) the process of *how* those opportunities were identified, and (3) how those opportunities are similar to and different from what already exists in the marketplace. In addition, I looked for potential boundary conditions that might help to build a more nuanced model of the relationship between distinction-making and opportunity identification.

Coding

In the first round of coding, I identified instances in which respondents referenced having identified an opportunity. These include references to actively seeking entrepreneurial opportunities in a particular market place (e.g., looking for unmet market needs in metro Detroit), searching for applications of a new technology (e.g., scanning markets when a newly engineered machine can improve manufacturing processes), and attempts to create new technologies without regard for the market (e.g., combining existing skills and interest to form a “lifestyle company”). I used open coding to note the

¹⁰ I use the term technology in its broadest sense, including new business models and competencies.

phrases respondents used to describe opportunities. I then developed codes that were used to denote patterns in the data, such as “existing technology, new market,” “new technology, existing market,” “existing technology, existing market,” and “new technology, new market.”

As previously noted, in developing these codes I drew on existing research that seemed to describe the overwhelming majority of my interviews. Specifically, Gregoire and Shepherd (2012) argued that opportunities are best characterized as technology-market combinations. Additionally, Sarasvathy and colleagues’ (2010) taxonomy of opportunity identification – discussed in the previous chapter – suggests that opportunities come in various forms, which include matching sources of supply and demand that already exist, situations in which either supply or demand already exists but the other does not, and the creation of new markets, where neither supply nor demand exist in obvious ways. Each of these types of opportunities represents a different type of technology-market combination.

Using this coding scheme, the categories I used to make sense of the data formed a two-by-two matrix, which categorized opportunities along the dimensions of technologies and markets. Table 3.2 shows this matrix, along with the number of cases observed in each category (not including the incubator and investor respondents, since they did not describe a unique opportunity identification event). It is interesting to note that there were no observed instances of opportunities where both the technology and the market were new. It could be argued that such opportunities represent radical or disruptive innovations, which are more rare occurrences in comparison to the other three categories of opportunities represented in the matrix.

Table 3.2 Opportunity Types

	Existing Market	New Market
Existing Technology	8	11
New Technology	5	0

These categories served two main functions. First, they helped to define the features that characterize opportunities. As previously discussed, there is little agreement among the literature on opportunities about what exactly constitutes an opportunity. Second, these categories provided a lens through which I looked for patterns in the opportunity identification process.

In the second round of coding, I focused on the processes of *how* respondents reported identifying opportunities. Again, I used open coding to categorize different types of opportunity identification processes into more abstract codes. These included analogistic thinking (e.g., starting a company that's like an existing company, but in a different market), recombination (e.g., combining existing but previously unrelated technologies), and distinction-making (e.g., asking how two or more firms, technologies, or markets are different from each other to discern unique value propositions). I then went through the data to look at whether there existed patterns relating the type of opportunity to the opportunity identification process.

After I finished coding, I had a list of opportunities that included (a) the type of opportunity that was described by the interviewee, and (b) the process(es) through which

those opportunities were identified. A sample of the coded data is included in Appendix C.

Findings

Data from my qualitative interviews revealed a common view of opportunities as new combinations of technologies and markets. These technology-market combinations most often emerged in one of two ways: (1) through the identification and development of new technologies, and (2) through the application of existing technologies to new markets. In both circumstances, respondents reported actively engaging in distinction-making to identify new opportunities.

Identifying opportunities for new technologies

Five of my respondents reported identifying opportunities through the creation of new technologies. In each of these cases, the new technology resulted from the recombination of existing technologies, skills, and/or abilities. As one example, consider the owner and operator of GYPSY. GYPSY was founded in early 2013, roughly six months before our interview. GYPSY is a “lifestyle company” that focuses on healthful living, which includes services such as vegan catering, yoga instruction, and health coaching. In developing her business model, the founder reported that she consciously thought about how to recombine her existing skills and experiences to generate a new type of business.

“I went to business school, started a vintage clothing store in California, so I have that entrepreneurial experience...I teach yoga, and I do vegan cooking. Then when I came back to Detroit, I'm like, how do I make all of this come together? What can I do that doesn't already exist here that would be a service to these people...I know it's not a traditional company, but it's a product of who I am and what I know.”

As this example shows, the interviewee recombined knowledge associated with several different categories of personal experiences in the development of an innovative business model. In this way, she identified an opportunity to create a new type of venture that did not already exist in the local marketplace. Her experience is representative of identifying an opportunity for a new technology; although she did have concern for the viability of her new business model in the market, her opportunity identification process was largely a function of distinguishing between, and then recombining, her existing skills and life experiences.

All five ventures that reported an opportunity for a new technology described this type of process. In a more high-tech industry, one respondent talked about recombining two existing technologies to create a technology with the potential to serve several existing markets, which is currently patent-pending:

“We’ve got this machine that I think is really cool. [My business partner] designed it...I do more of the financial and marketing stuff. The best way I can explain it is that it uses sound waves to pulverize things like rocks into incredibly small pieces...Sound waves are different from just mechanically breaking a rock into pieces because they create more surface area, and more symmetrical pieces...the sound technology was out there in different applications, and people have been trying to break materials down into smaller pieces forever, but [my partner] had the foresight to put them together.”

Among those respondents who identified this type of opportunity, all engaged in some type of recombinant process. Four out the five also engaged in distinction-making, although in some cases this process referred to applying the technology to the marketplace. The previous interviewee continued:

“He came up with this thing, really just because he saw a different possibility for pulverizing materials. As far as I know, he didn’t have any real application in mind. But after I joined we started looking at a lot of

different products and looking at different types of products... [For example,] we thought about food and beverage, and at first we weren't so sure there was anything there. But then we talked to a guy who really knows the industry and he pointed us to juice. So now we're working on a powdered juice, because when we use our machine to create the powder, it dissolves in water in 1/3 the time, and with a much better absorption rate compared to the products that are currently on the market."

This example is emblematic of a number of respondents who reported the same type of opportunity. When looking at the food and beverage industry broadly, the founders did not see an opportunity for their new technology. It was not until they distinguished "powdered juice" as its own category with unique features that the entrepreneurs identified a way in which their machine could be applied. A similar experience occurred when the founders explored possibilities for their technology in the oil and gas industry, where the technology is being used as a way to clean waste water associated with fracking. In the broadest sense, this is a clear example of opportunities being identified through the creation of a new technology, and distinction-making among market segments that represent potential applications for that technology.

Identifying opportunities for technology application

The data also indicate that 11 of the opportunities identified by respondents involved applying an existing technology to a new market, which was the highest instance of any of the four types of opportunities. The process of identifying opportunities for new market applications of an existing technology is exemplified by NETWRK. I interviewed one of three co-founders who started NETWRK in 2012. He describes NETWRK as "Google Now for your network," a mobile phone application that facilitates more regular communication between the user and his or her professional network. The application connects with a user's social network account, and uses an

algorithm to facilitate communication such as sharing articles and congratulating people on promotions or career changes. However, the NETWRK team went through several ideas before settling on their current venture. All three co-founders were actively searching for an opportunity to start a business and, like many interviewees, this person described a process of opportunity identification that relied on analogistic thinking in applying existing technologies to new markets. For example, during the opportunity identification phase...

“...[my co-founder] consciously thought about Fit-Bit and where we could apply it in other markets. Another one we thought about was like a delivery service where you could order anything you wanted instead of just food...it can be ‘I need pencils.’ We had another idea for the football games here in Ann Arbor that would help people sell their parking spots. We were like, ‘why don’t we do like an AirB&B for parking spots?’”

As this description suggests, NETWRK’s team of entrepreneurs actively engaged in attempts to apply existing technologies in new ways, and it was a deliberate mechanism for identifying opportunities. He went on:

“Certainly, I think that’s one thing I’ve learned, is thinking about business models, not just ideas. ‘Oh, Netflix is an interesting business model, how can we apply that through a new market.’”

This experience is typical of many of my interviewees. The respondent’s team was actively engaged in opportunity identification with the goal of starting a business. In the process of searching for opportunities, they tried to “match” technologies and markets by distinguishing between existing technologies to applying them to new market segments. They did so largely through analogistic thinking (i.e., “AirB&B for parking spots”). In contrast to the earlier examples, whose new ventures relied on recombining

existing technologies in the creation of a new technology, NETWRK took existing technologies and tried to apply them in new and different ways.

Distinction-making and opportunity identification

Data from across my qualitative interviews indicates that people not only think about opportunities as new combinations of technologies and markets, but also that they make distinctions among technologies and markets in doing so. Indeed, “distinction-making” was a prominent theme that emerged from my coding, and it occurred across opportunity types in both startups and established firms. For example, one respondent who founded an online retail company noted that making distinctions among the company’s own product categories led to the identification of a new product opportunity:

“Especially as our company began to grow, we needed to create more categories of products in our dropdown menus...It just needed to be more manageable for our customers to browse the products. But as we did that, it wasn’t just about the customers. It was kind of like an exercise in who we are and who we wanted to be. Creating more product categories, and reworking them to see which products fit together, we saw some clear opportunities for new product offerings that weren’t on our radar before... [For example] we created a category of products revolving around the living room space, and we thought about selling wallpaper. We’re a high-end boutique, and wallpaper just wasn’t even...we never would have considered selling it, but now it’s a great seller for us.”

This quote offers a clear example of distinction-making taking place within a startup company for the purpose of developing new product opportunities. In this case, it was not only the act of making distinctions, but also the active recategorization of products that spurred the identification of new opportunities. Similar examples emerged in many of my interviews with entrepreneurs; however, distinction-making was evident

in discussions with managers in established firms. For example, one manager in an established cyber-security firm relayed the following:

“[Our company] recently acquired a startup that does something totally different. I mean, we’re both broadly in cyber-security, and I think most people would just leave it at that. But we really thought through what they’re doing, and to us it’s totally different...Most companies like ours try to create barriers for computer viruses, like making the computer an impenetrable fortress. But obviously...I mean you hear about a new hack or virus every week now...it’s not enough to be defensive. So this new firm we acquired, they’re actually more of a behavioral analytics company. They have this technology that tries to predict when viruses and hackers will come after you. So sure, we’re both in cyber-security, but they’re completely different from us and that was a real opportunity that I think some other firms just didn’t see.”

In addition to demonstrating the role of distinction-making in identifying opportunities, this respondent presents an example of acquisitions as a way for established firms to pursue new opportunities. Although this was not a common occurrence among my sample (likely due to the limited number of established firms represented), it is interesting to note that once identified, opportunities can be pursued through a number of different ways. While many of the startups I examined relied on technology development or innovative marketing to exploit an opportunity, this firm used an acquisition to obtain technology that could help them exploit a new technology-market combination.

The previous two examples involved firms using distinction-making to examine the similarities and differences among products or technologies within the organization, which served as the impetus for opportunity identification. In addition, a number of respondents engaged in distinction-making to identify differences among external market segment that led to new opportunities. For example, the founder of an automobile repair

company described his recent decision to spin off part of his company into a new entity so that he could take advantage of a market sub-segment:

“I took a good look at what we do, thinking about what we do well, and thought, you know, there’s a basic division between two parts of our business. There’s service, which lots of other people do...oil changes, repairs, that sort of thing. But the other was quite different...It turned out that a big part of what we do is based on customers who want to experience high performance vehicles. So we're in the process of spinning off a new business that focuses on customers who, "a", need service for high performance cars, and "b", customers who need mechanical help as they try to get into the racing circuit.”

In this case, the entrepreneur looked at differences among his customer base to identify an opportunity. Whereas the majority of his customers were typical automotive repair consumers, a small proportion had a much different focus on high performance vehicles such as luxury sports cars and even F-1 style racing cars. This distinction among his customers led to the formation (e.g., spin off) of a new venture focusing on the latter.

Like distinction-making among products and technologies within firms, the process of distinction-making among market segments was not unique to entrepreneurial startups in my interviews. An executive in a large Seattle-based software company described packaging the same product in different ways according to the ways in which they distinguished among different market segments:

“[Product X] is a product that serves all segments of the market, but it's differentiated in how it's packaged in each segment of the market. With this new video service, we did that, too. We said is this something that's applicable to smaller businesses or is it really an enterprise service? We've also identified a pretty big opportunity in the US federal protective space for this product. We've gone and done a bunch of product work to tweak the product to address that market, positioning content to go after that market.”

Here we see not only an example of an established firm making distinctions among market segments, but also clear awareness about and a deliberate attempt at

matching a particular technology with a certain market. Although few respondents reported similar instances of actively changing a product to meet a particular market, the notion that opportunities are characterized by new technology-market combinations was a prevalent theme in the data.

Furthermore, there was a clear pattern in the relationship between the type of opportunity identified and the processes through which identification occurred. Recombination was reported, to some degree, as a mechanism for opportunity identification in all five cases where new technologies were being created. This is perhaps not surprising, as recombination has been argued to be an important mechanism of creativity, which in turn is the first step in processes of innovation (Baron, 2006; Sanchez-Burks, Karlesky, & Lee, 2015; Shane, 2003). Similarly, in those cases where existing technologies were being applied in new markets, analogistic thinking was a principal mechanism for opportunity identification.

However, across all categories of opportunities that were represented in the data, distinction-making appeared to be a common process through which both entrepreneurs and managers attempt to identify opportunities. Indeed, the deliberate act of creating and refining new categories of technologies, products, and market segments was strongly associated with opportunity identification. Although causality cannot be determined from the methods employed in this study, that there is some association between distinction-making and opportunity identification is clear.

Summary

The qualitative interviews conducted in this chapter established that (1) both entrepreneurs and managers in established firms engage in opportunity identification by

making cognitive efforts at matching technologies and markets, and (2) actively making distinctions among existing technologies and market segments is a primary mechanism for doing so. These findings form the foundation for the theorizing and experimental methods described in the next chapter, in which I attempt to isolate the relationship between distinction-making and opportunity identification in a controlled setting.

CHAPTER 4. THEORY DEVELOPMENT AND EXPERIMENTAL STUDIES

Distinction, n. The action of dividing or the fact of being divided

Oxford English Dictionary

Scholars have demonstrated great interest in opportunity identification as a first step in the entrepreneurial process. Historically, psychological research has emphasized individual differences in explaining why some people are better able to identify and exploit new opportunities compared to others (Shane, 2000). However, researchers have had mixed success in answering this question. For example, while some scholars have found that entrepreneurs tend to have a higher risk propensity compared to non-entrepreneurs (Stewart & Roth, 2001), others have found no differences (Brockhaus, 1980; Palich & Bagby, 1995). A plethora of individual-level characteristics have been associated with entrepreneurs, including need for achievement (McClelland, 1965), self-efficacy (Chen, Greene, & Crick, 1998), internal locus of control and tolerance for ambiguity (Begley & Boyd, 1987). Likewise, entrepreneurs have been found to score higher than others on tests of creativity (Vesalainen & Pihkala, 1999).

