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Making the Most of Failure Experiences: Exploring the Relationship Between Business Failure and the Identification of Business Opportunities

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Although previous research has extolled the importance of business failure as a precursor to transformational learning, few studies have explored the conditions under which such learning occurs or the content of the resulting knowledge. We explore several cognitive moderators of the relationship between failure experiences and a specific type of opportunity identification knowledge—the use of structural alignment processes. Results indicate that learning from failure is facilitated for entrepreneurs who possess a cognitive toolset that consists of opportunity prototypes and an intuitive cognitive style. Moreover, we found that prior professional knowledge negatively moderates this relationship.

Introduction

"*Failure is simply the opportunity to begin again, this time more intelligently.*"
—Henry Ford

Failure has been pervasively touted as a prerequisite for learning, a belief that has gained widespread expression in the social psychology and organizational behavior literature (Hastie, 1984; Zakay, Ellis, & Shevalsky, 2004). The potential learning benefits of failure are particularly salient to the field of entrepreneurship, where a large number of businesses fail each year (Singh, Corner, & Pavlovich, 2007). However, entrepreneurs can fail in a given enterprise, learn from their setback, and rise from the ashes to become successful in a subsequent venture. This pervasive narrative has given rise to a host of

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intriguing research questions, many of which delve into the learning opportunity afforded by failure. Indeed, research suggests that many successful entrepreneurs point to past failures as a critical learning opportunity (Cardon & McGrath, 1999; Minniti & Bygrave, 2001; Shepherd, 2003).

Given the preponderance of extant theorizing and anecdotal evidence espousing the significance of learning from business failure, it is surprising that studies focus overwhelmingly on business success. More recently, scholars have been encouraging researchers to move beyond this preoccupation with success toward a view that better integrates success and failure (Aldrich & Fiol, 1994; McGrath, 1999). Indeed, learning represents a potentially critical linchpin connecting failure and success (McGrath). For example, prominent theories in the field of entrepreneurship explore core entrepreneurial processes, such as opportunity identification, as operating primarily through trial and error learning processes (Deakins & Freel, 1998; Sarasvathy, 2001). Much of the previous work on entrepreneurial failure has focused on deciphering the reasons for the failure (Bruno, McQuarrie, & Torgrimson, 1992; Zacharakis, Meyer, & DeCastro, 1999) rather than on the impact such failures have upon entrepreneurs and their future ventures. Attention has recently shifted, however, as entrepreneurial scholars have increasingly begun to seek understanding of how failure affects entrepreneurs, as well as their desire and ability to start subsequent firms (for a review, see Ucbasaran, Shepherd, Lockett, & Lyon, 2013). Failure is a life-altering event with potentially damaging consequences for all the major areas of an entrepreneur's life, entailing economic, psychological, social, and physiological costs (Shepherd, 2004; Singh et al., 2007). Scholars have explored how entrepreneurs use different coping behaviors (Singh et al.), manage the grief recovery process (Shepherd, 2003), utilize self-compassion in regulating negative emotions (Shepherd & Cardon, 2009), and adopt positive attitudes in the face of failure (Politis, 2008; Politis & Gabrielsson, 2009) in trying to overcome barriers to learning. In so doing, researchers have made many rich theoretical and conceptual contributions to our collective understanding of venture failure; however, there have only been a handful of empirical works to substantively support these conceptualizations (Cope, 2011). Despite pervasive theorizing that failure may provide key learning opportunities that can better position an individual for success (Minniti & Bygrave, 2001; Shepherd, 2003), there have been few investigations (conceptually and empirically) to confirm that failure leads to specific learning outcomes.

To address this knowledge gap, we build on theories from cognitive psychology and learning to develop and test a business failure model focused on the structural alignment processes of opportunity identification. Within the context of opportunity identification, structural alignment can be defined as *the cognitive alignment between how a technology/product operates and the benefits/advantages conferred by the technology/product with what individuals in a market do, how/why they do it, and the unsatisfied needs and problems in that market* (Gregoire, Barr, & Shepherd, 2010). Cognitive work in the realm of opportunity identification suggests that individuals identify opportunities by using models of opportunities that they already have (e.g., prototypes and exemplars) to recognize patterns in the environment that suggest promising ideas for new ventures (cf. Baron, 2006; Baron & Ensley, 2006; Cornelissen & Clarke, 2010). More recently, Gregoire and colleagues found that expert entrepreneurs zero in on meaningful patterns by connecting structural aspects of a technology/product to structural aspects of potential markets (structural alignment). Subsequent work has confirmed that an entrepreneur's ability to connect structural similarities between technology/product and target markets is an important factor in explaining why some entrepreneurs are better able to identify certain opportunities than are others (Gregoire & Shepherd, 2012). Given the importance of structural

alignment processes to opportunity identification, this study explores the enhanced use of structural alignment as a possible learning outcome of failure.

In doing so, this study makes three primary contributions to the literature. First, while extensive attention has been given to exploring how various types of experience benefit the performance of organizations (Bruderl & Preisendorfer, 1998; Sarasvathy, 2001), we have little understanding of the specific knowledge conferred to individuals through their failure experiences. This study finds that when coupled with the proper cognitive tools, failure experiences are positively related to the use of structural alignment processes during opportunity identification. Second, current theories rarely incorporate differences in cognitions as distinguishing boundary conditions that help explain the transformation of experience into knowledge. This study explores why certain individuals are better able to translate failure experience into greater use of structural alignment processes during opportunity identification than are others; we find that opportunity prototypes, professional knowledge, and cognitive style help explain variance in this relationship.

Finally, prior research has extended our understanding of the types of experience that are particularly valuable to entrepreneurs in enabling heightened levels of business success. For example, entrepreneurial start-up experience, management experience, and industry-specific experience have all been linked to beneficial performance outcomes (Bruderl & Preisendorfer, 1998; Shepherd, Douglas, & Shanley, 2000; Ucbasaran, Westhead, & Wright, 2003). However, scholars still have limited insight into how these various types of experience interact with one another in developing valuable knowledge. This study theorizes and finds that a reliance on professional knowledge does explain a heightened usage of structural alignment processes during opportunity identification (in accordance with Gregoire et al., 2010); however, it is those individuals who rely less on professional knowledge who benefit the most (i.e., in terms of heightened usage of structural alignment processes) from failure experiences.

The rest of the paper proceeds as follows. First, we present our conceptual model, introduce structural alignment, and highlight its role in the opportunity identification process. Then, we extend theory regarding learning from failure and present our hypotheses. Subsequently, we describe the research methods. Finally, we report and discuss the results.

A Business Failure Model of Structural Alignment Processes

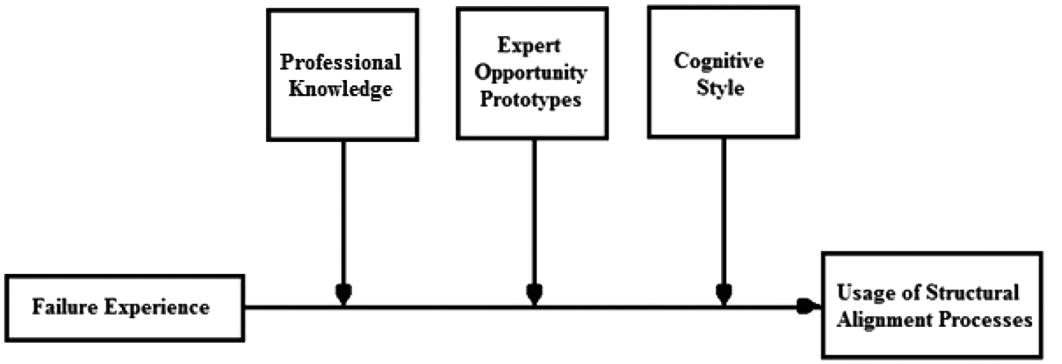
Building on the cognition, learning, and analogical thinking literature, we develop a business failure model of the use of structural alignment in the opportunity identification process. As illustrated in Figure 1, the factors that we theorize to influence the relationship between failure experience and the use of structural alignment processes include an individual's expert opportunity prototypes, professional knowledge, and cognitive style. Given the importance of structural alignment to our model, we now proceed to expand upon what structural alignment is and why it is a critical factor in explaining how individuals go about identifying opportunities.

