



## Entrepreneurial alertness in the pursuit of new opportunities

Jintong Tang<sup>a,1</sup>, K. Michele (Micki) Kacmar<sup>b,2</sup>, Lowell Busenitz<sup>c,\*</sup>

<sup>a</sup> Saint Louis University, John Cook School of Business, Department of Management, 3674 Lindell Blvd, Room 469A, St. Louis, MO, 63108, United States

<sup>b</sup> University of Alabama, Management and Marketing Department, 135 Alston Hall, Box 870225, Tuscaloosa, Alabama, 35487, United States

<sup>c</sup> University of Oklahoma, Price College of Business, Division of Management, 307 W. Brooks, Room 206, Norman, OK, 73019, United States

### ARTICLE INFO

#### Article history:

Received 16 February 2009

Received in revised form 16 July 2010

Accepted 19 July 2010

Available online 25 August 2010

Field Editor: D. Shepherd

#### Keywords:

Entrepreneurial alertness

Opportunities

Information

Search

Judgment

Scale development

### ABSTRACT

The recognition and development of new opportunities are at the heart of entrepreneurship. Building from Kirzner's (1973, 1999) work, cognition theory, and McMullen and Shepherd's (2006) recent development, we offer a model involving three distinct elements of alertness: scanning and search, association and connection, and evaluation and judgment. We then conduct multiple studies to develop and validate a 13-item alertness scale that captures these three dimensions. Results demonstrate appropriate dimensionality, strong reliability, and content, convergent, discriminant, and nomological validity. The resultant instrument provides researchers with a valuable tool for probing the entrepreneurial opportunity development process including antecedents and outcomes.

© 2010 Published by Elsevier Inc.

### 1. Executive summary

Given the growth and role of entrepreneurship today, it is becoming increasingly important to understand how new entrepreneurial opportunities get developed. Discussions of the emergences of new entrepreneurial opportunities often include “eureka” moments, but our understanding of how new opportunities get brought forward is limited. One concept that is starting to gain some traction involves alertness, the assumption being that entrepreneurs tend to be more alert to possibilities for new entrepreneurial ventures. Alertness is a concept that has the potential to add substantially to our understanding of how new ideas get initiated and pursued. Despite its potential, alertness remains understudied due to an ambiguous understanding of the term and particularly because of major measurement issues. This study further specifies the meaning of alertness and how we can empirically measure this construct in a rigorous manner.

Kirzner (1979) defined alertness as an individual's ability to identify opportunities which are overlooked by others. In further developing the boundaries of alertness, we argue that an important component of alertness is the aspect of judgment which focuses on evaluating the new changes, shifts, and information and deciding if they would reflect a business opportunity with profit potentials. We define alertness as consisting of three distinct elements: scanning and searching for information, connecting previously-disparate information, and making evaluations on the existence of profitable business opportunities.

This article reports on three consecutive studies that together rigorously develop and validate a scale for alertness. Study 1 focuses on generating the original pool of items for alertness and assessing the content adequacy. Originally, 28 items were developed. After content validity test and Q-factor analysis, 15 items were retained. Study 2 presents initial evidence of the

\* Corresponding author. Tel.: +1 405 325 2653.

E-mail addresses: jtang3@slu.edu (J. Tang), mkacmar@cba.ua.edu (K.M.(M.) Kacmar), busenitz@ou.edu (L. Busenitz).

<sup>1</sup> Tel.: +1 314 977 3811; fax: +1 314 977 1482.

<sup>2</sup> Tel.: +1 205 348 8931; fax: +1 205 348 6695.

reliability, dimensionality, and factor structure by utilizing a sample of 291 CEOs. These procedures resulted in 13 items. Study 3 provides evidence of convergent, discriminant, and nomological validity of the alertness scale with a sample of 109 entrepreneurs. Results confirm the 13-item alertness scale with 3 dimensions and also indicate that entrepreneurs' prior knowledge is significantly related to alertness and that alertness is positively associated with firms' innovation.

With the entrepreneurial alertness scale developed, we can now pursue how one's disposition and experience levels impact alertness. For example, interest levels and passion may lead to ardent alertness. Alertness levels also may impact the type of opportunities that are put forth. Finally, social cognition theory suggests that the decision and inference process can be improved with training and the appropriate inferential techniques (Fiske and Taylor, 1984). Thus, alertness represents a capability that can be learned and improved, and may offer guidance to aspiring entrepreneurs in how to mindfully discover opportunities with business potential.