Although many such studies exist, in combination they amount to little more than a list of individual characteristics that are vaguely predictive of entrepreneurial tendencies. More recent psychological research has shifted the conversation away from individual differences in entrepreneurial behavior and towards the cognitive processes that enable opportunity identification in the early stages of the entrepreneurial process. For example, Baron (2006) highlights three factors as being especially important to

opportunity identification: (1) engaging in an active search for opportunities, (2) entrepreneurial alertness, and (3) prior knowledge of the opportunity domain. In contrast to earlier research that focused on relatively stable individual differences, the growing attention given to concepts like *active search for opportunities* suggests that scholars have begun to explore mindsets and cognitive processes that can vary within individuals over time and in different situational circumstances.

In this chapter, I argue that distinction-making (Langer, 1989; Weick & Sutcliffe, 2006) is one such cognitive process that can enable the identification of opportunities. Distinction-making refers to the process of creating and refining new cognitive categories; that is, making distinctions among objects, events, and information in one's environment. I will argue that distinction-making enables the identification of opportunities in two ways. First, distinction-making aids the generation of ideas for new and potentially valuable technologies. Second, the process of distinction-making engenders more fine-grained perceptions of potential markets in which those technologies can be applied, and a much more nuanced understanding of opportunity possibilities. As a result of these two processes, I argue that distinction-making enables people to identify "fit" between technologies and markets, a hallmark of opportunity identification (Grégoire & Shepherd, 2012).

In the next section, I briefly revisit extant research on the nature of opportunities in light of the qualitative study reported in the previous chapter. Then, I discuss the relationship between distinction-making and research on cognitive categories, and examine the implications of distinction-making for the process of opportunity identification.

The nature of entrepreneurial opportunities

As previously noted, there has been much debate in the literature on entrepreneurship about the basic nature of opportunities (Alvarez et al., 2010; Alvarez & Barney, 2008). Whether opportunities are viewed as objective phenomena waiting to be discovered (a realist perspective) or as subjective interpretations of an individual's environment (a constructionist perspective) has implications for how those opportunities are identified. The present study is based on the latter perspective, which holds that entrepreneurial action originates in subjective beliefs that an opportunity exists for individuals and organizations with the desire and means to pursue it (McMullen & Shepherd, 2006; Stevenson & Jarillo, 1990). Accordingly, this study is grounded in three key assumptions.

First, drawing on the findings from my qualitative data, I follow existing conceptualizations of opportunities as situations in which new or improved products, services, or organizing methods can be introduced through the formation of new means, ends, or means-ends relationships (Casson, 1982; Eckhardt & Shane, 2003). In other words, opportunities consist of new technology-market combinations, which are formed by the application of a new technology in a particular market (Grégoire & Shepherd, 2012). Opportunities refer to subjective beliefs that new technology-market combinations can be created through (a) the development and application of new technologies, or (b) the application of existing technologies in new markets.

Second, I assume that opportunity identification is both conceptually and empirically distinct from decisions about whether to pursue an opportunity, as well as actions taken to exploit opportunities (Dimov, 2007a; McMullen & Shepherd, 2006).

Recent research suggests that the cognitive process of opportunity identification is different from the cognitive processes involved in evaluating opportunities (Grégoire, Barr, & Shepherd, 2010a; Haynie, Shepherd, & McMullen, 2009) and that the two constructs are empirically distinct (Grégoire, Shepherd, & Lambert, 2010b). I focus on the early stage of opportunity identification, rather than on opportunity evaluation and exploitation, because the initial identification of an opportunity forms the foundation for subsequent entrepreneurial action.

Finally, as my qualitative data suggest, I assume that opportunity identification is a general phenomenon that transcends the traditional entrepreneurial context. For example, as noted previously, members of established organizations attempt to discern opportunities for organizational growth (Jackson & Dutton, 1988), and social entrepreneurs look for opportunities to generate value through social change (Martin & Osberg, 2007). Moreover, while all entrepreneurs must have identified an opportunity, not all people who identify opportunities become entrepreneurs. As noted earlier, I found that employees in large and mature firms are more likely to pursue opportunities within the context of their current organization (Kacperczyk, 2012). For this reason, I theorize about opportunity identification broadly and test my predictions using samples of nonentrepreneurs as well as entrepreneurs.

Building on these assumptions, I follow recent work suggesting that opportunity identification takes shape through cognitive efforts to identify ‘fit’ between new technologies and markets in which they can be applied (Grégoire & Shepherd, 2012). In the next section, I review research on cognitive categorization to examine how people identify fit between technologies and markets.

Cognitive categories and distinction-making

The fields of psychology and organization studies have a rich history of research on how people perceive, categorize, and make sense of their environments. A basic assumption in this research is that people face ambiguous and uncertain information environments, and we meet those environments with limited cognitive capabilities (Miller, 1956). As a result, we filter information into discrete categories in order to help us make sense of the world around us (James, 1890).

Research on cognitive categories can be traced to William James (James, 1911). “The intellectual life of man,” he writes, “consists almost wholly in his substitution of a conceptual order for the perceptual order in which his experience originally comes” (p. 51). In James’ view, “perceptual flux” refers to the continuous flow of sensory experience that is, by itself, meaningless. Concepts, in contrast, are discrete mental representations that are imposed on and give meaning to our perceptions. Indeed, James writes, “the great difference between percepts and concepts is that percepts are continuous and concepts are discrete” (p. 48). Such is the case with the categories of information people perceive in their environments. Information is abundant and continuous, and we use cognitive categories to structure and give meaning to the flow of information in our environments.

For instance, when sitting in a football stadium filled with 100,000 people, it is much easier for us to categorize people into discrete groups (by shirt color, gender, race, etc.) than to consider the unique characteristics of each person individually. Likewise, faced with an economic environment, people generate categories of industries, firms and products into which we filter objects with similar characteristics. These include

categories of existing technologies and markets, such as the categories manifested in the North American Industry Classification System (NAICS). Such categories serve an important cognitive function; without them we would find ourselves overwhelmed by a world of staggering complexity (Daft & Weick, 1984).

However, the act of imposing these cognitive categories on our perceptions comes with a cost. “We know that the first step towards the intellectual mastery of the world in which we live is the discovery of general principles, rules and laws which bring order into chaos,” Freud writes (Freud, 1937). “By such mental operations we simplify the world of phenomena, but we cannot avoid falsifying it in so doing” (p. 384). We develop cognitive categories to help us understand the world, but those categories are only simplified approximations of all the information we perceive. Our reliance on cognitive categories is analogous to a sieve. We filter perceptions and information into the discrete categories that we have developed over time, but in doing so some information inevitably slips through the holes. By clinging to our preexisting cognitive categories, we sacrifice nuanced perceptions that could prove to be useful in identifying matches between technologies and markets.

Moreover, existing research suggests that sorting information into categories without discretion can cause people to overlook potential anomalies. For example, such categorization can lead people and organizations to miss signals of impending threats (Weick & Sutcliffe, 2011). Distinction-making is one mechanism that enables people to detect such anomalies early on in their development. By actively differentiating information and events as *dissimilar* to each other – rather than categorizing them according to their similarities – people generate more fine-grained perceptions of their

environments and consider each object or piece of information as its own instance with unique attributes.

Langer (1989) introduced the notion of distinction-making in her seminal work on mindfulness. Distinction-making, Langer argues, is one of three basic qualities of mindfulness.¹¹ “We experience the world by creating categories and making distinctions among them” (p. 11). Later, Langer writes “just as mindlessness is the rigid reliance on old categories, mindfulness means the continual creation of new ones” (p. 62). This process of creating new categories has been suggested to influence the way people think and behave in concrete ways. For example, a recent experimental study found that distinction-making reduced the extent to which participants cognitively stereotyped other people, as well as their subsequent behavior as a result of the stereotyping (Djikic, Langer, & Stapleton, 2008).

An important implication of distinction-making is the idea that people vary in the level of discriminant detail with which they perceive objects, events, and information in their environments. For example, consider the physical universe. The universe can be viewed at various levels of granularity. Whereas one person might look at the universe and see clusters of galaxies, another person might see individual stars and planets. At the opposite extreme, a third person might see the universe as a collection of atoms. All three people are observing the same information, but they are categorizing it at different levels of discriminant detail.

Similarly, people vary in the discriminant detail with which they perceive the social landscape. For instance, given a population of 100 university students, one person

¹¹ Mindfulness entails (1) creation of new categories; (2) openness to new information; and (3) awareness of more than one perspective (Hayek, 1945; Langer, 1989).

might categorize them into two groups: Ohio State students and Michigan students. Another person might see four groups: OSU men, OSU women, Michigan men and Michigan women. Likewise, an organization can be viewed as a single entity, several divisions, a series of departments, and so on. Or, using the NAICS as an example at the industry level, the “Information” sector can be divided into more distinct categories of establishments such as newspaper publishing, software publishing, sound recording, and motion picture and video production. Going even further, the motion picture and video production sector includes categories of establishments with even finer distinctions, such as animated cartoon production, instructional video production, and commercial television production. These examples represent different ways of categorizing the same underlying population of people and firms.

The detail with which people categorize their environments can vary not only among people, but also within individuals given different situational circumstances. Indeed, it is clear that a person can quite readily change the granularity with which he or she perceives a set of information. However, this kind of frame-switching can be cognitively taxing. Research in cognitive science suggests that people are limited in their capacities for working memory, and high levels of information processing can intensify cognitive load (Sweller, 1988). This is the very reason categories exist to begin with. In other words, without deliberate effort, people are likely to rely on their existing cognitive categories when perceiving their environments.

Distinction-making and opportunity identification

What are the implications of distinction-making for entrepreneurship and the literature on opportunity identification? Do these concepts give us any traction in

understanding opportunity identification that existing research does not? I theorize that distinction-making facilitates opportunity identification in two ways, and my argument is anchored on the assumption that opportunities consist of new technology-market combinations. First, making distinctions among existing technologies aids in the identification of opportunities for creating new technologies, which I refer to as a “supply-side” opportunity. Second, making distinctions among market segments enables people to identify new applications for existing technologies, which can be thought of as opportunities for technology transfer. I call this a “demand-side” opportunity.

Identifying opportunities for new technologies

The identification of opportunities for creating new technologies requires innovation, which itself is a process of recombination. That is, new technologies come into being by combining existing, but disparate, knowledge and information (Amabile, 1996; James, 1890; Schumpeter, 1934). Possessing more knowledge and information increases the probability that a person will make novel associations and linkages that have never before been considered, which is a hallmark of creativity and innovation (Cohen & Levinthal, 1990; Shepherd & DeTienne, 2005). As such, the literature on creativity and innovation presents a theoretical lens for understanding how and why distinction-making might influence the identification of opportunities for new technologies.

Researchers have long been interested in the relationship between creativity and entrepreneurship (Gilad, Kaish, & Ronen, 1988; Schumpeter, 1934; Whiting, 1984). For example, Ward (Ward, 2004) argued that novel and useful ideas are “the lifeblood of entrepreneurship” (p. 174). In the creativity literature, novelty and usefulness are well-

established as the two essential characteristics of creative ideas (Amabile, 1996). More recently, creativity and opportunity identification have been linked through the concept of *opportunity ideas*. Dimov (2007a) suggested that opportunities are creative ideas that have been acted upon and evaluated for their profit potential. The formation of these ideas represents an important first step in opportunity identification, and individuals differ in the ideas they generate at this stage of the process (Dimov, 2007b).

Like innovation, creativity is generally viewed as a process of recombination. That is, new ideas come into being by combining existing knowledge and information in new and different ways (Amabile, 1996; James, 1890; Schumpeter, 1934). Sanchez-Burks and colleagues refer to this process as *psychological bricolage* (Sanchez-Burks et al., 2015), noting that it is not possible to create something from nothing. In generating creative ideas, people make use of the knowledge and information they already possess. This is a fundamental tenet of research on “creative cognition,” an intra-psychic perspective focusing on the process of how people retrieve and recombine knowledge in new ways (Finke, Ward, & Smith, 1992; Leung, Maddux, Galinsky, & Chiu, 2008).

Creative recombination has been demonstrated in several ways. For example, knowledge systems are tightly bundled with social identities (for a review see Devine & Monteith, 1999). Individuals possess multiple social identities, and different knowledge systems are made accessible for use depending on which social identity is being activated (Fiske, 1998; Higgins, 1996). Drawing on this logic, Cheng et al. (Cheng, Sanchez-Burks, & Lee, 2008) found that people who have higher levels of integration among their social identities tend to generate more creative ideas than people whose identities are perceived as being more disparate. Theoretically, the reason for this is that the

knowledge and information associated with different social categories is simultaneously accessible for people who view their identities as integrated. In contrast, when an individual perceives these identities as being relatively distinct, only the knowledge associated with the most salient category is activated at a given time. Thus, when multiple identities are activated, more information is available for recombination.

A clear example of identity-based recombination could be seen in the qualitative data presented in the previous chapter. Recall the experience of the founder of “lifestyle company” GYPSY:

“I went to business school, started a vintage clothing store in California, so I have that entrepreneurial experience...I teach yoga, and I do vegan cooking. Then when I came back to Detroit, I'm like, how do I make all of this come together?”

In a sense, these previous experiences are manifestations of different identities the founder possesses. She was able to recombine knowledge associated with each one of them in her attempt to create a new supply-side opportunity in metro Detroit.

In a more direct examination of the relationship between creativity and cognitive categories, Mobley and colleagues (Mobley, Doares, & Mumford, 1992) demonstrated creative recombination by using category exemplars. Participants were presented with exemplars drawn from multiple a priori categories. They were then asked to combine the a priori categories to generate a new category, and to provide exemplars of the elements included in this new category. Importantly, the relatedness of the a priori categories was manipulated, such that some categories were closely related to each other and others were more distinct. The results indicated that when the a priori categories were relatively distinct, people demonstrated higher levels of creativity in generating new categories. In

combination, this research on identity-based knowledge systems and category exemplars suggests that people demonstrate greater creative recombination when (1) multiple categories are activated, and (2) those categories are relatively distinct from one another.

As a concrete example, consider the mobile phone industry. A potential entrepreneur might view this as a single category, *mobile phones*. Another might distinguish between *smart phones* and *non-smart phones*. A third might distinguish further between *touchscreen smart phones*, *non-touchscreen smart phones*, and *non-smart phones*. This example illustrates the way in which distinction-making generates different categories. As prototype theory suggests (Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976) each of the categories above implies an exemplar. For instance, when we think of touchscreen smart phones, many of us will think of an iPhone. Similarly, a non-touchscreen smart phone might look a lot like a Blackberry, and a non-smart phone might evoke images of a Nokia flip phone. These exemplars are different in several ways, and their differences represent sources of information that can be recombined when generating opportunity ideas for new phones. The entrepreneur who distinguishes three categories of mobile phones is likely to have more information to work with (i.e., to recombine) than is the entrepreneur who views mobile phones as a single category.

To summarize, cognitive categories serve as vessels for knowledge and information. Distinction-making generates finer categories of objects, and thus brings to mind a greater amount of knowledge and information. Based on this logic, I suggest that the process of making distinctions increases the cognitive availability of knowledge and information. Distinction-making creates more categories of information, which in turn

elicits a greater amount of knowledge that can be utilized in conceptual combination (Ward, 2004).

Hypothesis 1a: Distinction-making is positively related to the number of new technology opportunities a person identifies.