Structural Alignment and Opportunity Identification

At its core, structural alignment involves cognitive processes of comparison between items or ideas that results in useful implications. Structural alignment processes have been shown to influence performance on creative tasks such as scientific innovation and new

Figure 1

Business Failure Model of Structural Alignment Processes



product ideation (cf. Dahl & Moreau, 2002), tasks akin to opportunity identification. They have also been found to be directly involved in other higher-level reasoning processes (Keane, Ledgeway, & Duff, 1994) including problem solving (Catrambone & Holyoak, 1990), learning (Loewenstein & Gentner, 2005), and new category creation (Namy & Gentner, 2002). Cognitive researchers have determined that alignment proceeds at two levels: a superficial level and a structural relationship level (Gentner, 1983, 1989). A superficial alignment compares features or "parts" of an object, including representative attributes and characteristics, while structural relationships refer to more fundamental linkages between seemingly disparate features.

Recent studies have found that expert entrepreneurs display a cognitive preference toward aligning structural relationships when attempting to identify entrepreneurial opportunities. Specifically, Gregoire and colleagues (2010) found that expert entrepreneurs compare the structural characteristics of a technology/product (its ultimate benefits and/or capabilities) to the structural characteristics of a market (the needs/desires of a target population). This match often results in the identification of a business opportunity—a means by which profit can be created by delivering a product/service to a population who finds value in it. To further illustrate the use of structural alignment processes in opportunity identification, we apply it to a relatively new technology—the position and motion tracking technology utilized by the Nintendo Wii. At a superficial level, one might examine the individuals who developed the technology (engineers at Gyration Inc.), the constituent elements of the technology (e.g., short-range Bluetooth radio, an accelerometer, PixArt optical sensor, and the Sensor Bar), and the raw materials composing the apparatus. At a structural relationship level, one would focus on how the technology operates (e.g., the Wii remote uses an accelerometer to detect acceleration on three axes and uses an advanced image sensor to detect light from the Sensor Bar in order to mimic onscreen the three-dimensional movement of the remote) and abstract capabilities of the technology (e.g., incorporates the ability to sense motion, enabling a user to interact with and manipulate items on screen via hand or body movements).

In attempting to identify potential business opportunities arising from the development of the Nintendo Wii technology, an individual might try and connect the superficial and structural characteristics of the Wii to the superficial and structural characteristics of potential markets. Individuals making a superficial alignment of the features of the Nintendo Wii technology to various markets may arrive at traditional, and more obvious,

connections between the two—speculating that such a technology may serve existing gamers via a new and improved "wireless" handset. By accessing superficially similar market groups only, the range of possible applications will be restricted to one's prior experience or familiarity with certain elements (Keane et al., 1994), in this case leading to a superficial connection between a new handset and the established gaming population. In contrast, making a structural alignment between the Wii technology and prospective markets may result in a deeper, richer analysis of underlying similarities between the two (Holyoak & Thagard, 1995) and lead to the identification of truly innovative business opportunities. Working within the Nintendo Wii case, individuals attempting to structurally align the Wii technology and various markets may tie an ambiguous capability of the Wii (its basis in motion-sensing and onscreen motion mimicry) to an underlying need of a particular market. For example, one of the hallmarks of the Wii has been its ability to draw unconventional populations into the video game space. One such market group is those individuals seeking home fitness solutions. The base need of this group is a desire for stimulating home exercising options. Superficially, video gaming systems do not provide a satisfactory forum for this need, but an examination of the Wii technology at a structural level reveals a natural connection between its motion-based technology and this particular market's desire for more engaging home fitness.

Given the centrality of structural alignment processes to the opportunity identification phase of entrepreneurship (Gregoire et al., 2010; Gregoire & Shepherd, 2012), our study is interested in explaining variance in the usage of structural alignment by exploring how business failure can lead to heightened use of such a process during opportunity identification.

Failure Experiences and the Use of Structural Alignment Processes

In the entrepreneurial context, failure refers to *the closure of an initiative to create value that has failed to meet its goals* (McGrath, 1999; Shepherd, Patzelt, & Wolfe, 2011). Failure experiences are largely believed to prompt the development of critical skills and knowledge that can then be used in subsequent ventures (McGrath; Minniti & Bygrave, 2001). Sitkin (1992) contends that failure is a prerequisite for learning as such experiences provide the opportunity to pinpoint exactly ***why*** an important event has occurred; however, on the path to uncovering the causal antecedents to a failure, sense-making efforts often force individuals to radically alter the cognitive and the mental models that govern action and interpretation (Kolb, 1984; Wong & Weiner, 1981). Louis and Sutton (1991) have suggested that failures prompt learning by triggering the process of hypothesis testing, intensifying the attribution process, and stimulating sense-making efforts. In so doing, failure can fuel a Lewinian "unfreezing" process, where old ways of perceiving, thinking, and acting are destabilized and new cognitive processes can be experimented with and adopted, often for the first time (Louis & Sutton).

In this study, we specifically examine how failure can lead individuals to make greater use of structural alignment during the opportunity identification process. Failure often shocks individuals into a conscious (as opposed to an automatic) mode of information processing where cognitive processing is characterized by attention, awareness, and reflection (Louis & Sutton, 1991). It is during this mode of processing that individuals invest significant time and effort to more fully understand the problems they are facing. As a result, the complexity and extensiveness of an individual's mental models increases as he or she discovers new constructs and phenomena and recognize new causal relationships between old and new constructs (Evans, 1988). Indeed, Hastie (1980) has suggested that

this active process of reflection and cognitive "reprogramming" produces associative links between new information and old information and results in more richly linked constellations of memory.

As has been previously noted, structural alignment rests upon a higher-level comparison between objects or events—a comparison rooted in underlying relational connections. Action identification theory predicts that negative events (such as failure) can prompt individuals to consider events, objects, and phenomena at a structural level, probing similarities between contexts and across domains by considering events at a higher level of abstraction (Vallacher & Wegner, 1987). Failure can also enable a greater number of structural comparisons by greatly increasing the richness of mental models and associations/connections between new and old information (Ellis & Davidi, 1999). Reflecting this conventional wisdom about learning from failure, we offer the following as a baseline for subsequent hypotheses:

Hypothesis 1: There is a positive relationship between business failure experience and the use of structural alignment processes during opportunity identification.

Unfortunately, the transformation of experience into knowledge is neither automatic nor instantaneous. In terms of learning contexts, the business environment is often turbulent, dynamic, and uncertain, making learning difficult. In addition, the causes of failure are often complex, ambiguous, and challenging for individuals to interpret (Baumard & Starbuck, 2005; March & Sutton, 1997). Moreover, difficulty in learning from failure is compounded by the numerous cognitive biases (e.g., defensive attributions and confirmation bias) that often occlude sound understanding of the causal chains leading to the failure event (Madsen & Desai, 2010). Indeed, experiential learning theory draws a clear distinction between experience and experientially derived knowledge (Kolb, 1984). Business experience consists of direct observation of, or participation in, the events encountered in the course of starting and/or running a venture, while experiential knowledge is the wisdom or practical knowledge derived or extracted from such experiences (Reuber, Dyke, & Fischer, 1990). Kolb mirrored this reasoning in depicting experiential learning as a two-stage process consisting of acquisition of experience and the subsequent transformation of that experience into knowledge. As previously discussed, this study explores a trio of cognitive factors believed to influence the degree to which failure experiences are transformed into opportunity identification knowledge in the form of structural alignment processes, to which we now turn.

Opportunity Prototypes, Business Failure, and the Use of Structural Alignment Processes

It is a prerequisite to learning that the domain within which failure occurs be familiar enough that novel outcomes are recognizable and interpretable (Sitkin, 1992; Sitkin & Pablo, 1992). Familiarity and experience in a given domain enable individuals to operate at a higher level of specificity in understanding the cause and effect relationships surrounding the failure event, as well as to create potential guides for behavior in subsequent ventures (Abramson, Seligman, & Teasdale, 1978). In addition, experts process information differently than do novices. An expert's extensive experience in a given arena contributes to the development of rich, organized systems of knowledge and thought that enable them to differentiate between the numerous pieces of available information in making more sophisticated judgments (Glaser & Chi, 1988).