## 2. Introduction

The emergence of new ideas and how they can lead to commercializable opportunities are central to the field of entrepreneurship (Baron, 2006; Shane and Venkataraman, 2000; Short et al., 2010). Explanations for how new opportunities emerge include prior experiences, personal disposition, changes in the broader environment, gaining specific information, and being a frustrated user (Gaglio and Katz, 2001; Shane, 2000; Shepherd et al., 2007; Tripsas, 2008). Furthermore, discovering new opportunities has been linked to personal awareness, skills, and insights (Kirzner, 1999; Kaish and Gilad, 1991). Alertness is a process and perspective that helps some individuals to be more aware of changes, shifts, opportunities, and overlooked possibilities (Kirzner, 1973, 1979, 1985). Alertness and the development of schemata enable persons to organize and interpret information in various domains of knowledge related to the development of new opportunities (Gaglio and Katz, 2001). Thus, alertness is a concept that has the potential to add substantially to our understanding of how new ideas get initiated and pursued. Despite its potential, alertness remains understudied because we do not have adequate tools to rigorously investigate it.

This study seeks to provide a theoretically justified measure of entrepreneurial alertness. We examine the growing research in this area and then further develop the concept of alertness. From this foundation, we position alertness as consisting of three distinct elements: scanning and searching for information, connecting previously-disparate information, and making evaluations regarding the existence of potential business opportunities. We then develop a scale with solid psychometric properties that will enable researchers to better probe the various dynamics of alertness including antecedents and outcomes. While there has been some earlier scale development work with alertness (Kaish and Gilad, 1991), unfortunately, the theoretical and psychometric properties of those scales are unacceptable for rigorous research (Busenitz, 1996). Recent developments in the study of alertness and entrepreneurial opportunity suggest expansion of the alertness process; but since theory-building progresses no faster than do its measures (e.g. Nunnally, 1978), such expansion requires scale development. Our research reports on three consecutive studies we undertook to develop and validate a scale for alertness, which will better serve future research in the area: Study 1 uses students' responses to initial item generation to assess content adequacy; Study 2 employs a uniquely different sample of business-persons to assess reliability, dimensionality, and factor structure; and Study 3 assesses responses from entrepreneur-target respondents to examine convergent, discriminant, and nomological validity.

The developed alertness scale will allow researchers to empirically examine central research questions in entrepreneurship such as: Why do some persons but not others recognize opportunities for new products or services that can be profitably exploited? (Baron, 2004). More broadly, numerous antecedents that may influence one's alertness can be explored. It may also inform the fundamental question for entrepreneurial cognition research: How do entrepreneurs think? (Mitchell et al., 2007). Finally, the development of the alertness scale can open up numerous channels to the following question: Does greater alertness enhance the probability that a new venture will be pursued or even the type of resulting venture?

Our study makes several important contributions to alertness research. First, we carefully articulate the alertness process drawing on existing theoretical work by Kirzner (1979, 1999) and McMullen and Shepherd (2006). Second, we now offer a specific scale that can be used to help us understand alertness and its implications. The resultant scales developed here also will allow us to examine more closely the alertness process. Third, the development of these scales can put us on the road to better understanding the antecedents to entrepreneurial alertness; the interactions of the different dimensions of alertness, as well as the potential outcomes of varying levels of alertness.

## 3. Entrepreneurial alertness

Alertness has been central in the context of the recently developing area of "opportunity" in entrepreneurship research. Some of this research argues that either opportunities are discovered or they are created (see Short et al., 2010 or a review). Another approach parcels it into the three areas of opportunity recognition, opportunity discovery, and opportunity creation (Sarvasathy et al., 2003). Our research concerns itself primarily with opportunity discovery and creation.

Research on entrepreneurial alertness was initially developed by Kirzner (1973, 1979), who characterized individuals who were more alert as having an "antenna" that permits recognition of gaps with limited clues. Building on Kirzner's work, Kaish and Gilad (1991) saw alert individuals as having a "unique preparedness" in consistently scanning the environment ready to discover opportunities. Later Kirzner argued that alertness includes creative and imaginative action and may "impact the type of transactions that will be entered into future market periods" (1999, p. 10).

More recent scholars have continued to advance arguments that alertness involves a proactive stance based on a number of cognitive capacities and processes such as prior knowledge and experiences, pattern recognition, information processing skills, and social interactions (Ardichvili et al., 2003; Baron, 2006; Csikszentmihalyi, 1996; Gaglio and Katz, 2001; Shane, 2003). Central among these efforts is the article by McMullen and Shepherd (2006) which argues that entrepreneurship fundamentally involves action. According to McMullen and Shepherd (2006), alertness is not entrepreneurial unless it involves judgment and a movement toward action. “To act on the possibility that one has identified an opportunity worth pursuing” is the heart of being an entrepreneur (McMullen and Shepherd, 2006, p. 132). The developing views of alertness are summarized in Table 1.