In addition to the sheer number of opportunities a person identifies, Shepherd and DeTienne (2005) measured the innovativeness of those opportunities. Following earlier research, they argued that it is important to distinguish between incremental and truly innovative opportunities, and that innovativeness is indicative of the value of an opportunity. Here, the evolutionary approach has implications; the more opportunities a person identifies, the more likely it is that some of those opportunities will be innovative. However, as noted above, the creation of new cognitive categories supplies the individual with more “raw material” that can be recombined in new ways. Because innovation requires the recombination of existing materials and information, having more information enables people to make associations and linkages that may not have been considered before.

Hypothesis 1b: Distinction-making is positively related to the innovativeness of the new technology opportunities a person identifies.

Identifying market applications

As others have suggested (Gregoire et al., 2010a), entrepreneurial opportunities can lie in applying an existing technology to a new market. Moreover, although people

may identify many opportunities for creating new technologies, realizing those opportunities requires applying those technologies to the marketplace (Dimov, 2007; McMullen & Shepherd, 2006). As a result, entrepreneurs need to evaluate the environment to find markets for which their ideas are best suited. Indeed, like all organizations, entrepreneurs must identify opportunities for new technologies that match or fit their environment (Burns & Stalker, 1961; P. R. Lawrence, Lorsch, & Garrison, 1967).

A rich literature on environmental scanning examines how people perceive their environments. Environmental scanning broadly refers to the ways in which people receive data about external events and trends, which provide information that is critical to strategy formulation and decision-making (Daft, Sormunen, & Parks, 1988). For example, empirical evidence suggests that the greater the match between managerial perceptions of the environment and the actual environmental characteristics, the better an organization will perform (Bourgeois, 1985).

Distinction-making generates more fine-grained perceptions of the environment, and enables people to see more nuanced possibilities for applying technology to new markets. Returning to the NAICS example, market segments can be categorized at various levels of discriminant detail; a person can view the same underlying population of existing establishments with relatively coarse- or fine-grained distinctions. In this way, I suggest that distinction-making is an important part of environmental scanning when entrepreneurs and others seek opportunities for applying technologies in a particular market. Making distinctions among market sectors generates a broader range of possible applications for an existing technology. That is, holding the technology

constant, people who engage in high levels of distinction-making are likely to identify a greater number of market applications compared to people who engage in less distinction-making. In addition, distinction-making is likely to facilitate the perception of “fit” between a particular technology and the market category of interest.

Hypothesis 2a: Distinction-making is positively related to the number of market opportunities a person identifies for a particular technology.

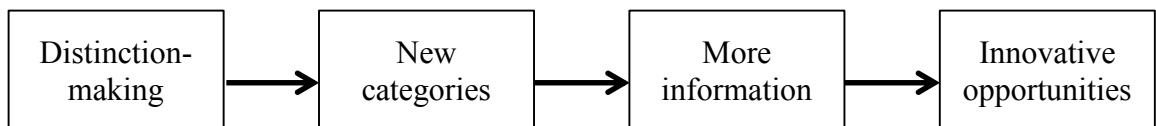
Hypothesis 2b: Distinction-making increases the likelihood that a person perceives a fit between a particular technology and markets in which it can be applied.

Taken together, the theorizing above suggests that people who engage in distinction-making are more likely to identify new technology-market combinations. On the supply side, making distinctions among existing technologies generates a greater variety of knowledge and information that can be recombined in efforts to identify new technologies. On the demand side, distinction-making engenders fine-grained perceptions of the market, which enables people to identify more opportunities for applying those technologies. This logic is consistent with Gregoire and Shepherd (2012), who argued that opportunities take shape “through cognitive efforts to make sense of potential ‘matches’ between new means of supply (i.e., new products, services, technologies, or business models) and the markets in which these new means of supply can be introduced” (p. 765).

Mechanisms

Two potential mechanisms can explain the theorized relationship between distinction-making and opportunity identification. Thus far, my theorizing has largely been based on a domain-specific information processing perspective, which is the first potential mechanism. The logic is as follows. Making distinctions among information and objects in one's environment (rather than categorizing them according to their similarities) generates new cognitive categories. These categories represent sources of information; that is, generating more categories creates more information that becomes cognitively available. Because idea generation is fundamentally a process of recombination, having more information available to recombine increases the likelihood that a person will generate more ideas (in this case, *opportunities for new technologies*) or see more nuanced possibilities for applying a particular idea (*market applications*). Additionally, these ideas and/or applications are likely to be more innovative. That is, having more information available to combine increases the probability that a person will make novel associations and linkages that have never before been considered, which is a hallmark of innovation (Cohen & Levinthal, 1990; Shepherd & DeTienne, 2005).

Figure 4.1 Domain-Specific Information Processing



The second mechanism is a broader information processing style, which is a generalized style of processing that transcends the particular domain in which distinction-making originally occurs.

The primary difference between these two mechanisms is as follows. The domain-specific information-processing approach implies that distinction-making *only* aids opportunity identification in the domain in which distinctions are made. For example, making distinctions among different types of mobile “apps” should generate new categories of apps, more information about apps, and increase the likelihood that an individual identifies opportunities for new apps. However, because distinction-making generates new categories and information unique to mobile apps, the ability to identify opportunities should be limited to this domain.

In contrast, if the process of distinction-making instills a more generalized processing style, the effects of distinction-making should transcend any particular domain such that people are able to identify opportunities irrespective of the domain in which the distinction-making originally occurs. For example, after making distinctions among different high-tech markets, a person might subsequently be able to identify opportunities in a different domain such as the food production industry. This would suggest that it is not simply the generation of new information in a particular domain that enables opportunity identification, but rather that distinction-making evokes a particular *way* of processing information, and it is that process that leads to opportunity identification.

If domain-specific information processing is the mechanism through which distinction-making enables opportunity identification, then we would expect there to be no relationship between distinction-making in one domain and opportunity identification

in a different domain. However, if a generalized processing style is the mechanism, then we would expect to observe a relationship between distinction-making in one domain and opportunity identification in another, different domain. Thus, the following hypothesis is a horse-race between the two mechanisms. Empirical support for this hypothesis would suggest that distinction-making enables opportunity identification by way of a generalized processing style.

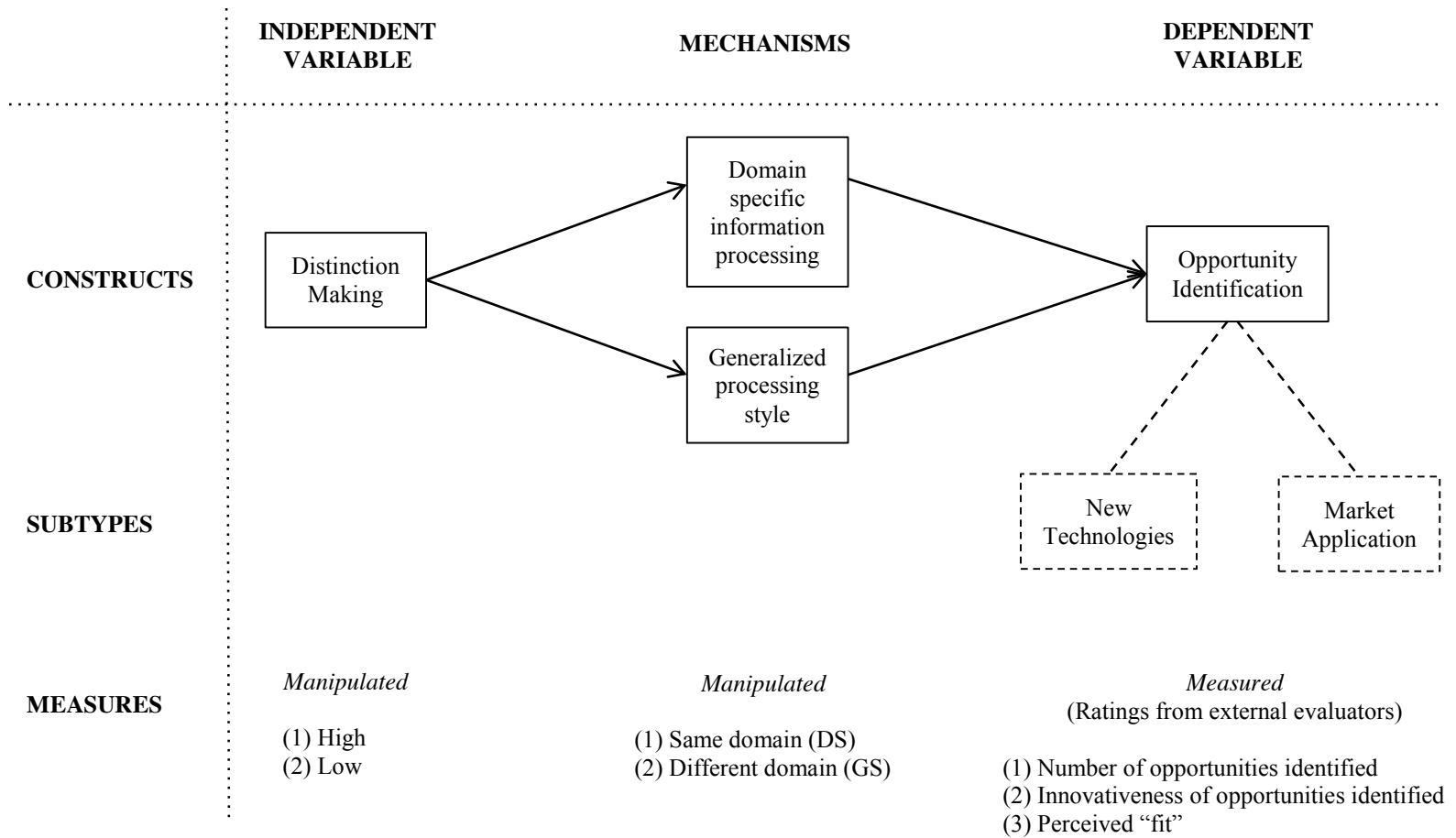
Hypothesis 3: Distinction-making is positively related to opportunity identification across the boundaries of a particular domain.

A summary of the hypotheses is available in Table 4.1. Additionally, Figure 4.2 illustrates the proposed relationships among the constructs discussed above.

Table 4.1 Summary of Hypotheses

<i>Hypothesis 1a</i>	Distinction-making is positively related to the number of new technology opportunities a person identifies.
<i>Hypothesis 1b</i>	Distinction-making is positively related to the innovativeness of the new technology opportunities a person identifies.
<i>Hypothesis 2a</i>	Distinction-making is positively related to the number of market opportunities a person identifies for a particular technology.
<i>Hypothesis 2b</i>	Distinction-making increases the likelihood that a person perceives a fit between a particular technology and markets in which it can be applied.
<i>Hypothesis 3</i>	Distinction-making is positively related to opportunity identification across the boundaries of a particular domain

Figure 4.2 Proposed Relationships Among Constructs



Overview of studies

To test these predictions, I conducted one pilot study that measured the extent to which variation in categorization is observable among individuals, and three experiments in which I manipulated (1) distinction-making, and (2) the domains in which participants identify opportunities. Study 1 examines the direct relationship between distinction-making and participants' ability to identify opportunities for new technologies. Study 2 investigated the relationship between distinction-making and the identification of opportunities for market application. Finally, in Study 3 I examined domain-specific information processing and a generalized processing style as the competing mechanisms through which distinction-making is theorized to affect opportunity identification.

Pilot

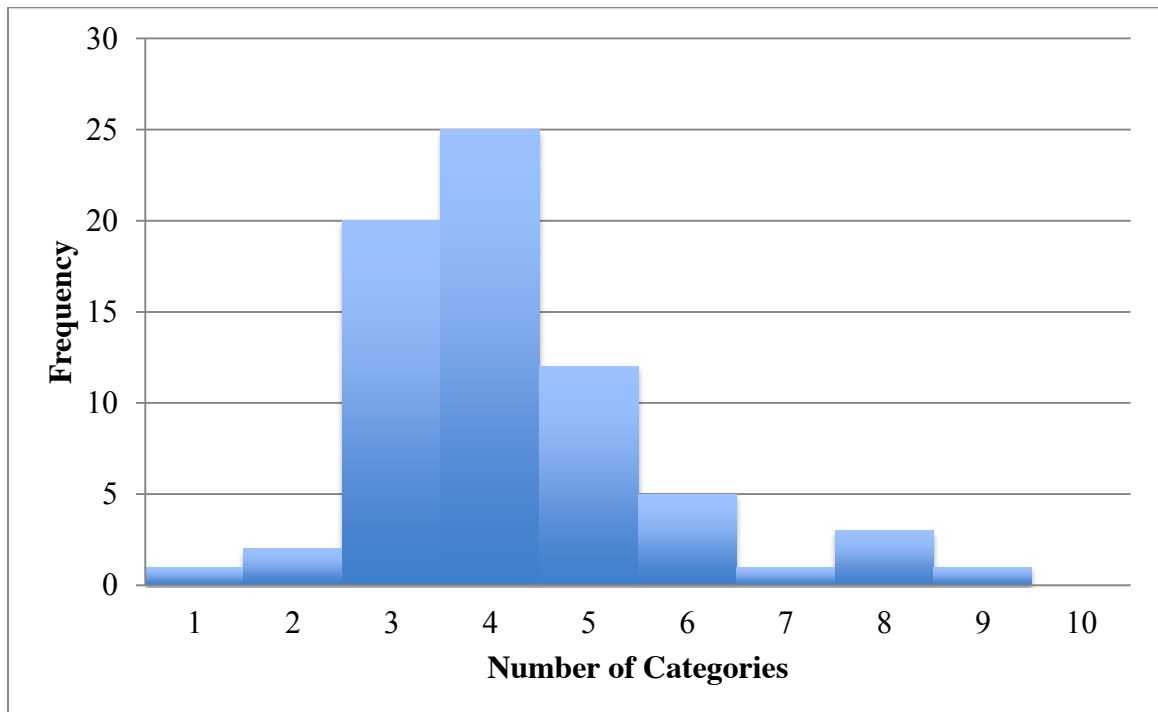
Before conducting Study 1, I ran a short pilot study to examine the extent to which people vary in the number of distinctions they make among mobile apps. Seventy participants were presented with 10 examples of real mobile phone apps sampled from TIME Magazine's list of the top 50 iPhone apps of 2014 (Aamooh, Newman, & Peckham, n.d.). An example of the information presented to participants is located in Appendix D.¹² The participants were then asked to freely categorize the apps according to their similarities and differences, using as many or as few categories as they deemed necessary.

Results from this pilot showed substantial variation in the number of categories used to make distinctions among the apps. As shown in Figure 1, the variation in

¹² In addition, participants saw images of each application's design and layout.

distinctions made approximates a normal curve, with a mode of four categories used to distinguish between the apps. This pilot establishes that people do vary in the extent to which they make distinctions among existing technologies, and this variation is theorized to have a causal effect on opportunity identification.