Research into pattern recognition suggests that individuals often reference prototypes in order to recognize new stimuli. In essence, prototypes represent the most typical member of a given class of events or objects (Smith, 1995). When an individual encounters a new stimulus, that stimulus is compared with existing prototypes to assess whether it belongs to or is associated with characteristics of specific categories. Indeed, through experience, entrepreneurs develop prototypes for the most idealized member of the "business opportunity" category. It is important to note that while more advanced prototypes develop through experience, they are not a natural and inevitable result of experience. Rather, a given prototype's clarity, richness, and focus on key attributes reflect one's exposure to a multitude of diverse stimuli, willingness to interact with those stimuli, as well as the active, effortful processing of those experiences (Lakoff, 1999). An opportunity prototype refers to *a cognitive representation of the ideal business opportunity, composed of the attributes an individual has found to be most desirable and predictive of success* (Baron & Ensley, 2006). Individuals operating with more expert opportunity prototypes have a richer, more fine-tuned understanding of what characteristics are closely tied to venture success (Baron & Ensley). In one study, Baron and Ensley found that expert entrepreneurs utilize richer opportunity prototypes than do novices and that these prototypes emphasize opportunity attributes such as "solving a customer's problems, the ability to generate positive cash flow, the speed of revenue generation, manageable risk, and (the presence of) others in their network with whom to develop the venture" (p. 1339).

Consistent with the notion of absorptive capacity (Cohen & Levinthal, 1990; Zahra & George, 2002), the rich and salient knowledge contained in an expert's opportunity prototype likely facilitates the process of recognizing the value of new information generated by a business failure experience, assimilating this new information with existing knowledge of markets and technologies, and applying it to opportunity identification through structural alignment processes. Based on the above reasoning, we offer the following:

> **Hypothesis 2:** The positive relationship between business failure experience and the use of structural alignment processes during opportunity identification is more positive for those with highly expert opportunity prototypes than for those with less expert opportunity prototypes.

Professional Knowledge, Business Failure, and the Use of Structural Alignment Processes

Extant research has revealed the importance of prior knowledge in explaining why certain entrepreneurs identify particular opportunities that others are simply unable to recognize (e.g., Corbett, 2005; Shane, 2000; Shepherd & DeTienne, 2005). However, previous research does not specify the cognitive mechanisms by which prior knowledge informs opportunity identification. Substantial research suggests that prior knowledge facilitates the alignment of structural comparisons (Chi, Feltovich, & Glaser, 1981; Keane, 1988). For example, experts find it easier to make structural comparisons (as opposed to superficial comparisons) than novices because experts have richer mental representations to compare objects or phenomenon (Chi et al.). Similarly, expert entrepreneurs will have a greater depth of knowledge regarding markets, technologies, and products that enable them to better align the capabilities/benefits of a given business solution to the needs/desires of a target population. Professional knowledge is *prior information derived from an individual's professional work domain and stored in memory* (Gregoire et al., 2010). In contrast to expert opportunity prototypes—which are

higher-level representations built upon previous knowledge and experience, and are often only tacitly understood—professional knowledge is explicit and directly references prior work experience or engagements. Professional knowledge likely allows individuals to focus on key structural connections and to identify opportunities within markets that are superficially diverse and have few explicit commonalities with the original technology and/or product. In support of this, Gregoire and colleagues found that entrepreneurs who drew more on prior knowledge were more likely to use structural alignment processes when attempting to identify business opportunities.

While extant literature suggests that experiencing business failure has a number of learning benefits, it is likely that the benefits of failure experience vary depending on the degree to which failure's lessons have already been learned. In the case where similar information is available from multiple sources, information substitution is likely to occur (Bruneel, Yli-Renko, & Clarysse, 2010). Information substitution refers to situations where duplicate information can be accessed through multiple channels, making any one source of such information a "substitute" for any other. If a business leader is able to stimulate structural alignment processes through reference to their professional knowledge, the benefit of a failure experience (at least when it comes to using structural alignment processes during opportunity identification) will be reduced.[1] That is, entrepreneurs with highly salient knowledge of starting and running new ventures are likely to have progressed in their usage of structural alignment processes to the point where a failure experience would have limited impact in further stimulating the use of structural alignment during opportunity identification. In other words, previous successful experience can be just as important in discerning what works well and why (Ellis & Davidi, 2005). In contrast to expert opportunity prototypes, which serve as a cognitive tool to help decipher failure's lessons (at least when it comes to learning structural alignment processes), we suggest that professional knowledge serves as an informational substitute for a failure experience, deepening an entrepreneur's structural understandings of markets and technology/products, and facilitating alignments between the two. Failure experience is not necessarily a superior vehicle to learning; rather, different types of experience can serve as alternate sources for similar knowledge. Based on the above reasoning, we offer the following hypothesis:

> **Hypothesis 3:** The positive relationship between business failure experience and the use of structural alignment processes during opportunity identification is more positive for those who rely less on professional knowledge than for those who rely more on professional knowledge.

Cognitive Style, Business Failure, and the Use of Structural Alignment Processes

Cognitive style refers to *the consistent approach an individual takes in organizing and processing information during learning* (Kickul, Gundry, Barbosa, & Whitcanack, 2009). Cognitive style is generally considered to be an antecedent of learning style (Curry, 1983; Riding, 1997) and influences how individuals organize and process information in

1. Additionally, multiple sources of information increase the likelihood that individuals will satisfice—search only until a "satisfactory" answer is found (Simon, 1955, 1956). Once a satisfactory solution is found, satisficing is likely to reduce the impact of subsequent learning opportunities (Bruneel et al., 2010). Thus, the learning benefits of failure are likely reduced in the presence of other information sources providing similar knowledge (e.g., prior professional experience).

developing increased knowledge and skill (Valley, 1997). Cognitive style influences how people scan their environment; how they gather, structure, and interpret environmental information; and how they augment or change their mental models as a result to guide subsequent behavior (Hayes & Allinson, 1998). Cognitive style has been assessed in a number of different ways, but one of the most established conceptualizations focuses on the intuition-analysis dimension of cognitive style. Analysts have been found to show high attention to detail; focus on "hard data"; and adopt a sequential, step-by-step approach to learning (Hayes & Allinson). In contrast, intuitives are less focused on detail, adopt a more holistic perspective, and use an open-ended approach to problem solving (Hayes & Allinson). In terms of individual learning, analysts and intuitives have been found to observe, reflect, and process their experiences differently, leading to significant contrasts in learning preferences (Hayes & Allinson). As opposed to an ability, where more ability is typically advantageous compared with having less ability, cognitive style is value differentiated, meaning that each pole of the intuitive/analytical continuum has adaptive value under certain circumstances and may create benefits relative to those circumstances (Witkin, Moore, Goodenough, & Cox, 1977). In support of this, past research has shown that the effect of cognitive style upon performance varies depending on the nature of the task (Allinson & Hayes, 1996).

The work demands of various task environments can be drastically different. Some tasks may require the careful analysis of large quantities of detailed information while others demand quick decisions based upon very limited information. The matching of cognitive style with an appropriate learning environment can help eliminate barriers to learning which arise when mismatches occur (Hayes & Allinson, 1996). Mismatches between cognitive style and task environments are believed to help explain why individuals with similar skills and abilities make different decisions (Hough & Ogilvie, 2005). For example, Driver (1987) suggests that higher-level jobs, which require the simultaneous monitoring and processing of complex data emanating from disparate sources, might be performed most effectively by intuitive cognitive styles, which allow the monitoring and synthesis of multiple sources of information. According to Hayes and Allinson (1998), this suggests that "people will learn and perform best in those situations where the information-processing requirements of the job match their cognitive style or preferred approach to processing information" (p. 851).

Entrepreneurs are commonly faced with complex situations characterized by limited hard facts, extreme uncertainty, and significant time pressure (Busenitz & Lau, 1996). In such settings, there are often few, if any, historic trends, previously established norms, or direct information to guide decision making because ventures are new or entrepreneurs are pursuing novel ideas. An intuitive cognitive style (favoring an open-ended approach, a reliance on holistic impressions, synthesis of information, and lateral as opposed to step-by-step reasoning) offers potential advantages in confronting these types of environments in comparison to an analytical style (favoring a structured approach, working according to preexisting rules, and using systematic methods and sequential reasoning) (Allinson & Hayes, 1996; Kickul et al., 2009). Much of the research investigating the influence of cognitive style in the entrepreneurial domain indicates that contexts of high uncertainty, novelty, limited objective data, and high pressure favor an intuitive information-processing approach (Miner, 1997; Olson, 1995).