Building from this review, we conceptualize alertness as having three complementary dimensions: scanning and searching for new information, connecting previously-disparate information, and evaluating whether the new information represents an opportunity. Consistent with Kirzner's early work and the role of awareness of gaps when new opportunities present themselves, alert scanning and searching refer to constantly scanning the environment and searching for new information, changes, and shifts overlooked by others. Extending alertness as a part of the entrepreneurial cognition process (Alvarez and Busenitz, 2001; Mitchell et al., 2007), this dimension involves pre-existing knowledge, preparedness, and sensitivity to new opportunities. The second dimension, alert association and connection, involves pulling together disparate pieces of information and building them into coherent alternatives. This dimension corresponds with Kirzner's later work on alertness (1999) and addresses how individuals cognitively respond to and process new information clues. Building on McMullen and Shepherd's (2006) recent work, we suggest that the third dimension involves making evaluations and judgments about the new changes, shifts, or information and deciding if they would reflect a business opportunity with profit potential. For there to be an entrepreneurial opportunity, action needs to evolve from the cues, gathered information, and evaluations.

Fig. 1 represents the model of alertness, consisting of three components described above. The model also illustrates prior research on certain determinants of alertness (e.g., individual disposition, training and exercises, social networks, etc.) and potential outcomes of alertness (e.g., venture startup activities). We now develop each of the above proposed dimensions of alertness and how they interact.

### 3.1. Alert scanning and search

Alert scanning and search allow entrepreneurs to be persistent and unconventional in their attempts to investigate new ideas (Busenitz, 1996). This dimension of alertness assists entrepreneurs in building a vast array of domain-relevant information. The information searched constitutes the individual's sensory store, which provides brief storage for information in its original form (Reed, 2004). Such a sensory store enhances the development of an individual's knowledge base: both tacit and explicit (Polanyi, 1967). Tacit knowledge is acquired during one's experience in a particular domain and often non-codified (Dimov and Shepherd, 2005). Explicit knowledge refers to knowledge and information which is external to the individual and can be easily shared with others. Both tacit and explicit knowledge facilitate the integration and accumulation of new knowledge as well as adapting to new situations (Weick, 1996). Scanning and search also can happen when the entrepreneur starts to look for answers to a specific question. Since no systematic strategy is deployed (Kirzner, 1979), an entrepreneur will typically search for multiple possibilities in the relevant places.

The scanning and search dimension helps lay the foundation for developing cognitive frameworks (i.e., prototypes and schemas that reflect an individual's knowledge and beliefs about the external world). Such cognitive frameworks represent the cumulative experience, learning, and meaning an individual has constructed about the specific domain. They are essential for processing and utilizing stored information and knowledge. Because the content and structure of schemas for a specific domain are idiosyncratic (Gaglio, 1997), entrepreneurs with more extensive scanning and search will have a wider range of knowledge and information, which can benefit them in attaining expert performance (Ericsson et al., 1993) in enhanced alertness to business opportunities.

**Table 1**  
Developing views of alertness.

	Early Kirzner	Later Kirzner	Recent Developments <sup>a</sup>
Role of markets	Disequilibrium gaps to be identified	Adjustments of opportunities to fit the market	Opportunities emerge from macro changes
Role of knowledge and pre-existing conditions	Helpful to the extent that it triggers the “Aha” moment	Prior knowledge can be expanded to further pursue opportunities	Prior knowledge and information processing inform observations and feasibility assessment
Alert scanning and search	Passive; a unique preparedness	Passive and active; pursue specific opportunities	Cognitive capacity (e.g., creativity, intelligence) and personal fit
Alert association and scanning	Lying dormant waiting to be identified	Still lying dormant but room for creativity and further development	Initial insights heighten sensitivity and can produce further search and processing
Alert evaluation and judgment	Largely unaddressed, assumed that entrepreneurs would act on opportunities	Evaluations of opportunities can evolve over time	Combining beliefs/ insights and desires for a judgment on venture prospects; distinction between first- and third-person opportunities

<sup>a</sup> Primarily drawn from McMullen and Shepherd (2006) and Baron (2006).

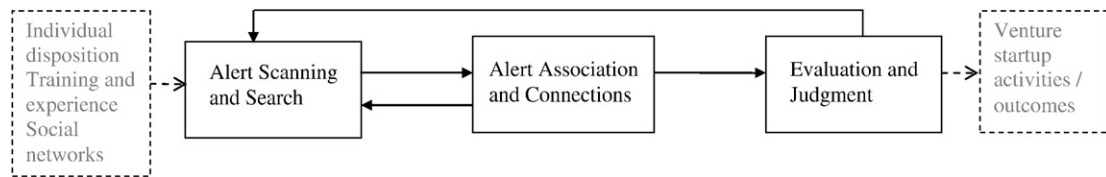


Fig. 1. Model of entrepreneurial alertness.

### 3.2. Alert association and connection

Alert association and connection focus on receiving new information, creativity, and making extensions in logic. It accounts for how information is applied or extended. Association allows an individual to consider multiple options and possibilities and to make unique connections. Rather than minimizing distractions and focusing on the relevant details of multiple pieces of information, association enables individuals to connect to the big picture so that distant and unprecedented connections can be made (Lehrer, 2008).