Figure 4.3 Pilot Variation in Categorization of Mobile Apps



Study 1

Study 1 was designed to establish the main effect of distinction-making on a person's ability to identify opportunities as manifested by the creation of new technologies. My primary hypothesis was that people who make finer distinctions among existing technologies would be more likely to identify opportunities for new technologies, which I have called supply-side opportunities. I tested this hypothesis by

having participants categorize existing mobile phone applications (apps), and then attempt to identify opportunities for designing new apps.

Sample and Research Design

One hundred seventy-four (174) adults were recruited from Amazon Mechanical Turk to participate in a controlled experiment in exchange for financial payment. This data panel allows researchers to conduct surveys and experiments that are completed by panel members in exchange for Amazon.com gift card credits. Mechanical Turk has been shown to be conducive for social science experiments (Alter, Oppenheimer, & Zemla, 2010), and data collected through Mechanical Turk compares favorably with data collected through more traditional methods (Buhrmester, Kwang, & Gosling, 2011; Sprouse, 2011).

The participants were 58% female and their average age was 34 years. The mean level of full time work experience was 12 years, and 39% of respondents reported that they had entrepreneurial experience by having started at least one new venture in the past. The experiment used a two condition between-subjects design in which I manipulated distinction-making (low, high) and then asked participants to identify opportunities for new mobile phone applications.

Procedure and Manipulations

The study was introduced by explaining that researchers were interested in hearing participants' opinions about new mobile phone apps. Participants were presented with the same materials used in the pilot study. For the distinction-making manipulation, participants were presented with the same 10 examples again, and this time they were asked to categorize the apps into either two (low distinction-making) or five (high

distinction-making) self-generated subgroups. As part of the manipulation, all participants were required to briefly describe their rationale for sorting the apps into the groups that they did, as well as to describe the within-group similarities and between-group differences they identified. Finally, participants were asked to identify opportunities for designing entirely new mobile phone applications.

In the control condition, participants did not explicitly categorize the apps; they were directed to generate ideas for new apps immediately after reading about the 10 example applications.

Dependent Measures

Following extant research, I operationalized opportunity identification as the sheer number of opportunities a person identifies (Shepherd & DeTienne, 2005). The logic for this measure follows an evolutionary approach; the greater the number of opportunities a person identifies, the more likely one of those ideas will turn out to be both feasible and valuable (Staw, 2009). In this study, participants were instructed to use a different field on the Qualtrics survey form for each new opportunity they identified. Two research assistants independently confirmed that participants' use of different fields did, in fact, correspond to different opportunities identified. I summed the number of opportunities each participant reported to create a single measure of the number of opportunities identified.

Controls

Entrepreneurial experience. I controlled for entrepreneurial experience by asking participants to self-report the number of new ventures they had started in the past, which

explicitly included for-profit firms, non-profits, and other types of organizations. Thirty-nine percent of respondents reported having started at least one new venture in the past.

Entrepreneurial intentions. I measured participants' entrepreneurial intentions by asking "how likely are you to start a new firm within the next five years?" This approach follows Krueger et al.'s (Krueger, Reilly, & Carsrud, 2000) method of asking respondents to state their intent to start a new firm (1, "I certainly will not," to 9, "I certainly will"). This measure meets three conditions stipulated for using a single item: the item of interest is (1) unidimensional, (2) clear to the respondents, and (3) sufficiently narrow (Wanous & Hudy, 2001).

Prior knowledge. I used a four-item scale designed to test two different dimensions of prior knowledge (Grégoire & Shepherd, 2012). To measure prior knowledge of mobile applications, participants were asked to report their knowledge of (1) mobile phone applications and (2) the scientific and engineering principles underlying the mobile phone applications. To assess prior knowledge of the market for mobile applications, I asked participants to report their knowledge of (1) the market for mobile applications and (2) the problems facing this market and possible solutions to this problem. Participants answered each question on a scale anchored at 1, "minimal knowledge," and 7 "considerable knowledge" ($\alpha = .82$).

Finally, I controlled for participants' age, sex, and years of full-time work experience.

Results and Discussion

Means, standard deviations, and correlations for Study 1 appear in Table 4.2.

As depicted in Figure 2, mean comparison analyses showed the predicted effects of distinction-making on the number of ideas participants generated for creating new mobile apps. In support of Hypothesis 1a, participants in the low distinction-making condition identified significantly fewer new apps than participants in both the high distinction-making condition ($t(107) = -6.34, p < .001$) and the control condition ($t(116) = -5.03, p < .001$). Interestingly, there was no difference in the number of opportunities for new apps identified between participants in the high distinction-making and control conditions ($t(111) = .39, n.s.$). This finding could reflect the fact that people in the control condition varied in the extent to which they implicitly made distinctions among the example apps provided. Indeed, when asked to freely categorize the apps in the pilot study, participants generated a mean of four categories, a number similar to the manipulation of five categories in the high distinction-making condition. These results might also suggest that higher levels of distinction-making do not necessarily facilitate opportunity identification, but rather that low levels of distinction-making *hinder* opportunity identification.

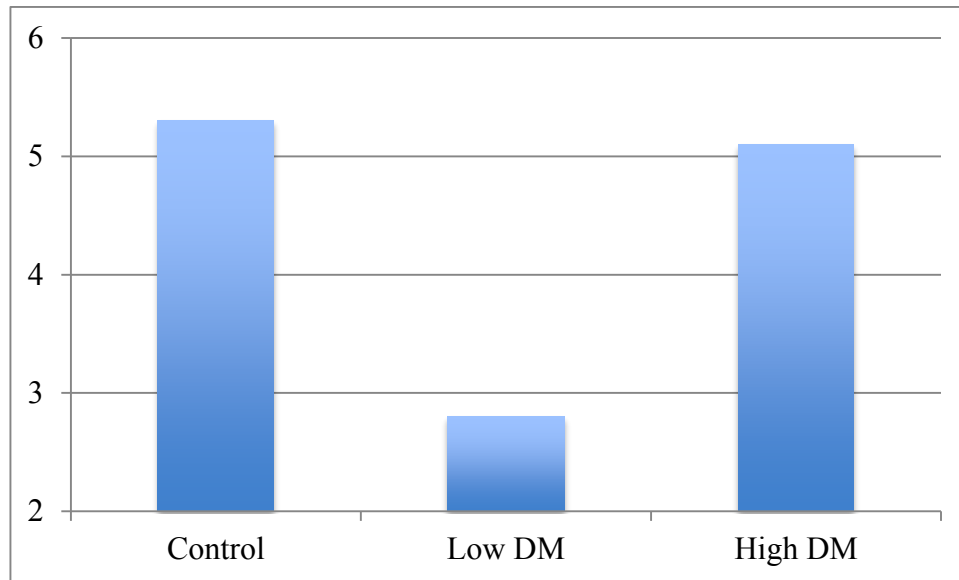
Table 4.2 Study 1 Means, Standard Deviations, and Correlations ^{a, b}

	Mean	SD	1	2	3	4	5	6	7
1. Number of Ideas	4.41	2.81	-						
2. Prior Knowledge	3.28	1.39	.07	(.82)					
3. Entrepreneurial Experience	.40	.49	.025	.13	-				
4. Entrepreneurial Intentions	3.70	2.55	.08	.46**	.50**	-			
5. Sex	1.58	.49	-.07	-.20**	-.05	-.16*	-		
6. Age	33.72	10.29	.13	-.26**	-.01	-.08	.07	-	
7. Work Experience	12.46	9.66	.07	-.20**	-.03	-.09	.07	.86**	-

^a Coefficient alphas appear across the diagonal in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$. Sample size = 174.

^b For sex, 1 = “male” and 2 = “female”.

Figure 4.4 Study 1 Number of Opportunities Identified by Condition



Additional analyses revealed no independent effects of entrepreneurial experience, entrepreneurial intentions, or prior knowledge on the number of opportunities participants identified for new mobile applications.

Although Study 1 established a main effect of distinction-making on the number of opportunities participants identified for creating a new technology, it did not examine the effect of distinction-making on the application of those technologies to the marketplace. In Study 2, I examine distinction-making as it relates to the application of three dimensional printing to the market for healthcare providers.

Study 2

The purpose of Study 1 was to establish the relationship between distinction-making and the identification of opportunities for new technologies. In Study 2, I examined the effect of distinction-making on identifying opportunities for applying

technologies to new markets. Specifically, I investigated the effects of distinction-making on identifying opportunities for applying three-dimensional printing (3DP) in the market for healthcare providers. I hypothesized that people who make finer distinctions among segments of the healthcare provider sector would be more likely to identify opportunities for applying 3DP in the healthcare industry. As Hypotheses 2a and 2b suggest, I also measure opportunity identification in two ways. First, like Study 1, I measured the number of opportunities participants identified. However, in order to capture participants' perceived fit between 3DP and the healthcare provider market, I also measured "opportunity beliefs," which I discuss in greater detail below.

Sample and Research Design

I conducted an experiment with 102 adults sampled from an online subject pool. Participants were 60% female and their average age was 41 years. The mean level of full time work experience was 19 years, and 48% of respondents reported having entrepreneurial experience by starting at least one new venture in the past. The experiment used a two condition between-subjects design in which I manipulated distinction-making (low, high).

Procedure and Manipulations

The study began by introducing 3DP as an emerging technology. Participants read a short article describing how the technology works, it's current stage of development, and the costs associated with using the technology (Petronzio, n.d.). For the *distinction-making* manipulation, participants were presented with nine segments from the Health Care and Social Assistance sector (sector 62) as defined by the North American Industry Classification System (NAICS). The NAICS is the standard used by

Federal agencies in classifying business establishments for the purpose of collecting and analyzing data related to the U.S. economy. Participants were presented with the information summarized in Appendix E. After being presented with this information, participants in the low distinction-making condition were asked to sort the nine industry segments into three groups of their own choosing based on the similarities and differences among the segments. Participants in the high distinction-making condition sorted the segments into six groups. As part of the manipulation, all participants were required to briefly describe their rationale for sorting the segments the way they did. Finally, each participant was asked to identify new opportunities for applying 3DP to the healthcare provider market.

Dependent Measures

As in Study 1, I measured the number of opportunities participants identified. In addition, I measured opportunity beliefs to capture the degree to which participants perceived a fit between the technology and the market, which was suggested in Hypothesis 2b.

Opportunity beliefs. I used the measure of opportunity beliefs developed and validated by Grégoire, Shepherd, and Lambert (2010b). This measure is based on research suggesting that in the early phase of entrepreneurial action, opportunity beliefs are primarily articulated along two dimensions: the fit between a new means of supply (e.g., a new product, service, technology or business model) and a potential target market, and the feasibility of introducing the new means of supply in that market. The dimension of *fit* reflects the notion that an opportunity's new "means of supply" has qualities that meet the needs and requirements of a target market (cf. Eckhardt & Shane, 2003).

Feasibility concerns beliefs that "an opportunity is seen as reasonably possible to achieve within a foreseeable future" (Grégoire, Shepherd, & Lambert, 2010b p. 122). These two measures – fit and feasibility – compose a single construct of opportunity beliefs. I adapted measures from extant research (Grégoire & Shepherd, 2012) to 3DP technology and the healthcare provider market, shown in Appendix F ($\alpha = .87$).

Controls

I controlled for participants' entrepreneurial experience, entrepreneurial intentions, prior knowledge of 3DP and the healthcare provider market, sex, age, and work experience.

Results and Discussion

Means, standard deviations, and correlations for Study 2 appear in Table 4.3.

There was a significant main effect of distinction-making on the number of opportunities participants identified for applying 3DP in the healthcare provider market. In support of Hypothesis 2a, participants in the high distinction-making condition identified significantly more opportunities than participants in the low distinction-making condition ($t(100) = 10.41, p < .001$). Similarly, there was no significant effect of distinction-making on the formation of opportunity beliefs.

Interestingly, while there was no effect of entrepreneurial experience on the identification of opportunities for new technologies in Study 1, entrepreneurial experience did have independent, significant effects on both the number of opportunities identified ($t(100) = 2.79, p < .01$) and the formation of opportunity beliefs ($t(100) = 2.17, p < .05$) in Study 2. Moreover, both entrepreneurial intentions ($t(100) = 2.22, p < .05$)

and prior knowledge of the 3DP and healthcare provider markets ($t(100) = 4.18, p < .001$) were significantly related to the formation of opportunity beliefs.

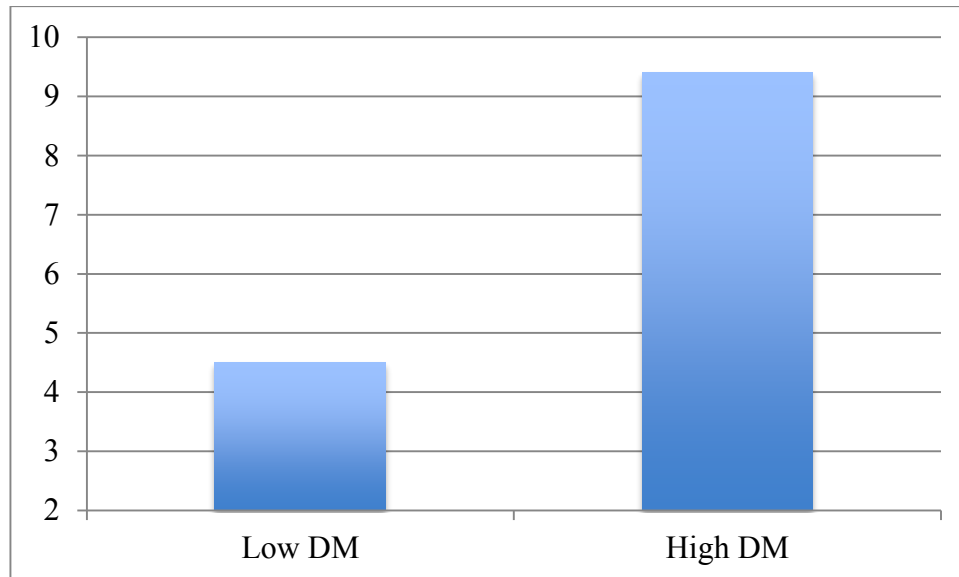
Table 4.3 Study 2 Means, Standard Deviations, and Correlations^{a, b}

	Mean	SD	1	2	3	4	5	6	7	8
1. Opportunity Beliefs	6.01	1.33	(.87)							
2. Number of Ideas	6.31	3.28	.17	-						
3. Prior Knowledge	2.93	1.12	.37**	.10	(.74)					
4. Entrepreneurial Experience	.48	.50	.21**	.27**	.17	-				
5. Entrepreneurial Intentions	3.51	2.41	.20*	.07	.22**	.39**	-			
6. Sex	1.61	.49	.10	-.10	-.12	.01	-.03	-		
7. Age	41.27	12.37	.11	.08	-.05	.22*	-.08	.23*	-	
8. Work Experience	18.74	11.29	.17	.11	-.02	.22*	-.01	.17	.86**	-

^a Coefficient alphas appear across the diagonal in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$. Sample size = 102.