Failure events represent a context where there is often an abundance of ambiguous information and where business leaders are forced to utilize a more open-ended approach to problem solving and lateral modes of reasoning. Mintzberg (1984) argues that in situations where individuals have limited information, they are forced to rely on a more intuitive approach, utilizing vague and speculative data, and oftentimes relying on a

hunch. Contexts of considerable change and high complexity require the special ability of synthesis that intuition provides (Parikh, Neubauer, & Lank, 1994). Business failure represents change and signals a need to rethink how the market works, the nature of different technologies, and the nexus of the two. Individuals with an intuitive cognitive style are more able to process the ambiguous and complex information revealed by a business failure into knowledge that informs (and facilitates the use of) structural alignment processes in attempting to identify subsequent opportunities. Structural alignment processes are rooted in the use of analogies to connect knowledge from disparate contexts as well as to extend knowledge to new or unfamiliar contexts (Markman & Gentner, 1993). Prior research suggests that an intuitive cognitive style is particularly well suited to solving problems by enabling analogical reasoning processes that connect knowledge originating in dissimilar contexts (Furnham, 1995). In contrast, analytical approaches favor a more structured method to problem solving, where an individual relies upon systematic methods of investigation, highly specific and defined pieces of information, and a sequential step-by-step analysis—an approach ill-suited to processing the ambiguous and complex information surrounding a business failure (Allinson, Chell, & Hayes, 2000). Based on the above reasoning, we offer the following hypothesis:

Hypothesis 4: The positive relationship between business failure experience and the use of structural alignment processes during opportunity identification is more positive for those with an intuitive cognitive style than for those with an analytical cognitive style.

Method

Sample

Our sample consisted of individuals attained through two channels. First, individuals were identified through the use of the OneSource Corp Tech database, a database well used in the management literature (Gardner, 2005; Kickul & Gundry, 2001). Second, additional individuals were identified through their venture's inclusion in technology parks or incubators. No significant differences between the two samples were found on any of the variables of interest to this study ($p > .05$). For both sample sources, individuals were selected on the basis of industry, location, company size, business formation date, and available contact information. We specifically targeted businesses operating primarily within high-tech industries as previous research has found that the fast-changing nature of technology-intensive firms leads individuals in these fields to more frequently make decisions about opportunities (Brown & Eisenhardt, 1997; Hughes, 1987). In terms of location, entrepreneurs were located in the Mid-West. Participants were drawn from companies of up to 500 employees, formed within the last 10 years, where contact information for a president/chief executive officer (CEO)/owner was made available. We selected presidents, CEOs, and/or owners to capture primary decision makers who are commonly involved in opportunity identification tasks.

The recruitment process consisted of sending a letter to each of the new venture decision makers. This letter described the purpose of the research and why each individual was being targeted, and informed them that they would be contacted by telephone in the "next few days." Within a week of the mailing, we made a follow-up phone call to each of the letter recipients to discuss the nature of the study and ask them to participate. For those who agreed to participate in the study, we scheduled a day and time for the opportunity identification exercise to begin. Data were collected over an 8-month period.

A total of 550 new venture decision makers were sent letters requesting participation in this study. Of that number, 309 individuals were eventually contacted over the phone with 114 eventually agreeing to participate, representing a response rate of 23%. The participating individuals were on average 52.45 (standard deviation [*SD*] = 12.86) years old; 96% were male; and 20% held a PhD degree as their highest qualification, 25% had a master's degree, 40% had a bachelor's degree, and the remainder had either some college experience or a high school diploma. Additionally, on average, each participant had started 3.18 (SD = 3.11) ventures in their career with 29% experiencing business failure during that span.

Research Design and Data Collection

This study consisted of new venture decision makers engaging in opportunity identification exercises based upon three hypothetical business scenarios. Each participant completed the exercises in a scheduled meeting lasting between 30 and 60 minutes. We began each exercise by asking the participant to read through scenario 1 before subsequently attempting to identify relevant business opportunities. Participants read the scenario to themselves before describing what opportunities they saw relative to the detailed technology or market. After discussing their thoughts, the participants were asked to assess and explain which of their opportunities they believed represented the "best" opportunity. This same process was followed for scenario 2 and scenario 3, after which the conversation ended. Following the opportunity identification exercise, participants completed a post-interaction survey. Subsequently, each participant's audio recording was transcribed by a professional transcription service.

The business scenarios used in this exercise were based upon three vignettes. Like Gregoire et al. (2010), one of the vignettes incorporated a description of a new technology called three-dimensional printing (3DP), a technology also studied by Shane (2000). The other two vignettes depicted two different market conditions in the United States—a young and growing Latino population and the upcoming mass retirement of the baby boomer population. Both the technology-side and market-side vignettes were designed to prompt discrete forms of opportunity identification reasoning processes in the participants and are well-documented contexts within which entrepreneurs commonly identify actual business opportunities (Mowery, Nelson, Sampat, & Ziedonis, 2004; Shane, 2000, 2001; Wiklund & Shepherd, 2003) and are consistent with prior accounts of opportunity identification (Shane, 2000). These vignettes are based on real (not hypothetical) technologies and market phenomena, supporting the external validity of our task and extending the generalizability of our findings.

Measures and Validation

We derived a number of the study's measures through verbal protocol analysis. Verbal protocol analysis enables us to observe, in real time, the thoughts and cognitive processes of entrepreneurs as they attempt to identify opportunities, rather than relying on recollections of past efforts to identify opportunities. Additionally, verbal protocol analyses are known for facilitating a high level of internal, construct, and external validity (Gregoire et al., 2010). This technique has been robustly supported in the organizational literature in exploring a number of subjects, including the decision models of entrepreneurs and investors (e.g., Hall & Hofer, 1993; Sarasvathy, 2001; Sarasvathy, Simon, & Lave, 1998), the cognitive processes underlying new product ideation (e.g., Dahl & Moreau, 2002), and the thinking tactics of managers and corporate officers (e.g., Isenberg, 1986; Melone, 1994).

We rely on extensive content analysis to code participants' verbal protocols and examine in greater depth the reasoning strategies and cognitive tools that entrepreneurs use to identify opportunities. The general process used to code the dependent variable (use of structural alignment processes), expert opportunity prototypes, and professional knowledge measures is detailed immediately below. Similar to Crutcher (1994) and Ericsson and Simon (1993), our coding methodology was focused on distinct forms of thinking common to each participant, rather than on the unique differences specific to each individual. Evidence for our hypotheses stems from the number and/or length of participants' discussion that reflect their use of structural alignment processes, expert opportunity prototypes, and professional knowledge (e.g., Sarasvathy, 2001; Sarasvathy et al., 1998).

Each verbal protocol (participant transcript) was coded on four dimensions: (1) the technology/market focus, (2) the level of structural reasoning (i.e., superficial versus structural), (3) the type of prior knowledge underlying different statements, and (4) the existence of expert opportunity prototypes underlying opportunity assessments. The first dimension identifies that component of the problem space addressed by the participant. Because each scenario focuses on prompting opportunity identification processes relative to either a new technology or a particular market population, the relevant problem space consists of information pertaining to the market (the demand side); the technology, product, or service (the supply side); both the market and technology/product/service; or something else entirely. Statements were coded accordingly, with evidence of cognitive alignment occurring where participant verbalizations concerned the features/relationships of *both* a market and a technology/product/service.

The second dimension of our coding scheme identifies the level of structural reasoning reflected in the participant verbalizations. As outlined by Gregoire and colleagues (2010), each statement was coded if it referred to superficial features or to a higher order structural relationship. The third dimension differentiates the source of the knowledge underlying the thoughts and reasoning strategies used by the study participants. More specifically, we distinguished between the different sources of knowledge that participants used to analyze each business scenario, coding for those instances where the participant drew upon knowledge derived from prior professional experience. Finally, the fourth dimension of our coding scheme explicitly identifies the existence of expert opportunity prototypes underlying opportunity assessments by the participants. As discussed in the expert prototypes measure description below, opportunity prototypes represent specific characteristics of a business opportunity—characteristics tied more closely to actual business success (Baron & Ensley, 2006). Each statement that evidenced the use of such an opportunity prototype was coded accordingly.

In adherence to accepted standards (cf. Krippendorff, 2004; Neuendorf, 2002), the transcripts were coded by two individuals working independently; the coding was done by the first author of this study and by a doctoral student who was blind to the study's underlying theory and hypotheses. The coders began by walking through the coding of one transcript together, checking for understanding and consistency in coding methodology. They then coded an additional transcript separately before meeting to compare and discuss results. They both then coded all 114 of the conversations; interrater reliability is reported for each measure below.