Social cognition theory suggests that the calculation of covariation and the strongly reappearing traces or responses are related and consist of multiple steps (Fiske and Taylor, 1984). First, individuals must seek understanding of what data are relevant to assess covariation. Data on multiple sides of the issue are needed for the connection. Second, data are classified into types of evidence such as positive or negative. Positive data fitting expectations are usually more quickly and easily incorporated into the inference model than negative data. Third, individuals recall the evidence and estimate the frequency of each type of evidence. The recalling confirms some data and disconfirms other. Finally, there is the combining of the evidence into a form, often in various nonlinear or non-sequential combinations. These cognitive associations of present information depend heavily on whether individuals have a prior expectation or experience about the relationship between the two variables.

These four aspects of covariation enable individuals, entrepreneurs in this case, to get an informed picture before making an evaluation by keying on specific pieces of information. If scanning and search can be passive or active, association and connection of knowledge into potentially viable ventures are proactive (Alvarez and Barney, 2002). This is accomplished by deliberate manipulation of information (Neisser, 1967), such as adding, deleting, or interpreting the same information in a different manner. Whenever something unusual or unexpected is detected, association allows entrepreneurs to change their existing schema to accommodate non-matching information (Gaglio and Katz, 2001). In essence, the association and connection dimension of alertness allows individuals to move out of the routine track and modify the categories of their existing means–ends interpretation framework.

Association and connection also change the character of information through bisociation, the sudden interlocking of two or more previously unrelated matrices of information or thoughts (Koestler, 1964). Bisociation is more likely to happen when the brain wanders (i.e., when entrepreneurs are engaged in “unconscious work” or “mental rambles,” because too much concentration can actually diminish creative connections) (Lehrer, 2008). Although relaxing the brain enhances association and connection, it does not necessarily mean that such cognitive processes cannot be improved via effortful activities. Engaging in deliberate practice can help individuals acquire expert performance (Ericsson et al., 1993) by promoting entrepreneurs’ ability to connect the dots, think outside the box, and perceive links between seemingly unrelated events.

Once dots are connected, individuals may need to scan and search the environment again to further clarify the picture or to explore the usefulness of the newly-connected information. One is unlikely to go from scanning and search to making judgments about the potentiality of the new connections. Rather, the newly-sought information has to be interpreted and perhaps considered for more associations and connections. Thus, we suggest that scanning and search involves a recursive relationship with association and connection as a search may often trigger additional associations and ideas.

### 3.3. Evaluation and judgment

In this article, we argue that an important part of entrepreneurial alertness is the aspect of judgment and thus extend the boundaries of alertness by adding a third dimension: evaluation and judgment. In assessing and estimating if an opportunity arises from new information, an entrepreneur exercises judgment (McMullen and Shepherd, 2006) that involves two stages: (1) attention and third-person opportunity; and (2) evaluation and first-person opportunity (McMullen and Shepherd, 2006). The first stage occurs when an individual believes that a potential opportunity exists for someone (i.e., third-person opportunity). It may not represent an opportunity for everyone, but only for those with the right qualities. At the second stage, the third-person opportunity activates another evaluation process when the entrepreneur decides if it is an opportunity for him or her (i.e., first-person opportunity). In essence, believing that a third-person opportunity exists does not necessarily mean that one believes one possesses the right combination of knowledge and motivation to exploit it. If a prospective entrepreneur thinks that the opportunity may be positive, s/he will likely assess his/her own willingness to bear the uncertainties, and decide whether s/he will exploit the opportunity by engaging in entrepreneurial action. McMullen and Shepherd (2006) posit that Kirzner’s theory of alertness addresses the attention stage of evaluation and focuses on judging the new changes, shifts, or information and deciding if they would reflect a business opportunity with profit potentials. Note that the evaluation here does not entail the actual launching and capitalizing on the opportunity, only whether an opportunity exists.

Turning to our alertness model in Fig. 1, after the entrepreneur scans and searches the environment, and connects previously-disparate information, at some point, s/he will make an evaluation about whether the newly-conceived information would fit into

his/her existing cognitive frameworks by matching the new information with his/her prototypes and exemplars for business opportunities (Baron, 2006). The evaluation and judgment dimension of alertness allows entrepreneurs to judge the content of the new information, filter unessential information, and make an assessment of whether the new information reflects any potential business opportunity. By so doing, it enhances entrepreneurs' "situational awareness." Alternatively, an evaluation may require individuals to obtain additional insights via search in order to adjust and reconsider related alternatives. This is presented in the link from evaluation and judgment back to scanning and search in Fig. 1. More information may help the individual to make more accurate evaluations on the potentiality of the new business idea.