^b For sex, 1 = “male” and 2 = “female”

Figure 4.5 Study 2 Number of Opportunities Identified by Condition



Study 3

Studies 1 and 2 were designed to test the main effects of my hypotheses concerning the relationship between distinction-making and opportunity identification. In Study 3, I returned to the field of mobile phone applications to test the competing mechanisms of domain-specific information processing versus a generalized processing style. Like Study 1, participants were tasked with identifying opportunities for new mobile phone applications. However, in the present study, half of the participants completed a distinction-making manipulation outside of the mobile app domain prior to identifying opportunities. This design was meant to test whether domain-specific information processing or a generalized processing style could explain the relationship between distinction-making and opportunity identification.

Sample and Research Design

One hundred twenty-three (123) adults were recruited to complete an online experiment using Qualtrics Panels in exchange for financial payment. The participants were 56% female and their average age was 40 years. The mean level of full time work experience was 18 years, and 42% of respondents reported that they had entrepreneurial experience by having started at least one new venture in the past. The experiment used a 2x2 between-subjects design in which I manipulated distinction-making (low, high) and the domain in which distinction-making took place (mobile apps, not mobile apps). I then asked participants to identify opportunities for new mobile phone applications.

Procedure and Manipulations

The study began by explaining that researchers are conducting a survey about categorization. Participants were divided into four groups: (1) low distinction-making, outside domain; (2) high distinction-making, outside domain; (3) low distinction-making, inside domain; (4) high distinction-making, inside domain. For the domain manipulation, participants in the “in domain” condition were asked to make distinctions among 60 iPhone apps taken from the same pool of apps in Study 1. In the “outside domain” condition, participants were asked to make distinctions among 60 different shape and color combinations. An example is included in Appendix G. I chose to use relatively abstract experimental materials in this prompt to avoid the potential endogeneity associated with using a different industry or sector.¹³

For the distinction-making manipulation, participants were presented with 20 apps (or colors and shapes, in the outside domain condition) at a time and asked to categorize

¹³ Although participants in the “outside domain” condition made distinctions among colors and shapes, they were presented with 20 examples of mobile phone applications before engaging in the opportunity identification task.

the apps into either two (low distinction-making) or five (high distinction-making) self-generated subgroups. Again, as part of the manipulation, all participants were required to briefly describe their rationale for sorting the apps into the groups that they did, as well as to describe the within-group similarities and between-group differences they identified. They did this three times consecutively, after which they had categorized a total of 60 items (60 mobile apps in the “in domain” condition; 60 color and shape combinations in the “outside domain” condition) Finally, participants were asked to identify opportunities for designing entirely new mobile phone applications.

Dependent Measures

As in Study 1, I measured the number of opportunities participants identified. In addition, I measured the innovativeness of the opportunities identified by participants.

Innovativeness. It has been previously suggested that it is important for research on opportunity identification to examine not just the existence of opportunities, but also their potential value (Fiet, 2002; Shane, 2000; Shepherd & DeTienne, 2005). Following extant research (Shepherd & DeTienne, 2005), I had independent raters evaluate the innovativeness of each opportunity identified by the participants as a measure of the potential value. Two raters were recruited from my pool of interviewees in the qualitative study reported in Chapter 3. One was an established entrepreneur who is currently considering investing in other nascent startups; the other was a manager in an established cyber-security firm who is familiar with mobile technologies, including mobile software and applications. Both raters volunteered their time after having participated in the qualitative portion of my dissertation.

The raters evaluated the responses independently and were blind to condition and hypotheses. The evaluation scale ranged from 1=not at all innovative, to 7=very innovative. The raters achieved a moderate level of reliability ($ICC(2) = .83, p < .001$). Since this is within conventional guidelines (LeBreton & Senter, 2008), I followed previous research and averaged the two coders' ratings to form a single measure for the innovativeness of each participant's opportunities. Examples of highly innovative opportunities include a retirement app that "shows how many days you still have to work every morning to end up with 7 million USD," and an app that "contacts you when medical appointments are delayed so you know before you go."

Controls

I controlled for participants' entrepreneurial experience, entrepreneurial intentions, prior knowledge of the technology underlying mobile apps, sex, age, and work experience.

Results and Discussion

Means, standard deviations, and correlations for Study 3 appear in Table 4.3.

As depicted in the figures below, mean comparison analyses again showed the predicted effects of distinction-making on the number of ideas participants generated for creating new mobile apps. In support of Hypothesis 1a, participants in the high distinction-making condition identified significantly more new apps than participants in the low distinction-making condition ($t(121) = 2.38, p < .05$). In addition, there was a significant main effect of domain on the number of ideas participants generated; participants who made distinctions among mobile apps (the "in domain" condition) identified significantly more opportunities than did those who made distinctions among

shapes and colors ($t(121) = 2.66, p < .01$). Despite these main effects, however, there does not appear to be a significant interaction between distinction-making and domain ($F(1, 119) = 0.13, p > .05$).

Similarly, in support of Hypothesis 1b, there were significant main effects of both distinction-making ($t(121) = 3.14, p < .01$) and domain ($t(121) = 3.65, p < .001$) on the innovativeness of opportunities identified by the participants. However, again, there does not appear to be a significant interaction between the two dimensions ($F(1, 119) = 1.71, p > .05$). Moreover, while individuals who reported having entrepreneurial experience did identify more opportunities compared to those with no entrepreneurial experience, the effect was not statistically significant ($t(121) = 1.41, p = .16$), and there was virtually no difference in the innovativeness of the opportunities entrepreneurs identified ($t(121) = 0.61, p = .54$).

Figure 4.6 Study 3 Number of Opportunities Identified by Condition

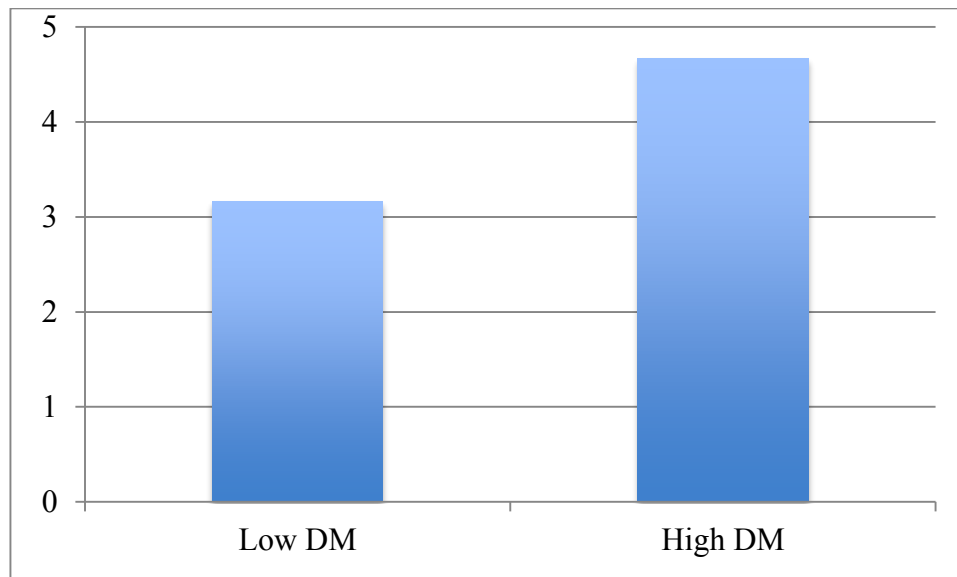


Figure 4.7 Study 3 Number of Opportunities Identified by Condition

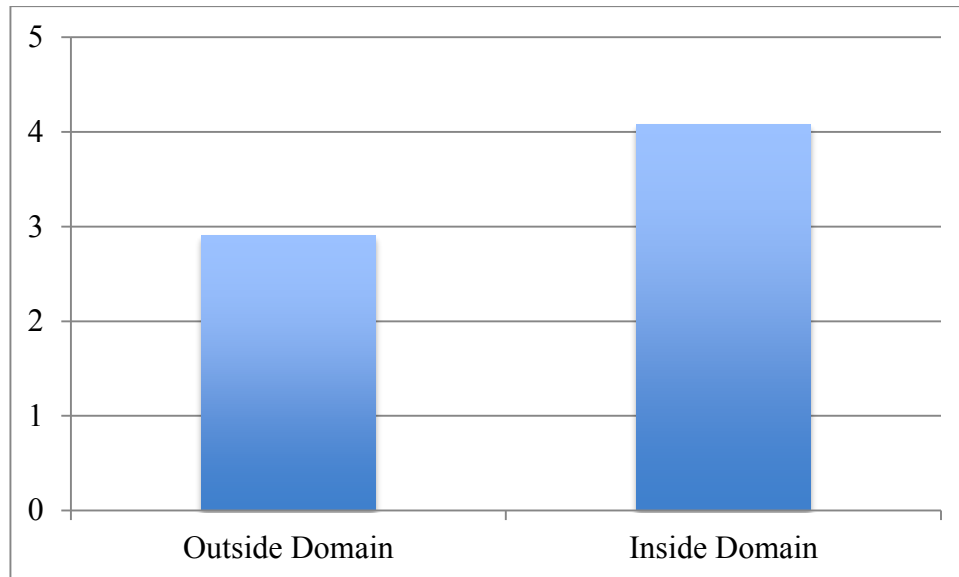


Figure 4.8 Study 3 Number of Opportunities Identified by Condition

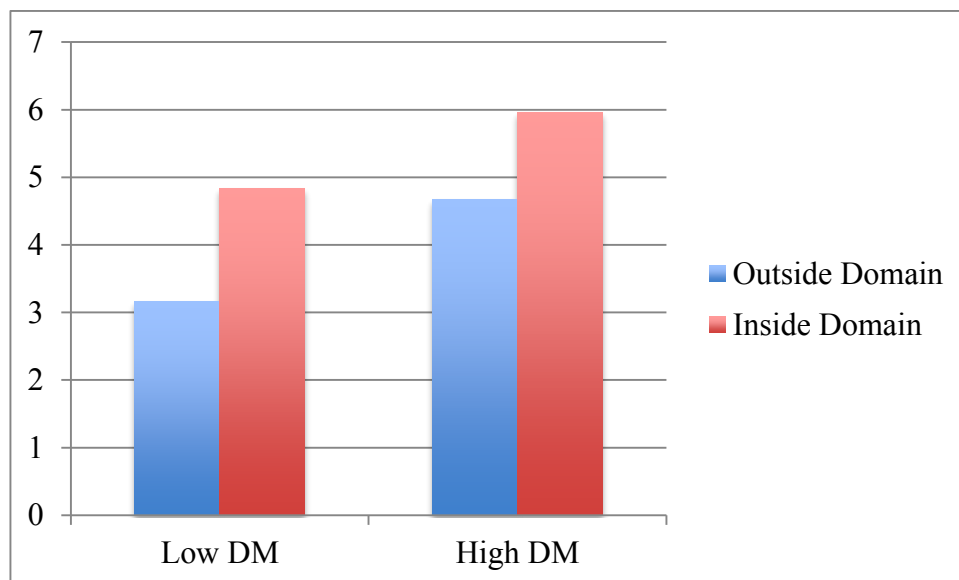


Figure 4.9 Study 3 Innovativeness of Opportunities Identified

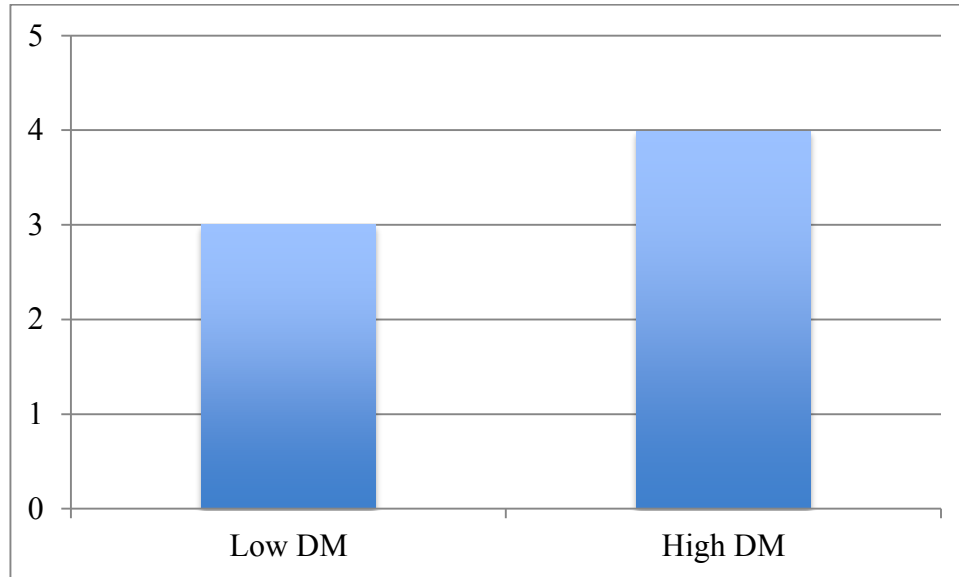


Figure 4.10 Study 3 Innovativeness of Opportunities Identified

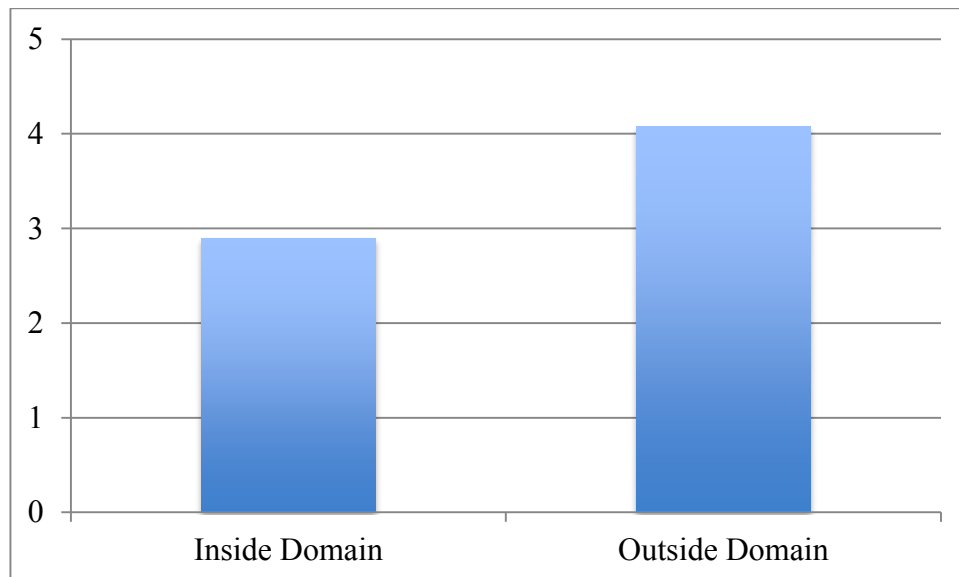


Figure 4.11 Study 3 Innovativeness of Opportunities Identified

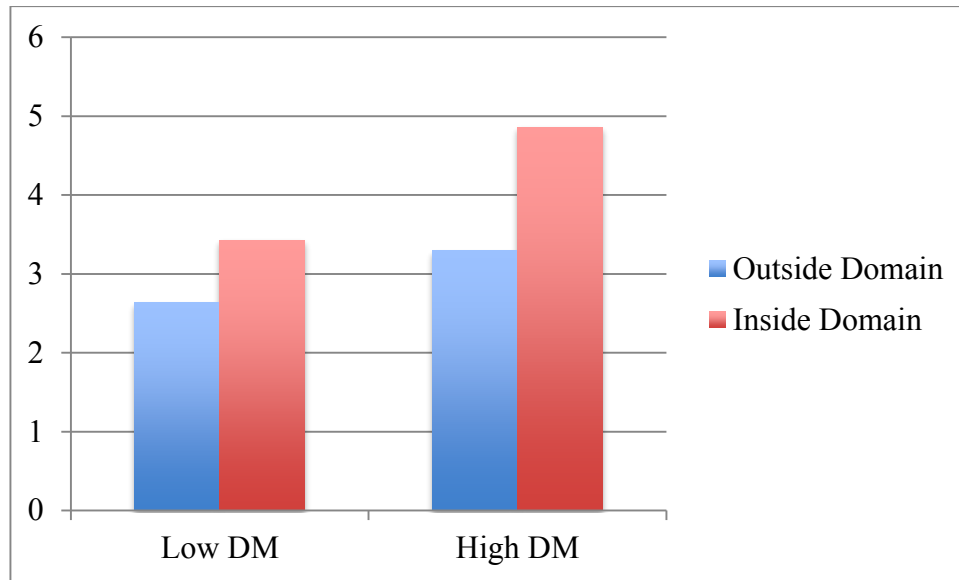


Table 4.4 Study 3 Means, Standard Deviations, and Correlations^{a, b}

	Mean	SD	1	2	3	4	5	6	7	8
1. Number of Ideas	3.22	2.39	-							
2. Innovativeness	3.20	1.71	.69**	-						
3. Prior Knowledge	2.71	1.19	.07	(.83)	-					
4. Entrepreneurial Experience	.42	.50	.15*	.08	.10	-				
5. Entrepreneurial Intentions	3.22	2.39	.05	-.02	.25**	.34**	-			
6. Sex	1.56	.49	.02	.02	-.13	.08	.12	-		
7. Age	39.60	12.53	.10	.19*	-.33**	.21**	-.10	.03	-	
8. Work Experience	18.31	11.93	.03	.12	-.27**	.28**	-.07	-.01	.92**	-

^a Coefficient alphas appear across the diagonal in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$. Sample size = 123.