Dependent Variable—Use of Structural Alignment Processes. The dependent variable is the use of structural alignment processes by participants over the course of the three exercises. As discussed above, and in accordance with the work of Gregoire and colleagues (2010), the transcripts were coded to reflect the use of high order structural alignment

processes during the course of the opportunity identification exercises. More specifically, as detailed by Gregoire and colleagues, high order structural alignment occurs where participants focus on the ultimate benefits of the technology/product, needs/desires of market actors, problems of the technology/product, problems for the market actors, and the underlying causes, among other things. For instance, one entrepreneur stated,

> *Now, the great thing about 3DP is that it is exceptionally good at crafting items according to preconceived specifications very quickly, so that one can visualize an item or place it in a particular location or as a cog in a larger machine or apparatus very easily. However, most 3DP fabrications are not industrial grade—they are rarely functional as more than a prop at this point. It would be the modeling people that would find particular benefit in using this technology. Those modelers, designers, and engineers who want to see what something would look like or how it would fit together would find true value here.*

This was coded as a high order structural alignment, specifically one connecting technology capabilities to the needs of a market. Further information relative to how statements were coded is included in Table 1.

Coding of the transcripts involved noting all of the statements where the participant connected structural aspects of a market to structural aspects of a technology/product/service. Structural alignment statements were coded by the length of the statements involved (the length of the text in terms of number of characters). In order to capture the relative importance such statements played in the entrepreneur's attempts to identify business opportunities, this value was divided by the overall length of the entrepreneur's discourse (total characters in the transcript). This measure conservatively estimates the importance that structural alignment statements play for each entrepreneur in the context of the opportunity identification process, net of the loquaciousness of each entrepreneur (Gregoire et al., 2010). In other words, the value for the usage of structural alignment processes measure for each entrepreneur is the percentage of his or her dialogue devoted to structural alignment. The two coders agreed on 94% of the structural alignment coding instances. In the 6% of cases where the coding differed, the two coders met to determine the validity of the coding, came to an agreement, and made the requisite change to the data before proceeding with data analysis. Interrater reliability was also calculated using Cohen's kappa, which controls for chance agreements in the calculation of agreement rates between two independent coders (Howell, 1992). Cohen's kappa for the dependent variable was 0.78. Cohen kappa values surpassing 0.75 indicate high levels of agreement (Fleiss, 1981). Together, these results demonstrate acceptable levels of interrater reliability (cf. Fleiss; Lombard, Snyder-Duch, & Bracken, 2002; Neuendorf, 2002).

Business Failure Experience. We measure business failure experience with a continuous variable representing the number of failures each participant has experienced as an entrepreneur. An individual's prior experience with failure was assessed with the question, "How many businesses have you closed or sold due to bankruptcy, liquidation, or receivership, or because it failed to meet your expectations?" (Gimeno, Folta, Cooper, & Woo, 1997).[2]

Expert Opportunity Prototypes. As assessed by Baron and Ensley (2006), expert opportunity prototypes include opportunities that are characterized by their ability to (1) solve

2. Results are substantially the same when using a dichotomous variable for business failure experience, with individuals categorized as to whether they had, or had not, experienced a business failure experience.

Table 1

Structural Alignment Coding Methodology

Level of alignment	Coding guidelines	Transcript examples
Higher level, structural statements (of market and product/technology)	Statements focusing on the: • Overarching capabilities of the technology/product • Causes of the benefits of the product/technology • Advantages that use of the technology/product will confer to the market • Drawbacks or problems with respect to the technology/product • Causes of the drawbacks or problems with the technology/product • How/why market actors use certain products/technology, what advantages or disadvantages do these choices create • Problems or limitations that exist for market actors • Reasons that market actors are satisfied or dissatisfied with current product/technology offerings • Goals, motives, or needs that market actors have that guide their behavior	"This 3DP technology would be perfect for building models. It can construct to scale, and realistic versions of drafts or ideas that individuals develop, and it can do it quickly at minimal cost. Architects could probably use it, home developers could probably use it to make a model of what houses are going to look like to some degree. There are a number of products that people want to see, touch, and get a sense of what it feels like." Example of aligning technology capabilities and market needs/benefits. "A prototyping machine could create an item quickly, but if there's something wrong with it or you didn't design something right, you can go back and change the model and make another one, not having to redo machine setups and all that kind of stuff. Users would have the ability to create and construct at a much faster pace than ever before. It would enable the modification of a lot of different types of products very quickly and efficiently. It could make a big impact." Example of aligning capabilities and market benefits. "As baby boomers get older, many of them are living in retirement homes. And there's a kind of disdain for retirement homes: clients get bored, and it's not the kind of lifestyle that a person wants to live in. I foresee a growth in services where you can actually pay someone to come to your home and provide some of those retirement home-like services in the comforts of your own home. Seniors would get the comfort, familiarity, and personality of home along with the care they so critically need to accomplish tasks that have become prohibitively difficult for them." Example of aligning market needs with product benefits.
Lower level, superficial statements (of market and product/technology)	Statements focusing on: • Characteristics of the technology/product: the pieces/components, makeup, inputs, outputs, creators, etc. • Descriptions of the users of the product/technology: who are they, what do they use now, characteristics of what they use now, characteristics of the market as a whole, etc.	"The 3DP machine runs off of a 3D drawing of whatever you want to build. It basically sprays the powder into the machine, and I guess the powder would depend on whatever you're building. Certain powders for certain things, I guess. And then the machine basically sprays something else on this powder that causes it to harden or whatever." Example of technology characteristics. "These elderly baby boomers often live in retirement communities, down in Florida or wherever, and live in condos and play shuffleboard all day long. These homes keep them in contact with others in their demographic." Example of market characteristics.

a customer's problems, (2) generate positive cash flow, (3) quickly generate revenue, (4) present manageable risk, or (5) involve others in the entrepreneur's network who can help develop the venture. Coding of the transcripts involved noting each instance where the participant referenced one of the five characteristics of an expert prototype in either recognizing or evaluating an opportunity idea, and then summing up the total references. The score for this variable essentially reflects the degree to which an entrepreneur referenced these characteristics in either identifying or assessing a business idea. Entrepreneurs with a higher frequency of referencing such characteristics would be presenting

evidence of more expert opportunity prototypes, i.e., showing evidence that they have advanced understanding of what a good opportunity "looks" like. Those with a lower count would be showing less evidence of expert opportunity prototypes. In order to control for the length of the entrepreneur's discourse, we divided the final count by the total character length of the entrepreneur's transcript. The two coders agreed on 98% of the expert prototype coding instances, and Cohen's kappa was 0.88. In the 2% of cases where the two coders differed, the two coders met to determine the validity of the coding, came to an agreement, and made the requisite change to the data before proceeding with data analysis. These results indicate high levels of interrater reliability (cf. Fleiss, 1981; Lombard et al., 2002; Neuendorf, 2002).

Reliance on Professional Knowledge. The score for professional knowledge was based upon the percentage of an entrepreneur's transcript that drew upon knowledge developed through prior professional experience. Participant transcripts were first coded on the nature of the knowledge drawn upon by the participants. Statements where participants explicitly drew upon knowledge developed through prior professional experience were coded according to the length of the statements involved (number of transcribed characters). This quantity was then divided by the overall length of the transcript (in characters) in order to reflect the entrepreneurs' reliance upon professional knowledge as a percentage of their overall discourse. Stated differently, this is the relative importance of prior professional knowledge as a component of an entrepreneur's efforts to identify opportunities. The two coders agreed on 96% of the professional knowledge coding instances, and Cohen's kappa was 0.82. In the 4% of cases where the coding differed, the two coders met to determine the validity of the coding, came to an agreement, and made the necessary change to the data. These results indicate high levels of interrater reliability (cf. Fleiss, 1981; Lombard et al., 2002; Neuendorf, 2002).

Cognitive Style Index (CSI). We used Allinson and Hayes's (1996) 38-item scale to measure cognitive style. The items were designed to be true/false statements, with an additional response of "uncertain." Example items include, "Formal plans are more of a hindrance than a help in my work" and "I am inclined to scan through reports rather than read them in detail." Of the 38 items, 21 were worded such that a "true" response indicated an analysis orientation and the remaining 17 items were reversed such that a "true" response indicated an intuitive orientation. In computing the overall measure, the 17 reversed items were reverse-coded and then each item response was allocated a certain number of points: true was assigned a score of 2, 1 for uncertain, and 0 for false. Item scores were summed, with higher scores indicating a more analytical respondent and lower scores a more intuitive respondent.

In terms of validation testing, Allinson and Hayes (1996) administered the CSI to seven separate samples including around 1,000 subjects. Sadler-Smith, Spicer, and Tsang (2000) conducted a replication study to further validate the CSI. These validation efforts supported the unifactorial structure of the CSI and revealed high internal consistency (Cronbach's alpha coefficients ranging from .84 to .92) as well as strong construct and concurrent validity (Allinson & Hayes; Sadler-Smith et al.). These results are consistent with subsequent research supporting the unifactorial structure of the CSI (e.g., Brigham, De Castro, & Shepherd, 2007). For the current study, the measure produced a Cronbach's coefficient alpha of .85.