While it may appear that a judgment is arrived at without a detailed analysis (i.e., insight erupts into awareness) (Lehrer, 2008), entrepreneurs will typically have processed relevant and available information. When individuals receive multiple messages transmitted over various channels, they will usually make successive selections from among all the possible messages based on reconstructed and relevant stored information (Neisser, 1967). In order to do so, scanning and search requires sorting information through association and connection. The connected information is aroused from time to time by making evaluations. This cognitive unit can disappear and reappear over and over again, a phenomenon labeled as the "reappearance hypothesis" (Neisser, 1967). The more it reappears, the more likely it will be that one can decide if the new concept matches their interpretation framework and thus represents a business opportunity.

The social inference process is marked by humans' willingness to use strategies to move information through the cognitive system quickly (Fiske and Taylor, 1984) because our knowledge structures (i.e., schemata, scripts, frames, stereotypes, etc.) tend to be very abstract (Schneider, 1991). Individuals who retrieve constructed or reconstructed information and make judgments quickly before opportunity windows close, are often referred to as "cognitive misers" (Taylor, 1981). In effect, evaluation and judgment serve as a filter that determines which patterns will be recognized and attended (Reed, 2004). It reflects an individual's ability to develop an insight into the value of specific information that others are overlooking. Making judgments allows entrepreneurs to sense opportunities (Kirzner, 1997; Yu, 2001) and to choose among multiple possibilities. It serves as business acumen that helps entrepreneurs envision the future with viable business opportunities (Kirzner, 1985). Entrepreneurs make their judgments based on their patterns to clarify what the associated information entails in terms of an unmet market need (Dutta and Crossan, 2005). This dimension is consistent with the conjecture of signal detection theory (Swets, 1992), which suggests that four situations exist when individuals attempt to determine whether a stimulus is present: hit or correct identification (the stimulus exists and the perceiver concludes that it is present), false alarm (the stimulus does not exist and the perceiver concludes that it is present), miss (the stimulus exists but the perceiver fails to recognize it), or correct rejection (the stimulus does not exist and the perceiver concludes that it is not present). Therefore, signal detection theory (Swets, 1992) suggests that the better the entrepreneur's ability to decide on the right information, the higher the possibility that he/she will achieve a "hit" or "correct identification."

Having further developed the alertness process, we now focus on building and initially validating a scale to measure alertness across three studies. Study 1 focuses on generating the original pool of items for alertness and assessing their content adequacy with a student sample. Study 2 presents initial evidence of the reliability, dimensionality, and factor structure by utilizing a CEO sample. Study 3 provides evidence of convergent, discriminant, and nomological validity of the alertness scale with an entrepreneur sample.

## 4. Research method

### 4.1. Study 1: item generation and content adequacy assessment

#### 4.1.1. Item generation

We employed both deductive and inductive approaches for item generation (Hinkin, 1995). Initially 28 items were generated to assess the alertness construct and to representatively reflect the three dimensions theorized to comprise alertness. The items for the scanning and search dimension were developed based on the earlier work by Busenitz (1996), Fiet (2002), Kaish and Gilad (1991), and Kirzner (1979). The items for the association and connection dimension were generated based on an extensive review of the literature on the cognitive perspective of alertness by Baron (2006), Gaglio (1997, 2004), Gaglio and Katz (2001), Kirzner (1999), Ko and Butler (2003), and Yu (2001). Finally, the items for the evaluation and judgment dimension were developed by conducting a systematic review of the related literature with particular reference to judgment in the inference forming process (e.g., Fiske and Taylor, 1984; Schneider, 1991) and opportunity recognition (e.g., McMullen and Shepherd, 2006) context.

Next, these items were subjected to discussions with 2 subject matter experts and in-depth interviews with 2 experienced entrepreneurs, to further identify the items that were deemed appropriate to represent each of the three dimensions. Through this process, 4 items were deleted for failing to provide face validity, reducing the number of items to 24:8 items for each of the 3 alertness dimensions.

#### 4.1.2. Content adequacy test

A content adequacy test was conducted following the quantitative approach suggested by Schriesheim et al. (1993) in order to ensure that the content of a measure covers a representative sample of the domain to be measured (Anastasi, 1982).

**4.1.2.1. Sample and procedures.** The sample was composed of 164 upper level undergraduate business students from a large state university in the Southeast United States who completed the content adequacy survey in exchange for extra credit points. The average age was 22 and 13% had entrepreneurial experience; 58% were male and 84% were Caucasian. The surveys, administered

in April, 2006, instructed participants to determine how representative each item was of the definition (1 = “definitely not representative” and 5 = “definitely representative”). Each category/dimension rating appeared on a separate page. Each page contained a conceptual definition for the dimension at the top of the page. Five versions of the survey, which were randomly distributed to the respondents, were used to decrease priming effects caused by the question context or item embeddedness.