^b For sex, 1 = “male” and 2 = “female”.

Summary

To summarize the results from the experimental studies reported above, there appears to be a significant main effect of distinction-making on the identification of opportunities for both new technologies and for the market applications of those technologies, thus providing support for Hypotheses 1a and 2a. In addition, results from Study 3 suggest that higher distinction-making is associated with the identification of more innovative opportunities for new technologies, supporting Hypothesis 1b. Study 2 showed no main effect of distinction-making on the formation of opportunity beliefs, my operationalization of perceived “fit.” However, people who self-reported having entrepreneurial experience in the past *were* more likely to form such beliefs. As a result, although Hypothesis 2b is not supported, there appears to be room for further investigation into the conditions under which fit between technologies and markets is perceived.

Hypothesis 3 predicted that there would be no difference in opportunities identified between people who made distinctions in the focal domain versus those who made distinctions in a different domain prior to identification. In other words, this hypothesis predicted that the effects of distinction-making on opportunity identification could be attributed to a generalized processing style rather than to domain-specific information processing. Study 3 found significant differences between participations who made distinctions inside versus outside the focal domain, where those in the “inside” condition not only identified a greater number of opportunities, but also opportunities that were independently rated as being more innovative. Thus, this research appears to

provide support the information-processing as the mechanism through which distinction-making impacts opportunity identification.

CHAPTER 5. GENERAL DISCUSSION

The purpose of this dissertation was to explore the cognitive processes underlying opportunity identification. Specifically, I asked the question “how do people identify opportunities?” I used qualitative interviews with both nascent and established entrepreneurs, managers in established firms, and individuals associated with business incubators to ground my theorizing. I argued that distinction-making is one cognitive process through which opportunity identification occurs. To date, this process has been unexamined in the literature on entrepreneurship. In addition, my theorizing suggests that distinction-making facilitates opportunity identification by enabling information-processing and creative recombination. I tested this theorizing across three experimental studies.

My qualitative interviews suggest that entrepreneurs and nonentrepreneurs alike view opportunities as technology-market combinations that can emerge through the creation of new technologies or through the application of existing technologies to new markets. Although many definitions of opportunities exist in the literature on entrepreneurship, this view is consistent with emerging research in entrepreneurial cognition suggesting the entrepreneurs identify opportunities by “matching” technologies and markets in new ways (Grégoire & Shepherd, 2012).

Moreover, my interviews suggest that entrepreneurs engage in distinction-making as a way to identify opportunities. Although other processes were clearly observed in my qualitative research, including analogistic thinking and recombination, the process of

distinction-making transcended the type of opportunity identified and the domain in which identification occurred. Indeed, both entrepreneurs and managers used distinction-making as a way of understanding the opportunities they discussed. However, as with much qualitative research, it is difficult to determine whether the process of distinction-making was a facilitator of opportunity identification in the first place, or if it is more of a post-hoc tool for making sense of past situations. Nonetheless, my qualitative research established that distinction-making has some role to play in the process of identifying opportunities, even if that role is only in developing beliefs that a particular situation does, in fact, constitute an opportunity.

My experimental research attempted to address this limitation by directly manipulating distinction-making and measuring its effects on opportunity identification. Across three studies, the data suggest that high levels of distinction-making enable the identification of greater numbers of potential opportunities. This pattern held using two different manifestations of opportunities: (1) opportunities for creating new technologies, and (2) opportunities for applying existing technologies in a new market. The number of opportunities a person identifies is one way of measuring opportunity identification (Shepherd & DeTienne, 2005), and this measure is based on the logic of an evolutionary approach. The greater the number of opportunities a person identifies, the more likely one of those ideas will turn out to be both feasible and useful (Staw, 2009).

In addition, my research suggests that higher levels of distinction-making are associated with the identification of more innovative opportunities, where innovative opportunities refer to those that are both new and potentially valuable. This relationship appears to operate through an information-processing mechanism by which distinction-

making enables the creation of new and different cognitive categories. Information from these categories is made cognitively available, which increases the likelihood that an individual will make novel associations and linkages that have never before been considered (Cohen & Levinthal, 1990; Shepherd & DeTienne, 2005).

This dissertation also finds that distinction-making, as a cognitive process that facilitates opportunity identification, is common among both entrepreneurs and nonentrepreneurs. As noted in Chapter 2, much research on opportunities either (a) focuses entirely on samples of entrepreneurs, or (b) assumes that entrepreneurs are fundamentally different from other people at the individual difference level. The experiments reported here suggest that there is not a clear difference between entrepreneurs and nonentrepreneurs in the sheer number of opportunities that they identify. However, Study 2 did find that people who have prior entrepreneurial experience might be more likely to form subjective beliefs that new technologies have potential to be introduced into the marketplace. In other words, entrepreneurs seem to be more likely to see a fit between a particular technology and a given marketplace. This finding could reflect higher levels of confidence or risk-taking behavior among entrepreneurs when evaluating decisions about whether to pursue opportunities. Consistent with prior work positing that the cognitive process of opportunity identification is different from the cognitive processes involved in evaluating opportunities (Grégoire, Barr, & Shepherd, 2010a; Haynie, Shepherd, & McMullen, 2009), this nuanced finding suggests that scholars should take care to distinguish between the cognitive processes associated with opportunity identification and the subsequent steps entrepreneurs might take in their attempts to exploit those opportunities.

Contributions

This dissertation contributes to two bodies of literature: entrepreneurship and social cognition. I argue that exploring the relationship between distinction-making and opportunity identification advances theory in both of these areas.

Contributions to the entrepreneurship literature

As noted in the introduction, opportunity identification is a critical, but understudied step in the entrepreneurial process. Although research on entrepreneurship continues to grow, our understanding of how people identify new opportunities remains relatively limited (Shane, 2012). Research on this early phase of entrepreneurship has been slow to progress for both theoretical and methodological reasons. Theoretically, the epistemological debate about the very nature of opportunities has fragmented research into realist and constructionist camps. That debate has manifested itself methodologically in a lack of consensus about how to measure and operationalize opportunity identification. Furthermore, existing empirical research on opportunity identification has largely relied on entrepreneurs and their own retrospective accounts of the opportunity identification process, which introduces many potential alternative explanations for this phenomenon.

My dissertation aims to address these limitations of previous research by explicitly adopting an evolutionary realist perspective (Alvarez et al., 2010). Although others have implicitly used the underlying logic of evolutionary realism (Shepherd & DeTienne, 2005), my dissertation uses this approach to theorize about opportunities for creating new technologies and identifying “fit” between those technologies and potential market applications. Additionally, using an exploratory sequential mixed methods design

(Creswell, 2013) enabled me to both build theory through qualitative research and to isolate distinction-making as a source of variation via experimental design.

Perhaps most importantly, distinction-making represents a new theoretical lens for understanding opportunity identification. While others have linked entrepreneurship to research on creative cognition (Dimov, 2007a; Gilad et al., 1988; Ward, 2004; Whiting, 1984), my dissertation suggests that distinction-making is a specific mechanism through which recombining knowledge and information can lead to opportunity identification. This extends psychological research on entrepreneurship, which has begun to shift its focus from individual differences to intra-psychic variation in explaining how people identify new opportunities.

Contributions to the social cognition literature

In addition to contributing to the growing literature on entrepreneurship and opportunity identification, my dissertation builds on a long history of research on social cognition. The notion the people categorize information to help them organize and make sense of their environments dates to the early years of modern psychology (Freud, 1937; James, 1911). The implications of cognitive categorization have been well-documented in areas such as prototype theory (Rosch et al., 1976), stereotyping (Djikic et al., 2008), and social identity theory (Tajfel & Turner, 1979). Building on existing research on mindfulness (Langer, 1989; Weick & Sutcliffe, 2006), I argue that an important implication of making distinctions among cognitive categories is that people can vary in the level of discriminant detail with which they perceive their environments.

I suggest that the level of discriminant detail with which people perceive their environments affects the way in which they think about and engage with those

environments. Here, I examined this phenomenon in the context of entrepreneurship and opportunity identification. However, granularity arguably affects cognition and behavior in any situation where cognitive categories are made salient. I will outline the implications of this suggestion more thoroughly when I discuss the future directions of this research.

Contributions to practice

In addition to its implications for research, this dissertation will contribute to practice by elucidating one way in which people can actively engage in opportunity identification. Existing research suggests that actively searching for opportunities – a relatively simple intervention – aids in their identification (Baron, 2006; Kaish & Gilad, 1991; Shane, 2003; Teach et al., 1989). Similarly, this dissertation suggests that actively engaging in distinction-making might enhance people’s ability to identify opportunities for innovative technologies and new market applications of those technologies. Both entrepreneurs and nonentrepreneurs (i.e., members of established organizations) can potentially benefit from distinction-making in their attempts to identify opportunities. Distinction-making also holds promise to impact other areas of practice, such as workplace creativity, where recombining information from different cognitive categories enables people to develop new ideas and ways of solving problems.

Limitations

Although this dissertation presents preliminary evidence that distinction-making facilitates opportunity identification, the results need to be considered in light of several limitations. While I identify distinction-making as one cognitive process underlying opportunity identification, it remains unclear why, and under what circumstances, a

person might engage in relatively higher or lower levels of distinction-making to begin with. Thus, future research could make meaningful contributions to our understanding of cognitive categories by examining the antecedents of distinction-making. For example, individual differences, such as cognitive complexity, might play a role in the level of granularity with which one is wont to engage in higher levels of distinction-making.

Similarly, situational mindsets likely influence a person's propensity to engage in distinction-making. Although my research suggests that distinction-making affects opportunity identification through domain-specific information processing, some type of generalized mindset could elicit distinction-making in the first place. Indeed, Langer (1989) suggests that mindfulness is a state of mind in which individuals create new cognitive categories to understand their environments rather than relying on pre-existing ones. Like mindfulness, there may be other mindsets which, when prompted by situational cues, can lead to higher levels of distinction-making.

It is also reasonable to examine distinction-making in environments that are characterized by highly institutionalized categories. For example, the degree to which an individual identifies with a particular institution and internalizes its category structure will likely impact the extent to which he or she makes finer distinctions among subcategories. Consider the political landscape in the United States. "Republican" and "Democrat" are highly institutionalized categories defining the political spectrum. However, the political spectrum can also be categorized in finer detail with categories such as "socialist," "Reagan democrat," "libertarian," "anarchist," and so on. Thus, the extent to which a person internalizes such categories, as well as the degree of

institutionalization of those categories, might affect the likelihood that a person will make distinctions among them.

Another limitation of this dissertation could be addressed by further empirical work. Although at least one finding in the samples above appears to be unique to entrepreneurs (opportunity beliefs surrounding the application of 3DP to the healthcare market), this paper does not examine the interactive effects of entrepreneurial experience, entrepreneurial intentions, or prior knowledge of a marketplace with distinction-making. While research at the psychological level historically has emphasized individual differences in explaining why some people are better able to identify and exploit new opportunities compared to others (Shane, 2000), increasing attention is focused on examining the underlying cognitive processes that enable opportunity identification. In the future, the literature on entrepreneurship could be extended by explorations into the interactive effects of relatively stable individual characteristics and deliberate cognitive processing such as distinction-making.

Finally, this paper focused on opportunity identification as a discrete occurrence. My purpose in focusing on this initial stage was two-fold. First, I attempted to isolate distinction-making from other cognitive processes that might be associated with entrepreneurial behavior. Second, entrepreneurship is a path-dependent process that unfolds from the foundation laid in the early stages of opportunity identification. Thus, the initial identification of an opportunity is consequential for the remainder of the entrepreneurial process. In practice, however, entrepreneurship is an iterative progression in which people identify opportunities, seek feedback about those opportunities, and adapt those opportunities over time. More research is needed to

understand the implications of distinction-making as a repeated practice over the course of the entrepreneurial process.

Future research

My dissertation also paves the way for future research that holds the potential to make meaningful contributions to a number of different literatures. For example, as discussed above, an exploration into the antecedents of distinction-making might extend our understanding of individual differences, situational mindsets, and institutional identification. However, one area of future research is particularly exciting with regard to its potential for integrating distinction-making with existing theory.

Construal Level Theory

According to Construal Level Theory (Liberman, Trope, & Stephan, 2007; Trope & Liberman, 2010), psychological distance changes a person's mental representation of objects and events. The greater the psychological distance, the more likely objects and events are represented in abstract, general terms (high-level construal); the less the psychological distance, objects and events tend to be represented in relatively more concrete and detailed ways (low-level construal). To illustrate, consider a person thinking about a conference a year from now. He or she might think about the conference in terms of more superordinate goals, such as "learning about new research." Conversely, a person thinking about a conference that takes place tomorrow likely construes it in terms of more subordinate and concrete goals, such as "ironing one's pants."