Control Variables. We used three control variables. Participant age was controlled to account for age-related differences in how individuals may think about opportunities. The

extent of each individual's education was assessed by asking each participant to indicate the highest level of education achieved from among the following choices: high school education/some college classes, 4-year college degree, or graduate-level degree. We dummy-coded education as a categorical variable to help control for the effect that different levels of education may have upon thinking processes. Finally, start-up experience was captured by asking how many businesses the participant had owned and played a role in starting up in his/her life. This experience was controlled for as it may be a primary factor in developing structural alignment-based thinking.

Results

Results from our content analysis revealed that the 342 verbal protocols (114 entrepreneurs completing three different business scenarios) lasted approximately 9 minutes apiece. A further breakdown of the 342 protocols revealed that in total, they generated 5,814 statements that addressed a similar subject and "hung together," with each being approximately 215 characters long ($SD = 112.5$ characters).

On average, entrepreneurs spent 6.9% of their conversation drawing on knowledge from previous professional experience. Ninety-five percent of entrepreneurs referenced an expert opportunity prototype at least once during their discourse. In breaking down the frequency with which particular characteristics of expert opportunity prototypes were referenced, solving a customer problem was referenced the most (47.5% of all references), followed by the generation of positive cash flow (41.2%), quickly generating revenue (5.3%), involving others who could partner (4.4%), and presenting manageable risk (1.7%). In further analyzing these statements, we found that entrepreneurs spent 38.4% of the discussion talking about the technology/product and 28.8% of the discussion talking about the market. Additionally, entrepreneurs spent 8.4% of their discourse on superficial statements and 12.4% of their discourse on statements concerned with structural relationships.

Robustness Analysis

Hierarchical regression analysis was used to test our hypotheses. In an attempt to minimize multicollinearity concerns, the independent variables were mean centered prior to the creation of interaction terms, the results of which were consistent with results using noncentered interaction variables (Aiken & West, 1991). All variance inflation factors (VIFs) were below 4, with a maximum VIF of 3.41. Additionally, a condition index test of multicollinearity (Belsley, Kuh, & Welsch, 1980) revealed condition indices for regression models 1–3 to be 11.52 (model 1), 12.17 (model 2), and 12.32 (model 3), respectively. Since all VIFs are well below the generally accepted limit of 10, and the condition indices were all below 30, we concluded that multicollinearity is unlikely to have confounded the results (Belsley et al.; Kutner, Nachtsheim, & Neter, 2004). We also sought to alleviate multicollinearity concerns by extending analysis beyond an examination of VIF and condition index values. Echambadi and Hess (2007) recommend reestimating models for multiple iterations using a randomly drawn subsample of 90% of the data set, arguing that multicollinearity will result in unstable regression coefficients. In this case, the regression coefficients remained stable in terms of direction and significance levels, further allaying concerns that multicollinearity has influenced our findings.

Table 2

Means, Standard Deviations, and Correlations of the Study Variables

Variable	M	SD	1	2	3	4	5	6	7	8
1. Age	52.41	13.30								
2. Education—4-year degree	0.4132	0.4945	0.04							
3. Education—Grad degree	0.4545	0.5000	–0.05	–0.77**						
4. Startup experience	3.27	3.14	0.08	0.14	–0.17					
5. Cognitive style index	35.69	12.19	0.21*	0.01	0.11	–0.22*				
6. Professional knowledge	0.0685	0.0830	–0.03	–0.06	0.04	0.01	–0.09			
7. Expert opportunity prototypes	0.0003	0.0002	–0.20*	0.05	–0.03	–0.16	–0.07	0.04		
8. Failure experience	0.4793	0.9407	–0.04	–0.02	–0.06	0.46**	–0.02	0.08	–0.10	
9. Use of structural alignment	0.1236	0.0976	–0.34**	0.09	–0.04	0.13	–0.05	0.23*	0.21*	0.11

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

Regression Analysis

In Table 2 we present the means, SDs, and bivariate correlations for variables used in the regression analyses. In Table 3, we present the results of the hierarchical regression analysis.

The first step in the regression (model 1) consisted of the study's control variables. The control variables explained a significant amount of the variance in the use of structural alignment processes (model 1: $R^2 = .170$; $p < .01$), with only the entrepreneur's age registering as significant ($p < .01$). The second step was to add the main effect variables (model 2). The addition of the main effect variables explained a significant share of the variance in the use of structural alignment processes (model 2: $R^2 = .273$; $p < .01$). This also represents a significant increase over and above model 1 ($\Delta R^2 = 0.103$; $p < .01$). Hypothesis 1 posited that there is a positive relationship between business failure experience and the use of structural alignment processes in opportunity identification. The coefficient for failure experience was nonsignificant and positive ($\beta = 0.041$, $p > .05$), and therefore, hypothesis 1 was not supported.

Step 3 in the regression (model 3) was to enter the two-way interaction terms. This model significantly explained variance in the use of structural alignment processes by entrepreneurs (model 3: $R^2 = .426$, $p < .01$) and represents a significant increase over and above the main effects only model ($\Delta R^2 = 0.153$, $p < .01$). The findings for model 3 demonstrate a significant positive interaction term for expert opportunity prototypes and failure experience on the usage of structural alignment processes ($\beta = 0.401$, $p < .01$). We also found a significant negative interaction term for professional knowledge and failure experience on the usage of structural alignment processes ($\beta = –0.199$, $p < .05$). Additionally, we found a significant negative interaction term for cognitive style and failure experience on the usage of structural alignment processes ($\beta = –0.263$, $p < .01$).

We plotted the significant interactions to determine the nature of the relationships. Figure 2 shows a plot of failure experience on the usage of structural alignment processes for high and low values of expert opportunity prototypes. Figure 3 illustrates a plot of failure experience on the usage of structural alignment processes for high and low reliance on professional knowledge. Finally, Figure 4 depicts a plot of failure experience on the

Table 3

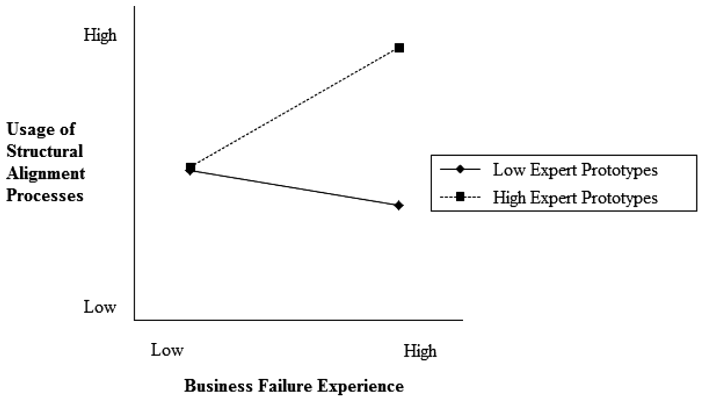
Results of Hypothesis Testing Using Hierarchical Regression

	Model 1	Model 2	Model 3	VIF
Control variables				
Age	–0.381**	–0.363**	–0.369**	1.13
Education—4-year degree	0.162	0.152	0.119	2.52
Education—grad degree	0.096	0.086	0.094	2.53
Startup experience	0.162	0.176	0.260**	1.60
Predictor variables				
Failure experience		0.041	–0.243	3.41
Expert opportunity prototypes		0.170*	0.234**	1.14
Professional knowledge		0.267**	0.341**	1.09
Cognitive style index		0.084	0.041	1.29
Interaction variables				
Failure experience × expert opportunity prototypes			0.401**	2.71
Failure experience × professional knowledge			–0.199*	1.10
Failure experience × cognitive style index			–0.263**	1.16
R^2	0.170**	0.273**	0.426**	
Adj. R^2	0.140**	0.218**	0.364**	
ΔR^2	0.170**	0.103**	0.153**	

Note: Standardized regression coefficients are displayed in the table VIF, variance inflation factor.
* $p < .05$; ** $p < .01$; n = 114 (The regression results remained substantially the same when we used "number of business ideas generated" as the dependent variable.)

Figure 2

Business Failure Experience, Expert Opportunity Prototypes, and the Use of Structural Alignment Processes



usage of structural alignment processes for analytical and intuitive values of cognitive style. We plotted values for expert opportunity prototypes (Figure 2), professional knowledge (Figure 3), and cognitive style (Figure 4) at one SD above and below their means as recommended by Cohen and Cohen (1983).