There are mixed opinions regarding the generalizability of results from student samples when studying managerial behaviors (e.g., Barr and Hitt, 1986; Mullins, 1982). We acknowledge that the use of student participants may impact generalizability. However, the degree of impact may not be large when researching human behavior in general because student samples have been widely used where the objective is to ascertain how the human mind responds to various symbolic input (e.g., Kacmar and Carlson, 1997; Scandura and Williams, 2000; Seers and Woodruff, 1997; Van der Vegt and Van de Vliert, 2005). Such results have been accepted for generalization (Friede Westring et al., 2009), especially in cases where – as in our task – the objective is to, for example, assess content adequacy.

**4.1.2.2. Analysis and results.** The mean score of the responses on each item provided was calculated for each dimension. An item's highest mean had to correspond to the intended alertness dimension. In addition, to eliminate items that did not discriminate between dimensions, an item's highest mean had to be sufficiently different from the ratings obtained for the other categories. If the difference between the highest and the next highest mean was not at least .20 (Carlson et al., 2000), the item was discarded. Table 2 summarizes the mean scores of the responses on each item for the alertness scale. Two items (5 and 9) were removed because they failed to pass the mean comparison test. Another 7 items (8, 11, 12, 13, 17, 18, and 23) were dropped because they failed to discriminate between dimensions.

Next, the remaining 15 items were arranged into an extended score matrix to be entered for Q-factor analysis. A principal axis factor analysis with varimax rotation was conducted. Our observations to respondent ratio for this analysis were 10.9:1, which exceeds the 5:1 rule-of-thumb ratio (Hair et al., 2006). Loadings of .40 or greater were considered meaningful for interpretation and the more positive an item's loading on a Q-factor, the more the item was viewed as measuring the construct underlying that factor. Conversely, negative item loadings were treated as indicating that the factor construct was not present. Items were therefore assigned to the factors on which they had positive and meaningful loadings, and these item assignments were then checked with and interpreted based primarily upon the mean scores to ensure they properly reflected the judge's evaluations. As a result, 3 factors with eigenvalues

**Table 2**  
Judge total evaluations for alertness (Study 1, N = 164).

Item	Mean scores		
	Scanning and search	Association and connection	Evaluation and judgment
<i>Scanning and search</i>			
1. I have frequent interactions with others to acquire new information.	3.97	3.48	3.48
2. I always keep an eye out for new business ideas when looking for information.	3.83	3.33	3.56
3. I read newss, magazines, or trade publications regularly to acquire new information.	3.77	3.38	3.40
4. I browse the Internet every day.	3.96	3.73	3.75
5. While going about day-to-day activities, I try to look for new business ideas.	3.54	3.43	3.60
6. I am an avid information seeker.	3.74	3.50	3.50
7. I am always actively looking for new information.	3.73	3.46	3.45
8. I regularly seek information from new business development resource centers (such as local chamber of commerce, small business center at local university, small business administration website, entrepreneurs.com, or others).	3.35	3.17	3.32
<i>Association and connection</i>			
9. I often see new combinations of people, materials, or products.	3.20	3.41	3.48
10. I often make novel connections and perceive new or emergent relationships between various pieces of information.	3.38	3.72	3.52
11. I often find differences between the way I see certain situations and the way other people see them.	3.45	3.61	3.50
12. I often come up with new ideas and approaches to customer problems.	3.54	3.60	3.44
13. I often think “outside the box.”	3.65	3.73	3.49
14. I see links between seemingly unrelated pieces of information.	3.55	3.80	3.44
15. I am good at “connecting dots.”	3.48	4.01	3.49
16. I often see connections between previously unconnected domains of information.	3.48	3.85	3.36
<i>Evaluation and judgment</i>			
17. “Seeing” potential new business opportunities comes very naturally to me.	3.49	3.46	3.62
18. I have a special alertness or sensitivity toward profitable opportunities.	3.53	3.33	3.69
19. I have a gut feeling for potential opportunities.	3.27	3.24	3.56
20. I can distinguish between profitable opportunities and not-so-profitable opportunities.	3.51	3.54	3.74
21. I have an extraordinary ability to smell profitable opportunities.	3.12	3.16	3.53
22. I have a knack for telling high-value opportunities apart from low-value opportunities.	3.38	3.32	3.58
23. When it comes to business opportunities, I am good at filtering or blocking out insignificant information to make decisions.	3.58	3.43	3.67
24. When facing multiple opportunities, I am able to select the good ones.	3.56	3.48	3.77

greater than 1 (22.19, 6.96, and 3.58) were generated. These 3 factors explained a total of 43.28% of variance and all items had positive loadings greater than .50 on their intended dimensions (Table 3). All 15 items were retained.