Prior research has consistently shown that psychological distance facilitates creative thinking (Förster, Friedman, & Liberman, 2004; Jia, Hirt, & Karpen, 2009). For

example, Forster and colleagues (2004) found that high-level temporal construals enhance performance on a variety of tasks requiring creativity or creative insight. Participants were told to imagine their lives tomorrow (near future, low-level construal) or on a day 1 year from now (distant future, high-level construal). Compared to participants in the low-level construal condition, participants in the high-level condition demonstrated better mental and visual insight (Studies 1, 2 and 3) and generated more creative responses (Studies 4 and 5). More recently, Jia, Hirt and Karpen (2009) found similar effects for high-level *spatial* construals. Participants were asked to complete a task developed in a nearby location (low-level construal) or in a distant place (high-level construal). Consistent with Forster et al. (2004), spatial distance enhanced the generation of creative responses.

The underlying assumption in this stream of research is that cognition becomes more abstract when individuals are induced into higher-level mental representations, and creativity has generally been thought to benefit from abstract thinking (e.g., Finke, 1995; Ward, 1995). However, my dissertation suggests the opposite effect. Whereas abstraction refers to the creation of super-ordinate categories that subsume more fine-grained categories, distinction-making is a process of specification. That is, as one makes finer distinctions among categories of information, that information becomes more concrete in nature. My research suggests that distinction-making, and thus concrete thinking, leads to the identification of more innovative opportunities.

Future research should more explicitly examine the relationship between Construal Level Theory and distinction-making. Perhaps distinction-making is its own construct, entirely independent from cognitive construal. Alternatively, it is conceivable

that distinction-making is a mechanism for specification. Moreover, both the research reported in this dissertation and existing research on construal levels focus on *either* abstract or concrete thinking. Additional research should consider the very real possibility that individuals iterate between abstraction and specification, and that such frame-switching can have measurable effects on creativity and opportunity identification, as well as variables in other domains.

Concluding remarks

Entrepreneurial activity is growing across the globe. People are increasingly pursuing their own for-profit ventures, but there is also emerging interest in related processes like social entrepreneurship and intrapreneurship in established organizations. Uncovering the factors that influence opportunity identification is critical to understanding these phenomena. And yet, existing research is relatively limited. This paper advances our understanding of opportunity identification by exploring distinction-making as a cognitive mechanism that enables the identification of opportunities for creating new technologies, and for applying those technologies to the marketplace.

making as a cognitive mechanism that enables the identification of opportunities for creating new technologies, and for applying those technologies to the marketplace.

APPENDIX A
Review of Empirical Research on Opportunities

<i>Author(s)</i>	<i>Year</i>	<i>Definition/Depiction of Opportunities and Entrepreneurs</i>	<i>Study Design</i>	<i>Findings</i>
Gruber, MacMillan, & Thompson	2013	“If we can discover what determines entrepreneurial ideas about what the firm can and cannot do, that is, what determines the nature and the extent of the ‘subjective’ productive opportunity of the firm, we can at least know where to look if we want to explain or to predict the actions of particular firms” (Penrose, 1959)	Face to face interviews with 396 German and 100 British founders of technology ventures	Industry experience in founding team is positively related to both the number and variety of opportunities identified in new firm creation. Technological experience benefits the variety of opportunities identified, but not the number of opportunities identified.
Gregoire & Shepherd	2012	Opportunity beliefs take shape through cognitive efforts to make sense of potential "matches" between new means of supply (i.e., new products, services, technologies, or business models) and the markets in which these new means of supply can be introduced.	98 U.S. entrepreneurs in biological, medical, and life sciences; replicated with second sample of 51 entrepreneurs from more diverse industries	Superficial and structural similarities characterizing different opportunity ideas affect the initial formation of opportunity beliefs. Entrepreneurs’ opportunity beliefs are most positive when superficial and structural similarities are high between technologies and markets.
Gruber, MacMillan, & Thompson	2012	<i>A productive opportunity set</i> “comprises all of the productive possibilities that its ‘entrepreneurs’ see and can take advantage of” (Penrose, 1959)	Survey of founders or 133 VC-backed firms	Education level, management experience and prior entrepreneurial experience among founding team members are positively associated with the number of opportunities considered for pursuit. Technological and marketing experience are negatively associated with opportunities considered.
Gregoire, Barr, & Shepherd	2010	Opportunities are courses of action that seek to derive benefits from these changes - the development of new knowledge by individuals and organizations, changes in the behavior of relevant actors in the economy (e.g., competitors, consumers, suppliers, institutions, etc.), or wide-ranging changes in the macroenvironment (e.g., market saturation, deregulation, business cycles, etc.)	Verbal protocol study with 9 executives who had new venture founding experience	Opportunity identification involves cognitive processes of structural alignment

Gregoire, Shepherd, & Lambert	2010	<i>Opportunity beliefs</i> are “subjective beliefs that an opportunity exists for the willing and able” (Grégoire, Shepherd, & Lambert, 2010b)	Three experiments with (1) 9 experienced entrepreneurs (2) 6 experienced entrepreneurs and 24 business Ph.D. students (3) 148 entrepreneurs	Opportunity-recognition beliefs are captured by two related, yet distinct dimensions: (a) the degree of alignment between an opportunity’s means of supply and target markets and (b) perceptions of an opportunity’s general feasibility
Ucbasaran, Westhead, & Wright	2009	Opportunities involve creation or purchase of a business	Survey of 637 British business founders/owners	Experienced entrepreneurs identified more opportunities and exploited more innovative opportunities with greater wealth creation potential. An inverse U-shaped relationship was detected between the proportion of failed businesses and the number of opportunities identified
Haynie, Shcpherd, & McMullen	2009	Opportunities are evaluated based on future value	Conjoint analysis experiment with 73 entrepreneurs	Entrepreneurs are attracted to opportunities that are complementary to their existing knowledge resources
Dyer, Gregersen, & Christenson	2008	Starting an innovative business involves recognizing, discovering, or creating opportunities	Survey of 72 entrepreneurs and 310 executives	An individual’s ability to generate novel ideas for innovative new businesses is a function of questioning, observing, experimenting, and idea networking behaviors
Eddleston, Kellermanns, & Sarathy	2008	Opportunities result from technological innovation, and industries vary in opportunity richness	Survey of 74 family firms	The positive relationship between reciprocal altruism and family firm performance is stronger in environments rich with technological opportunities
Gartner, Shaver, & Liao	2008	Opportunities “are perceived as positive situations that are controllable” (p. 304)	438 nascent entrepreneurs from the Panel Study of Entrepreneurial Dynamics (PSED)	Entrepreneurs attributed the opportunities they exploited to their abilities and efforts
Gruber, MacMillan, & Thompson	2008	Market opportunities emerging from a new technology, and thus the generality of a technological competence depend on people’s efforts in technological competence building and market opportunity identification (Penrose, 1959)	Survey of 142 founders of VC-backed firms; archival performance data of those firms	New firms that considered more than one market opportunity prior to first entry generated significantly higher revenues
Hmieleski & Baron	2008	The opportunity discovery context is characterized by risk, while the opportunity creation context is characterized by uncertainty	Survey of 201 entrepreneurs	An entrepreneur’s self-regulatory mode has implications for the success of opportunity exploitation in dynamic environments; in dynamic environments, a promotion focus enhances performance, whereas a prevention focus reduces performance

Mitchell, Mitchell, & Smith	2008	Opportunities are created	Survey and interview data from 220 entrepreneurs	Past failure positively influences the new transaction commitment mindset and keeps opportunity formation processes flexible while commitment emerges
Bingham, Eisenhardt, & Furr	2007	Abundant opportunities imply opportunities are discovered and captured	Interviews and secondary data on 67 country entries by 12 entrepreneurial technology firms	Past experiences result in decision-making heuristics, which allow opportunity capture and improve subsequent performance
DeTienne & Chandler	2007	Opportunity identification involves both recognized and created opportunities for creating a new venture	Quasi-experiment with 95 undergraduate business students and a survey of 189 entrepreneurs in 2 high-technology industries	Although men and women use unique stocks of human capital and exhibit difference processes of opportunity identification, there are no differences in the innovativeness of the opportunities identified by each gender
Dimov	2007	Opportunities begin as ideas; they are intuited and interpreted by individuals	Online experiment with 95 MBA and undergraduate students	Intention to exploit an opportunity is driven not only by how much knowledge individuals have of the opportunity domain but also on whether their learning style matches the situation at hand
Gruber	2007	Opportunities are exploited by the creation of new firms	Online survey of 142 founders of VC-backed firms	Planning aids opportunity exploitation
Ozgen & Baron	2007	Opportunities involve the creation of new firms; individuals vary in their alertness to such opportunities	Survey of 201 IT company founders	Mentors, informal industry networks and participation in professional forums are positively related to opportunity recognition
Baron & Ensley	2006	Opportunity recognition is the process through which ideas for potentially profitable new business ventures are identified by specific persons (Kirzner, 1997; Shane, 2003)	Open-ended survey questions with 88 experienced entrepreneurs and 106 novice entrepreneurs	The cognitive representations of opportunities of experienced entrepreneurs differ from those of novice entrepreneurs. Pattern recognition is a key component of opportunity recognition.
Cliff, Jennings, & Greenwood	2006	Opportunities involve the creation of new firms that vary in terms of their innovativeness	Survey of 60 law firm founders in Vancouver	Founders with extensive experience in the industry's core firms establish imitative firms, whereas founders with greater experience in the industry's periphery establish innovative firms

Arenius & De Clercq	2005	An important reason for why some people are more likely to be exposed to new information and therefore to perceive entrepreneurial opportunities results from the different structure of the network they are embedded in	Survey of 3,102 Belgian and 1,434 Finnish adults via the Global Entrepreneurship Monitor	Network cohesion is negatively related to entrepreneurs' perceptions of opportunities
Mullins & Forlani	2005	Opportunities involve the creation of new firms that vary in terms of risk	Two experiments involving 75 founder CEOs of fast-growing public firms	The likelihood and the magnitude of loss/gain influence an entrepreneur's choice of new venture opportunities
Shepherd & DeTienne	2005	Differences in knowledge allow individuals to identify opportunities	Experiment with 78 MBA students	Prior knowledge of customer problems directly affects the quantity and quality of opportunities identified, and moderates the effect of financial reward on opportunity identification
Choi & Shepherd	2004	Opportunities exist when there is customer demand for a new product and are exploited by venture creation	Experiment using 55 entrepreneurs housed in incubators	Entrepreneurs are more likely to exploit opportunities when they perceive more knowledge of customer demand for the new product, more fully developed necessary technologies, greater managerial capability, and greater stakeholder support
Wiklund & Shepherd	2003	Environmental dynamism is related to opportunities	Survey of 326 CEOs of Swedish small businesses (multiwave)	Environmental dynamism enhances the effect of a small business manager's growth aspirations
Randoy & Goel	2003	Opportunity exploitation requires financing	Archival data on 68 Norwegian SMEs	Firms with founder leaders face different agency contexts than firms with non-founder leaders
Shane	2001	Firm formation is a method of opportunity/invention exploitation	Archival data on 1,397 patents issued to MIT between 1980 and 1996	Inventions are more likely to be exploited through firm formation when (1) the technical field is young and (2) the market is relatively segmented
McCline, Bhat, & Baj	2000	Entrepreneurs are unique as "opportunity finders"	128 nurses registered nurses, some employed, others self-employed (entrepreneurs)	Entrepreneurial Opportunity Recognition (EOR) appears to be a useful attitudinal tool for classifying entrepreneurs and nonentrepreneurs
Shane	2000	Entrepreneurial opportunities are opportunities to bring into existence new goods, services, raw materials, and organizing methods that allow outputs to be sold at more than their cost of production (Hayek, 1945)	Detailed case studies of eight new ventures exploiting a single MIT invention	People are not equally likely to discover opportunities from technological change. Entrepreneurs "discover" rather than search for opportunities. Prior knowledge determines who discovers opportunities

Schwartz & Teach	2000	An entrepreneur informally and intuitively perceives an opportunity, based upon some "feel" for the market While ideas may be ad hoc, opportunities are not	68 businesses from the National Business Incubator Association	Factor analyses indicated that opportunity recognition and exploitation can be effectively modeled and the model remained relatively constant over time, although there are firm type and industry specific differences in the application of model strategies. (Specific elements of model not discussed.)
Singh, Hills, Lumpkin, & Hybels	1999	<i>New venture idea</i> : when someone first thinks of a possible new venture <i>New venture opportunity</i> : when someone has evaluated a new venture idea	256 founders of IT consulting firms	Network size and the number of weak ties in an entrepreneur's network were significantly and positively related to both the number of new venture ideas identified and opportunities recognized
Thakur	1999	Opportunities exist as a result of demand and supply gaps, price differences, technology substitution, or innovation	Case studies of 50 Indian entrepreneurs	Access to resources limits range of opportunity choice
Hills & Shrader	1998	<i>Opportunity recognition behaviors</i> : (1) founding companies; (2) starting a major new part of a business; (3) acquiring a new type of business	53 members of Chicago Area Entrepreneurship Hall of fame; 187 survey respondents who had demonstrated at least one of the behaviors	Entrepreneurs were found to be less likely to identify their opportunities from public information such as magazines, newspapers, and trade publications; rather, they actively sought such information in more unique sources, such as personal contacts and more specialized publications
Hills, Lumpkin, & Singh	1997	Opportunity recognition is "either a) perceiving a possibility to create new businesses, or b) significantly improving the position of an existing business, in both cases resulting in new profit potential"	Mail survey of 190 entrepreneurs	Exploratory factor analysis distinguished three "types" of entrepreneurs: (1) solo entrepreneurs, (2) network entrepreneurs, and (3) informal entrepreneurs
Busenitz	1996	An entrepreneur is (a) a founder of existing business and (b) currently involved in that business or another startup	Survey research via interviews and mail questionnaires with 176 newly emerging firms in a single state	Entrepreneurs exhibit more general alertness than do managers by spending more non-business time searching for opportunities and ideas

Zahra	1996	Opportunities arise due to differences across industries in their technological innovations and research and development expenditures	Archival and survey data of 138 Fortune 500 firms	The level of perceived technological opportunities moderates the relationships between corporate governance and institutional ownership with corporate entrepreneurship
Amit, Muller, & Cockburn	1995	Exploiting opportunities involves self-employment and entails costs	Survey of 352 new entrepreneurs through Canadian Labor Market Activity Survey	Opportunity costs are negatively related to opportunity exploitation
Hills	1995	Opportunity recognition manifests itself in the behaviors of entrepreneurs, small business owners, corporate managers, and general public	Survey of 100 entrepreneurs inducted into UIC Entrepreneurship Hall of Fame	“The most fundamental finding is that the entrepreneurs strongly see themselves as having a special alertness to opportunity. At the same time, more than half agree that ideas are a dime a dozen--evaluation is the key”
Bhave	1994	The entrepreneur locates an opportunity, accumulates resources, markets products and services, and builds and organization	Interviews with 27 business founders in upstate New York	Entrepreneurship is a multidimensional phenomenon, and there is little agreement on common dimensions characterizing it. This paper develops a process model suggesting the use of business concept, production technology, and product as the preliminary set of core dimensions
Patterson	1993	Opportunities are fleeting	Archival data for 151 firms across 6 industries	The ability to exploit opportunities decreases with industry age
Gaglio & Taub	1992	Entrepreneurs are founders of growth-oriented venture	10 new venture founders 10 corporate marketing managers	When presented with an ambiguous business situation and asked to search for new business opportunities or ideas new venture founders and corporate managers appeared to approach the task differently. This suggests entrepreneurs might have a unique set of cognitive skills and strategies
Davidson	1991	Objective opportunities and perceived opportunities are distinct	Survey of 400 small Swedish firms	Industry characteristics, geographic dispersion, and competitors determine <i>objective</i> opportunities; objective opportunities, perceived external obstacles, entry barriers and growth potential determine <i>perceived</i> opportunities