Figure 3

Business Failure Experience, Professional Knowledge, and the Use of Structural Alignment Processes

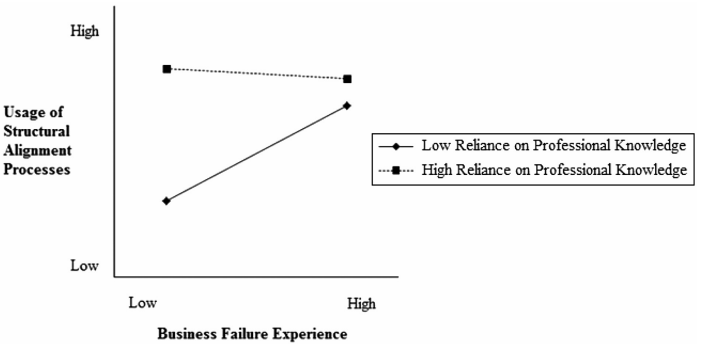
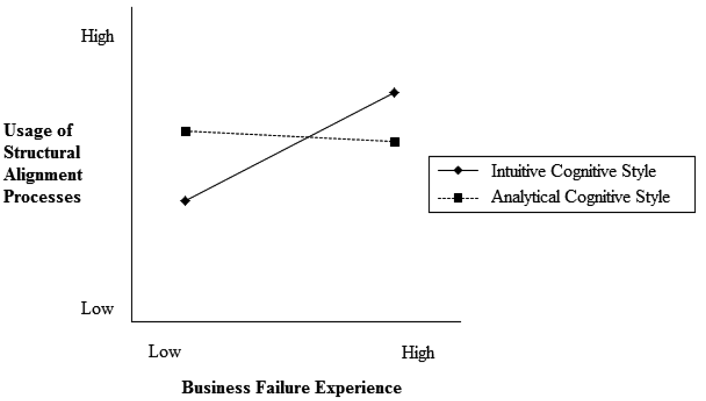


Figure 4

Business Failure Experience, Cognitive Style, and the Use of Structural Alignment Processes



The interaction shown in Figure 2 indicates that the positive relationship between business failure experience and the use of structural alignment processes in opportunity identification is more positive for individuals with highly expert opportunity prototypes than for those with less expert opportunity prototypes. This finding provides support for hypothesis 2. The nature of the interaction in Figure 3 indicates that the positive relationship between business failure experience and the use of structural alignment processes in opportunity identification is more positive for individuals who rely less on professional knowledge than for those who rely more on professional knowledge. This finding provides support for hypothesis 3. The plot of Figure 4 indicates that the positive relationship between business failure experience and the use of structural alignment processes in opportunity identification is more positive for individuals with an intuitive cognitive style than for those with an analytical cognitive style. This finding supports hypothesis 4.

Discussion

Business failure has largely been lauded in extant literature as providing a wide variety of uniquely valuable knowledge to the entrepreneur (McGrath, 1999; Minniti & Bygrave, 2001; Timmons, 1999). However, little prior work has explored the type of knowledge that can result from failure experiences, or the cognitive factors that can moderate the learning process. While the main effect between failure experience and the use of structural alignment processes was not significant, this study found that when coupled with the proper cognitive tools, failure experience can be beneficial in the long run, helping to equip individuals for success in subsequent ventures (at least in the identification of opportunities). Additionally, this study identified a number of cognitive tools—the possession of expert opportunity prototypes and an intuitive cognitive style—that help individuals make sense of a failure experience such that these experiences facilitate the use of structural alignment processes in opportunity identification. Moreover, we found that the extent to which failure experiences foster the use of structural alignment processes is greater for those who rely less on professional knowledge in their attempts to identify opportunities. Learning from failure is a complicated process operating in a complex environment. Cognitive tools such as opportunity prototypes and an intuitive cognitive style may be critical pieces of a "cognitive toolset" that better enable entrepreneurs to learn from their failure experiences (at least in terms of the use of structural alignment processes in attempts to identify opportunities).

Theoretical Implications

According to Kolb (1984), experiential learning is a process where experience is transformed into knowledge. This process is distinguished by two different phases: the acquisition of experience and the subsequent transformation of that experience into experiential knowledge. Previous research into learning, however, has largely focused on the acquisition of experience, leaving the transformation process unexplained. The study of entrepreneurial learning has primarily consisted of comparing the relative differences between entrepreneurs' "total stock" of various experiences and attempting to explain variances in performance by way of varying levels of experience (e.g., Bailey, 1986; Box, White, & Barr, 1993; Sapienza & Grimm, 1997). This view of learning has made important contributions to the literature; however, it is inherently limited because it has difficulty explaining why some individuals are able to benefit more from their experiences than others.

This study contributes to our understanding of how certain individuals benefit more from their failure experiences than others by fleshing out some of the cognitive underpinnings of the transformation process. In doing so, we highlight the importance of not only distinguishing between different types of experience as creating manifold varieties of business knowledge (e.g., Box et al., 1993; Bruderl & Preisendorfer, 1998; Sapienza & Grimm, 1997; Shepherd et al., 2000), but the role that each individual's cognitive makeup plays in determining how adept they are at transforming that experience into actual knowledge. Interestingly, while prior research has identified start-up experience as an important precursor to opportunity identification knowledge and ability (Ucbasaran et al., 2003), the current study failed to find a statistically significant direct relationship between start-up experience and the use of structural alignment during opportunity identification. Our findings relative to failure experience suggest that relationships between experience and knowledge are oftentimes not direct or linear, but rather enabled by individual cognitive characteristics (among other things) that facilitate the learning process.

Corbett (2005, 2007) explored the concept of learning asymmetries—essentially hypothesizing, and finding, that individuals incur and transform their experiences differently. More specifically, Corbett (2007) showed that an individual's preference for how he/she acquires experience as well as for how he/she transforms experience can determine variance in opportunity identification learning outcomes. The current study complements and extends the work of Corbett (2005, 2007) and Kolb (1984) by exploring the cognitive structures and processes that can explain variance in an individual's ability to transform experience into knowledge.

Specifically, this study found that those individuals with expert opportunity prototypes are more equipped to transform failure experience into opportunity identification process knowledge. Experiential learning theory has expounded the importance of prior knowledge and preexisting knowledge structures in the acquisition and transformation of experience. In fact, a central principle of experiential learning theory is that learning occurs when new information is combined and/or interpreted by an existing knowledge base (Kolb, 1984). In this study, we specify one facet of prior knowledge that is important to the transformation of failure experience—expert opportunity prototypes. In essence, we theorize that expert opportunity prototypes help entrepreneurs better understand the causes of their failure from an underlying opportunity perspective and this insight enables them to better match the capabilities of a product/technology to a market need in recognizing and assessing future business opportunities.

Kolb (1984) posits that there are two primary modes of experience transformation: apprehension and comprehension. Those individuals with a preference for apprehension rely on their feelings to digest their experiences whereas individuals who rely on comprehension use a forward-looking schema to assimilate new information through combination with past knowledge (Kolb). Future research might look at how certain cognitive structures or processes (like opportunity prototypes) work in tandem with the differing modes of experience transformation. It seems likely that individuals using a comprehension mode would more actively make use of preexisting knowledge structures such as expert opportunity prototypes. Our findings also suggest that certain opportunity prototypes may be more likely to be referenced and used than others during particular tasks. According to our coding analysis, entrepreneurs were far more likely to reference opportunity characteristics such as "solve a customer's problem" or "generate positive cash flow" while attempting to identify business opportunities than they were to reference other characteristics. This is an interesting extension of Baron and Ensley's (2006) work, and future research might seek a finer tuned understanding of when and how different opportunity characteristics are referenced throughout the entrepreneurial process.

Another finding of this study is that individuals who rely less on professional knowledge show a more positive relationship between business failure experience and the use of structural alignment processes during opportunity identification than those who rely more on professional knowledge. In other words, business failure experience is more beneficial (in terms of learning structural alignment processes) to entrepreneurs with more limited access to salient professional knowledge, than to those with a rich backdrop of relevant professional knowledge. This is most likely because entrepreneurs with large amounts of professional knowledge have already developed a cognitive preference for structural alignment processes. Previous literature delving into learning and the many benefits of experience has largely failed to examine the interaction of different types of experience on learning and performance outcomes (Bruneel et al., 2010). We know little about how various types of experience can substitute for, or complement, one another. Our findings indicate that in-so-far as we are investigating the use of structural alignment process knowledge, professional experience and failure experience are perhaps informational

substitutes for one another. This finding contrasts that found relative to expert opportunity prototypes which, while primarily developed from prior experience, interact with failure experience to augment the learning of structural alignment processes. Future research can explore the interactive effects of multiple sources of information and develop a richer understanding of how different types of experience can supplement, or entirely replace, one another.