#### 4.2. Study 2: reliability, dimensionality, and factor structure

##### 4.2.1. Sample and procedures

In Study 2, the 15 items retained from Study 1 were examined for construct validity. A mail survey was conducted to collect data from CEOs competing in multiple industries all over South Korea. Data collection was administered by South Korea Small Business Research Institute located in Seoul, South Korea. The first-round surveys were sent in June, 2006 to all 2000 CEOs on the mailing list of the institute with self-addressed and stamped return envelopes. One month later, the second-round survey reminder was sent to increase the response rate. All completed surveys were returned to the research institute. Consistent with the framework established by Brislin (1980) for conducting international surveys, the survey was drafted in English and then translated into Korean. To ensure linguistic and conceptual equivalence between the two versions, several rounds of modifications were made to correct any discrepancies. Of the 2000 surveys sent, 291 were returned with complete data, reflecting a response rate of 14.6%. The average age of the respondents was 35 and 85% were male. In addition, 79% of the respondents reported education levels of 4-year College or above.

To assess reliability, dimensionality, and factor structure, it is necessary to utilize a sample that will permit generalizability across items, rather than subjects (Nunnally, 1978). It is also helpful when data from a different source other than the student-respondents of Study 1 can be employed to avoid common method bias (e.g., Podsakoff et al., 2003) in measurement. Furthermore, it is commonly expected in social research that where tests can be performed in highly unique contexts, the results are “much more credible” (e.g. Stinchcombe, 1968: 20). Accordingly, given our access through the South Korea Small Business Research Institute to a sampling frame that could meet all of these criteria (i.e., data from CEOs competing in multiple industries from all over South Korea), we utilized this data source to further support the rigor of our analysis.

##### 4.2.2. Analyses

In order to explore and confirm the 15-item alertness scale, we randomly split the sample in half. Using the first half of the sample (N = 144), we began by performing the measure of sampling adequacy test (MSA) to assess which items to drop from the model because they are too multi-collinear (Hair et al., 2006). Results showed that the KMO overall statistic was .91 and each individual KMO statistic was greater than .90, much higher than the recommended .60 threshold. Thus, all 15 items were kept for exploratory factor analysis. Our observations to respondent ratio for this analysis were 9.6:1, which exceeds the 5:1 rule-of-thumb ratio (Hair et al., 2006). Then principal axis factoring with an oblimin rotation requesting 3 factors was performed (Reis and Judd, 2000). One item did not load on its intended factor (e.g., “I often make novel connections and perceive new or emergent relationships between various pieces of information.”) and another had a loading less than .40 (e.g., “I have an extraordinary ability to smell profitable opportunities”). These 2 items were eliminated and the analyses were rerun.

The rotated factor solution of the 13 items, presented in Table 4, shows that these 3 factors explained 71.81% of the total variance. All item loadings were greater than .40 on a single factor and there were no cross loadings. Examination of this table suggests that the 3 factors are readily interpretable and represent the 3 factors of alertness as conceptualized. As also noted in Table 4, internal consistency indices revealed reliability estimates of .91 for search, .94 for evaluation and judgment, and .90 for association. The inter-correlations of the 3 dimensions ranged in magnitude from .65 to .68.

**Table 3**  
Results of Q-factor analysis for alertness (Study 1, N = 164).

Items	Factor 1	Factor 2	Factor 3
<i>Scanning and search</i>			
1. I have frequent interactions with others to acquire new information.	.05	.68	.11
2. I always keep an eye out for new business ideas when looking for information.	.19	.59	.16
3. I read news, magazines, or trade publications regularly to acquire new information.	.06	.57	.06
4. I browse the Internet every day.	.21	.53	.01
5. I am an avid information seeker.	.16	.70	.15
6. I am always actively looking for new information.	.16	.76	.14
<i>Association and connection</i>			
7. I often make novel connections and perceive new or emergent relationships between various pieces of information.	.09	.13	.62
8. I see links between seemingly unrelated pieces of information.	.15	.15	.81
9. I am good at “connecting dots.”	.20	.11	.67
10. I often see connections between previously unconnected domains of information.	.15	.10	.79
<i>Evaluation and judgment</i>			
11. I have a gut feeling for potential opportunities.	.70	.18	.09
12. I can distinguish between profitable opportunities and not-so-profitable opportunities.	.79	.12	.12
13. I have an extraordinary ability to smell profitable opportunities.	.79	.15	.12
14. I have a knack for telling high-value opportunities apart from low-value opportunities.	.74	.13	.18
15. When facing multiple opportunities, I am able to select the good ones.	.58	.19	.20

**Table 4**

Results of exploratory factor analysis for alertness.