Kaish & Gilad	1991	Entrepreneurial opportunities come from readiness to recognize disequilibrium (market gaps) when it is encountered	Survey of 51 founders of companies from SBA list and 36 executives of a large financial firm	Entrepreneurs spent more time searching for information in their off hours, employed different information sources than executives and paid special attention to risk cues about new opportunities
Jennings & Seaman	1990	Opportunities arise through industry deregulation and are exploited by new business activities	Archival data on 80 Texas savings and loan institutions	Organizations with prospector strategies and organic structures pursue more opportunities than organizations with defender strategies and mechanistic structures
Teach, Schwartz, & Tarpley	1989	First market opportunities are identified by founders of new firms	Field survey of firms listed in DataPro, a publication that lists software developers	Four types of first market opportunity identification were found among new venture founders: (1) deliberate search, (2) formal planning and evaluation, (3) developing ideas during personal time, (4) accidental
Peterson	1988	Purpose of study was to examine how small business owners come up with new produce ideas	Survey of 483 small business institute clients	Unstructured and unplanned processes, such as reliance on inspiration and spontaneous thoughts, are relatively common in the small business arena
Jackson & Dutton	1988	"Threat" and "opportunity" represent two schemata that are commonly used by organizational decision makers as they scan their environments and choose how to respond	78 participants in executive training courses; 83 MBA alumni from a large university	Opportunities are positive issues. There is a high potential for gain without loss and successful resolution of such issues is considered likely; feelings of control are likely to be high because resources are available for resolving the issue; in addition, respondents associated opportunities with feelings of being qualified, having autonomy to take action, and having the freedom to decide whether to act.
Long & McMullan	1984	Entrepreneurial opportunities are new production functions	In-depth interviews with four founders; survey of 51 venture founders	The opportunity identification process has four stages including pre-vision, point of vision, opportunity elaboration, and the decision to proceed.

APPENDIX B

Semi-Structured Interview Protocol

Interview Guide

Current business

- Please describe your work. What is your background and what do you do now?
- What is your startup business?
 - What services/products does your business provide?
 - What is the mission of your business?
 - What do you spend most of your time doing these days?
 - Operations (e.g., physically making the product)?
 - Strategy (e.g., planning for the future of the business)?
 - Other?
 - Where do you plan to go in the future?
- How does your business fit into the broader landscape of products and services in the area?
 - How is your business/product/service different from what already exists?
 - Were these differences clear when you first came up with your idea, or did they emerge later?
 - How is your business/product/service similar to other businesses that already exist?
 - Were the similarities clear when you first came up with your idea, or did they emerge later?
- What opportunities do you see for your business as it grows and develops?
- What threats do you see for your business as it grows and develops?

Opportunity Identification

- Please tell me how the business got started.
- How did you get the idea for your business?
 - Probe:
 - Did you see unmet demand for your product or service?
 - Do you have a personal passion for your work that other organizations did not fulfill?
 - Did the idea strike you in a particular moment, or did it emerge over time?
 - Tell me about that moment (or that process of emergence).
- Can you think of one or a few moments of your life that were critical for the beginning of this idea?
- What were you doing before starting this new venture?

- How, if at all, did your previous experiences (personal and/or professional) influence the creation of your business/idea?
- Have you founded or been involved in other entrepreneurial ventures before?

Entrepreneurial motivation

- Why did you decide to pursue a new opportunity rather than a job in an established organization?
- Why did you decide to pursue this particular opportunity?
 - Did you see other opportunities that you could have pursued?
 - What was different about those opportunities compared to the one you're currently pursuing.
- What were your expectations about life as an entrepreneur in the beginning? Do you think your expectations were met?

Feedback and adaptation

- How has your idea/business changed over time?
- What is the reaction from other people when you tell them about your business?
 - Friends and family?
 - Customers?
 - Suppliers?
 - Investors?
 - Competitors?
 - Other entrepreneurs?
 - Strangers?
 - Others?
- How, if at all, have you incorporated feedback from other people?
 - Do you value/incorporate some peoples' opinions more than others?
 - Why?

APPENDIX C
Sample of Coded Data

Opportunity	Technology	Market	Identification Processes
A mobile phone application that collects notes a person writes to oneself from emails, text messages, note-taking application, etc.	Existing mobile phone and software technology. (New to the extent that new software code had to be written)	Existing mobile phone market, for example via Apple's App store	<p>Distinction-making: "How is writing a note to yourself via email different from using the 'notes app'?"</p> <p>Recombination: "Combining the centrality of a notes app with the convenience of writing notes from different locations in text messages or emails."</p>
Gourmet bakery in an economically challenged and underserved community	Existing	New	<p>Distinction-making: "looking at the food market and the similarities and differences of food providers in [the city], there was a gap for high end baking"</p>
New industrial machine	New	Existing	<p>Distinction-making: "Explaining to potential customers how this machine is different from what they're currently using"</p>
New software that enables people on social networking sites to send colleagues targeted articles or items of interest	New (software application)	Existing (social networking sites)	<p>Analogistic thinking: "Fitbit for babies"</p>

APPENDIX D
Study 1 Mobile Application Information from TIME Magazine

Mobile Application	TIME Description
All Recipes	All Recipes' "dinner spinner" angle lets you shake your iPhone to roll random meals based on dish styles, ingredients and "ready in" categories. All Recipes has thousands of user-submitted recipes of all styles. The menu planner alone is invaluable: assign recipes to days of the week, tweaking servings as you like, then add them to your shopping list, and presto, All Recipes assembles a checkable list, sorted by grocery store section and in precise quantities that synchronizes with your iPhone in lieu of having to scribble items down by hand.
Backdrops	Most iPhone users probably have plenty of backgrounds to choose from just by pulling from photo rolls of family and friends, but if you want access to some of the highest quality images on the web, taken by professional photographers, Backdrops is a must. It links to InterfaceLIFT, arguably the finest editor-managed retina-quality image repository online — updated regularly — then lets you browse by metrics like date, popularity, location and artist.
Beer Buddy	Use the \$4 Beer Buddy app to scan the UPC code on a bottle, can or case of beer and you'll get instant info about its alcohol content, tasting notes and ratings from RateBeer.com. And if you find yourself drinking a beer you really like, rank it and add it to your favorite's list so you can make sure to order another one (or several) in the future.
Google Translate	Google Translate does exactly what you'd think: Plug in some words — either by voice, text or handwriting — and the app can translate it into 80 other languages. You can also bookmark specific translations for quick offline access so you'll never have trouble finding a bathroom in a foreign country.
Kayak	Finding flights is generally about as fun as having your teeth worked on by a far-sighted dentist with the shakes. Kayak makes the experience (finding flights, not the dentist) bearable by returning clean, organized, deep results from the various airlines. You can book hotels and car rentals, too, and the app gives you quick access to flight info and customer support numbers.
Mint	Your various banking institutions and credit card companies may each have their own apps, but Mint.com's app ties them all together and adds up your income and debt so you can put an exact number on the soul-crushing feeling of being constantly in the hole. There's hope, though: The app helps you set a budget for yourself, tracks your spending and presents you with money-saving offers on financial services.
OpenTable	OpenTable helps you skip all the nonsense of trying to make a restaurant reservation over the phone and get right to the point: what's nearby, which times are available, and how are the reviews? Potential eateries can be filtered by cuisine, distance, price and more. Once you find a restaurant that looks good and has an available table, tap to reserve it. Done and done.
Quick Scan	No smartphone owner should ever be without a good price-scanning app. Quick Scan uses your phone's camera to scan the bar codes of products you find in real-world retail stores, returning price comparisons from competing retailers and letting you purchase items directly if you find them online for cheaper.
Songza	Sometimes you don't want to put too much thought into your music. In that spirit, Songza offers up mood-based playlists cobbled together by music professionals. Stream a mix for working out or driving or unwinding or singing in the shower. The moods can get as specific as you like, and the service is free and unlimited if you're willing to put up with some ads here and there.
Waze	Waze is an incredibly useful app for anyone who spends a meaningful amount of time in the car. Aside from providing turn-by-turn GPS directions, you'll be alerted to speed traps, accidents and slowdowns up ahead of you thanks to data gleaned from other Waze users just like you. You can play the hero yourself, too, by reporting incidents along the way.

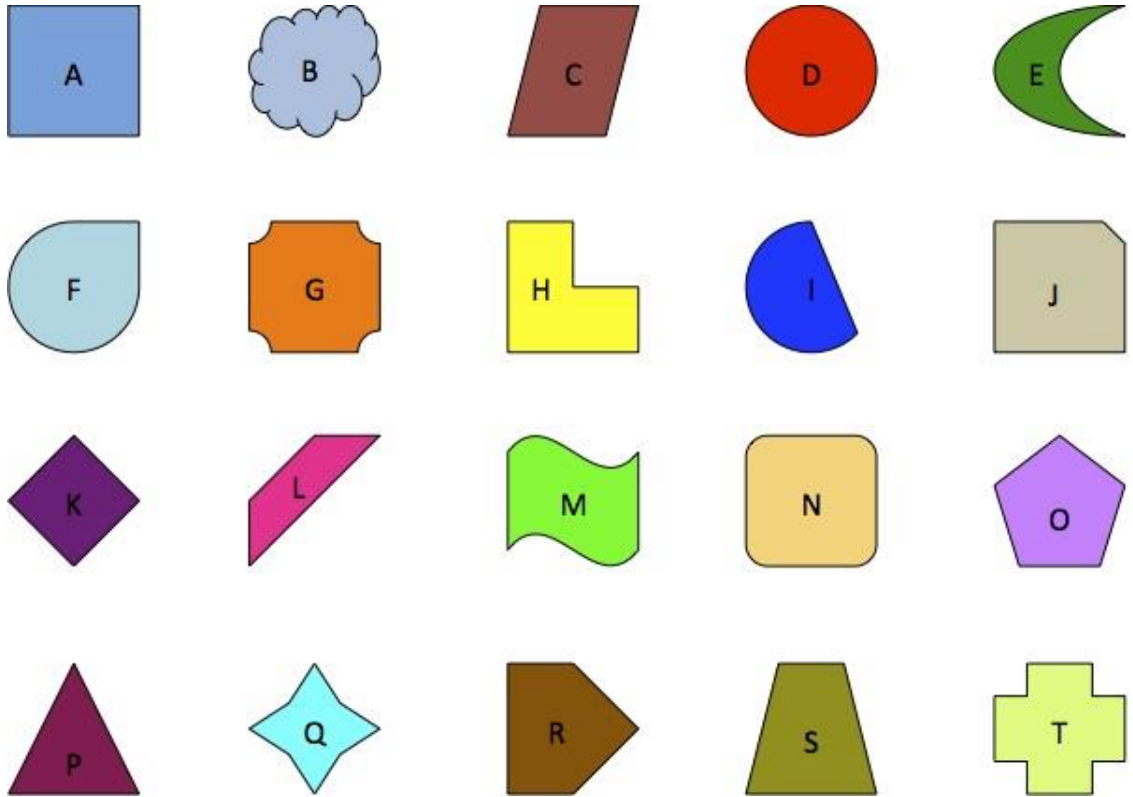
APPENDIX E
Study 2 NAICS Information

Industry Segment (NAICS code)	NAICS Description (2012)
Physicians (621111)	This industry segment comprises health practitioners having the degree of M.D. (Doctor of Medicine) or D.O. (Doctor of Osteopathy) primarily engaged in the independent practice of general or specialized medicine (e.g., anesthesiology, oncology, ophthalmology, psychiatry) or surgery.
Dentists (621210)	This industry segment comprises health practitioners having the degree of D.M.D. (Doctor of Dental Medicine), D.D.S. (Doctor of Dental Surgery), or D.D.Sc. (Doctor of Dental Science) primarily engaged in the independent practice of general or specialized dentistry or dental surgery. They can provide either comprehensive preventive, cosmetic, or emergency care, or specialize in a single field of dentistry.
Chiropractors (621310)	This industry comprises health practitioners having the degree of D.C. (Doctor of Chiropractic) primarily engaged in the independent practice of chiropractics. These practitioners provide diagnostic and therapeutic treatment of neuromusculoskeletal and related disorders through the manipulation and adjustment of the spinal column and extremities.
Optometrists (621320)	This industry segment comprises health practitioners having the degree of O.D. (Doctor of Optometry) primarily engaged in the independent practice of optometry. These practitioners examine, diagnose, treat, and manage diseases and disorders of the visual system, the eye and associated structures as well as diagnose related systemic conditions. Offices of optometrists prescribe and/or provide eyeglasses, contact lenses, low vision aids, and vision therapy. They may also provide the same services as opticians, such as selling and fitting prescription eyeglasses and contact lenses.
Mental Health Practitioners (621330)	This segment comprises establishments of independent mental health practitioners (except physicians) primarily engaged in (1) the diagnosis and treatment of mental, emotional, and behavioral disorders and/or (2) the diagnosis and treatment of individual or group social dysfunction brought about by such causes as mental illness, alcohol and substance abuse, physical and emotional trauma, or stress.
Physical Therapists (621340)	This industry segment comprises independent health practitioners primarily engaged in providing physical therapy services to patients who have impairments, functional limitations, disabilities, or changes in physical functions and health status resulting from injury, disease or other causes, or who require prevention, wellness or fitness services.
Occupational Therapists (621340)	This industry segment comprises independent health practitioners primarily engaged in planning and administering educational, recreational, and social activities designed to help patients or individuals with disabilities, regain physical or mental functioning or to adapt to their disabilities.
Speech Therapists (621340)	This industry segment comprises establishments of independent health practitioners primarily engaged in diagnosing and treating speech, language, or hearing problems.
Podiatrists (621391)	This segment comprises establishments of health practitioners having the degree of D.P.M. (Doctor of Podiatric Medicine) primarily engaged in the independent practice of podiatry. These practitioners diagnose and treat diseases and deformities of the foot.

APPENDIX F
Study 2 Measurement Items for Opportunity Beliefs

Please select the circle that most closely corresponds to your evaluations of the following statements:									
Definitely Not		Maybe						Yes, Definitely	
1	2	3	4	5	6	7	8	9	
3D printing can be used to solve the problems of healthcare providers									
3D printing has the capability to meet the needs of healthcare providers									
There is a "match" between what 3D printing does and what healthcare providers demand									
Applying 3D printing to the healthcare provider industry represents a feasible opportunity									
3D printing is sufficiently developed to be applied by healthcare providers									

APPENDIX G
Study 3 Non-domain experimental manipulations



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