An additional finding of this study is that cognitive style plays a significant role in explaining variance in the positive relationship between failure experience and the use of structural alignment processes in opportunity identification. Initial theorizing about entrepreneurial learning has highlighted the importance of "mode of transformation" (Minniti & Bygrave, 2001), experiential outcomes (Cardon & McGrath, 1999; Sitkin, 1992), predominant logic (causation versus effectuation) (Ravasi, Turati, Marchisio, & Ruta, 2004; Sarasvathy, 2001), and career orientation (Dyer, 1994; Katz, 1994) in explaining when and how entrepreneurs transform experience into knowledge. This study adds to these prior findings by identifying the powerful role that cognitive style may play in processing experience. More specifically, we found that an intuitive cognitive style facilitates the transformation of failure experiences into opportunity identification process knowledge. Additionally, consistent with previous research (e.g., Brigham et al., 2007; Ucbasaran et al., 2003), our study finds a negative correlation between start-up experience and CSI, lending credence to the argument that in the entrepreneurial domain, an intuitive cognitive style provides specific information processing advantages relative to an analytical cognitive style.

While a number of scholars have suggested that cognitive style may be a crucial distinguishing characteristic of entrepreneurs (Allinson et al., 2000; Sadler-Smith, 2004), others contend that although an intuitive cognitive style is important for entrepreneurs, it may have heightened importance for certain "types" of entrepreneurs, or at certain points in the entrepreneurial process. For example, Miner (1997) has identified intuition as a critical characteristic for entrepreneurs who are "expert idea generators," and Olson (1995) speculates that the most advantageous approach to information processing may differ throughout the entrepreneurial process, with a beneficial emphasis on intuitiveness during ideation and an emphasis on analysis during assessment and planning phases. The current study suggests that learning from failure may be another entrepreneurial process where an intuitive cognitive style is beneficial to the entrepreneur. Furthermore, the relationship between failure experience, cognitive style, and learning may help to explain why previous work has found that so many habitual and portfolio entrepreneurs operate with an intuitive cognitive style (Brigham & Sorenson, 2008; Ucbasaran et al., 2003). Those entrepreneurs with learning advantages, by nature of their intuitive cognitive style, are more likely to leverage that learning and start up future ventures. As such, cognitive style wields an important role in the learning process and has the potential to help explain the development of habitual and recurrent entrepreneurial action. These possibilities can be further explored in future research.

Cognitive style has linkages in prior research to coping strategies (Myers & Briggs, 1976). Coping consists of cognitive, emotional, and behavioral strategies to manage and/or reduce stress (Lazarus & Folkman, 1984), and is viewed as a temporary response to problems or situations whereas cognitive style is viewed as relatively stable over the long term (Hayes & Allinson, 1994). However, Kirton (1989) connected the two constructs and defined coping behavior as something that intercedes between stable, preferred cognitive style and actual, needed behavior. In this respect, coping behaviors are more flexible behaviors that are adopted in response to specific events and circumstances. Once they have outlived their usefulness, such behaviors and responses are abandoned quickly,

unless they mirror the natural preferences of a given cognitive style (Kirton). Existing literature on coping has consistently identified two major styles of coping: problem-focused coping and emotion-focused coping (Litman, 2006). The former deals with the source of the stress and the latter addresses the thoughts and feelings related to the stressor. Both types of coping have been categorized as approach-oriented coping—coping focused on dealing with the problem and/or emotions that accompany it (Roth & Cohen, 1986). However, this means of coping has been contrasted with avoidance-oriented coping—coping focused on ignoring or avoiding problems or stressors.

A potential limitation of our study is that our sample may inherently underrepresent those entrepreneurs who adopt avoidance-oriented coping mechanisms. Because avoidance-oriented coping mechanisms are commonly linked to negative traits and outcomes (Abbott, 2003; Moos & Holahan, 2003), it is possible that entrepreneurs who adopt this coping style may develop a more negative response to failure, and, indeed, may not effectively learn from failure or recover in order to start a subsequent business. In this respect, our study suffers from the oft-cited "survivor bias" wherein entrepreneurial samples are limited to those entrepreneurs who remain in business, or start subsequent businesses on the heels of an entrepreneurial exit (Aldrich & Wiedenmayer, 1993; Nightingale & Coad, 2014).

Given the significance that coping methods and processes have been found to have in learning from failure (Shepherd, 2003), the degree to which an individual's coping style enables them to leverage the appropriate cognitive (and other) mechanisms in order to learn may be a fruitful avenue for future research. Indeed, while cognitive style and coping style are two relatively distinct constructs, their intersection and potential interactive relationship may help to explain when and how entrepreneurs learn from failure.

In exploring how entrepreneurs learn from failure, we used a continuous variable that measured how many discrete new venture failures an individual had experienced. While the quantity of failures is no doubt important in explaining learning, the failure experience can vary significantly. Future research might meaningfully delve into other, connected characteristics of a failure that might help tease out some additional nuances in understanding how entrepreneurs learn from failure and what/how different cognitive and coping constructs explain variance in learning. Such characteristics might include the intensity or magnitude of the failure, the time since the most recent failure, the financial/social/emotional impact of the failure, or any of a number of other associated characteristics of the failure. It would be particularly interesting to analyze how the various characteristics of an individual's failure might hasten or impede the deterioration of knowledge gained as a result of the failure. Further, while we very specifically define a failure event as a business that was closed or sold due to bankruptcy, liquidation, or receivership, or because it failed to meet expectations, there may be inherent limitations or biases that result from this measure being self-reported. Future research may look at identifying more objective means of quantifying or qualifying business failures to address perceptual or recall-based biases on the part of the entrepreneur.

Finally, by identifying some of the cognitive characteristics that can influence the degree to which experience is transformed into knowledge, this study complements prior work which focuses on the environment in explaining learning. Prior work on learning from failure has pointed to the importance of the "type of failure" and other characteristics of the failure itself which facilitate or inhibit subsequent learning. This is based on the idea that not all failures are equally effective at prompting learning (Politis, 2005). Previous research has characterized those failures that are more amenable to being learned from as "intelligent failures"—those failures which provide enough information and feedback such that there is a basis from which business leaders can learn (Sitkin, 1992). This study

demonstrates that a focus on the cognitive characteristics of the entrepreneurs themselves, in addition to the characteristics of the failure, can help explain why some individuals are able to make better sense of the complex environment in gleaning important knowledge about how to process information for opportunity identification.

Implications for Practice and Conclusions

One implication of this study is that it empirically links business failure experience to a specific type of thinking—structural alignment. This study demonstrates that when equipped with the proper cognitive tools individuals can benefit from their business failures, and one specific benefit is an enhanced approach to identifying business opportunities. Moreover, there are steps that individuals can take to improve their ability to derive important lessons from business failure. Our results indicate that expert opportunity prototypes play a role in transforming failure experience into opportunity identification process knowledge. Entrepreneurs can develop and enrich their opportunity prototypes through experience, but also through conversations with other experienced entrepreneurs, or through entrepreneurship education (Baron & Ensley, 2006). Given the connection that such prototypes are believed to have, both to the development of opportunity identification capabilities (Baron & Ensley) and to the subsequent assessment of viable opportunities (Gregoire et al., 2010), centers for entrepreneurship education may want to emphasize the development of rich opportunity prototypes through a clear focus on the opportunity characteristics that lead to viable businesses.

Additionally, this study shows that there is a reason for optimism on the heels of a business failure. A large number of businesses fail every year (Harrison & Leitch, 2005; McGrath, 1999). The many anecdotal stories of entrepreneurs who have failed only to eventually succeed can instill hope and optimism following a failure; however, this study offers some mechanisms to underly such stories by explaining how failure experiences can actually be a stepping stone to the identification of subsequent opportunities.

An entrepreneur's attitude toward failure can have a significant influence upon his or her ability to learn from such failures (Politis & Gabrielsson, 2009). A positive attitude toward failure is based upon a willingness to learn from failure and includes the motivation to pursue learning through exploratory search and experimentation (Politis, 2005; Sarasvathy, 2001). Such mindsets are not fixed; indeed, prior research has shown that a positive attitude toward business failure can be developed and/or changed through new experiences and new information (Politis & Gabrielsson). Studies such as this one—demonstrating the benefits of failure—may help to diminish the negative stigma attached to business failure, thereby prompting a more positive attitude toward failure among entrepreneurs.

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