Items	Study 2 (1st half sample) <sup>a</sup>			Study 3 <sup>b</sup>		
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
<i>Scanning and search</i>						
1. I have frequent interactions with others to acquire new information.	.57	.10	-.06	.43	.04	-.01
2. I always keep an eye out for new business ideas when looking for information.	.67	.07	-.06	.41	.17	-.03
3. I read newss, magazines, or trade publications regularly to acquire new information.	.96	-.03	.13	.56	.05	.08
4. I browse the Internet every day.	.66	.03	-.01	.44	-.04	.00
5. I am an avid information seeker.	.77	-.04	-.18	.87	-.11	-.16
6. I am always actively looking for new information.	.79	.01	-.13	.70	.05	-.10
<i>Association and connection</i>						
7. I see links between seemingly unrelated pieces of information.	.13	.10	-.68	.06	-.05	-.89
8. I am good at “connecting dots.”	.02	.00	-.94	.02	.16	-.76
9. I often see connections between previously unconnected domains of information.	.03	.02	-.88	-.01	.01	-.89
<i>Evaluation and judgment</i>						
10. I have a gut feeling for potential opportunities.	-.08	.95	-.03	-.08	.55	-.10
11. I can distinguish between profitable opportunities and not-so-profitable opportunities.	.04	.90	.03	-.04	.90	.09
12. I have a knack for telling high-value opportunities apart from low-value opportunities.	.01	.82	-.01	-.01	.84	-.05
13. When facing multiple opportunities, I am able to select the good ones.	.04	.63	-.20	.06	.66	.00
Eigenvalue	8.09	1.19	.82 <sup>c</sup>	4.90	2.03	1.21
Percentage of variance explained	62.26	9.12	6.33	34.97	12.50	6.35
Cumulative percentage of variance explained	62.26	71.38	77.71	34.97	47.48	53.83
Coefficient alpha reliability estimates	.91	.94	.90	.71 <sup>d</sup>	.83	.91

<sup>a</sup> N = 144.<sup>b</sup> N = 109.

<sup>c</sup> The eigenvalue for the 3rd factor in this sample is less than 1 because we requested 3 factors when performing exploratory factor analysis rather than setting eigenvalue greater than 1, which is required by our theory re-conceptualizing alertness as consisting of 3 dimensions. All the other indices, e.g., factor loadings, coefficient alpha, and CFA results conducted with the second half of the sample, indicate the existence of the 3rd factor.

<sup>d</sup> Although the coefficient alpha of the 1st factor in this sample is smaller than the alphas of the other two factors, it exceeds the threshold of .70 (Nunnally, 1978) and thus is considered acceptable.

Next, confirmatory factor analysis was conducted on the second half of the sample (N = 147). Using LISREL 8.7, the proposed 3-factor model was estimated. The 3-factor model produced good fit indices (CFI = .99, NFI = .97, RMSEA = .07) and fit was significantly better ( $\chi^2_{\text{difference}} = 155.45$ ,  $df = 8$ ,  $p < .001$ ) than a 1-factor model (CFI = .95, NFI = .94, RMSEA = .15). To further explore the discriminant validity of the three dimensions, we followed the procedure outlined by Fornell and Larcker (1981) and calculated the square root of the average variance explained for each of the three dimensions of alertness. This value, which we present on the diagonal in Table 5, represents the variance accounted for by the items that compose the scale. To demonstrate discriminant validity, this value must exceed the corresponding latent variable correlations in the same row and column. If this condition is met, we have evidence that the variance shared between any two dimensions is less than the average variance explained by the items that compose the dimension. As Table 5 indicates, this condition is met for the 3 dimensions. In total, our results provide clear evidence that the three dimensions of alertness are distinct from one another and measure three unique aspects of alertness. Thus, the 13 items in Table 5 were retained for Study 3.

#### 4.3. Study 3: convergent, discriminant, and nomological validity

In Study 3 we provide convergent and discriminant validity of the alertness scale and test a nomological model that examines some of the potential antecedents and consequences of alertness. To test the convergent and discriminant validity, hypotheses are formulated concerning the constructs to which different dimensions of alertness should and should not be related. The nomological validity of the scale is tested by investigating some of the antecedents and consequences of alertness grounded in extant theories of human capital and innovation.

**Table 5**

Means, standard deviations, and inter-correlations among alertness dimensions (Study 2, 2nd half sample, N = 147).

Variable	Mean	S.D.	1	2	3
1. Scanning and search	5.50	.99	.78		
2. Association and connection	5.08	1.20	.74**	.90	
3. Evaluation and judgment	5.10	.99	.72**	.68**	.84

Note: 1. All items are on 7-point Likert Scales. 2. Values on the diagonal are the square root of the average variance explained which must be larger than all zero-order correlations in the row and column in which they appear to demonstrate discriminant validity (Fornell and Larcker, 1981).

N = 147 \*\*  $p < .01$ .



#### 4.3.1. Convergent validity

The goal for our convergent validity tests is to demonstrate that the alertness scale correlates with existing scales to which it would be expected to correlate. However, these relationships should not be great in magnitude so as to indicate construct redundancy.

**4.3.1.1. Systematic search.** Of the three alertness dimensions, scanning and search capability should be most strongly related to systematic search. The systematic search view of opportunity recognition argues that aspiring entrepreneurs can improve their odds of discovering valuable venture ideas if they will systematically search in areas where they are already knowledgeable (Fiet, 2002; Fiet et al., 2004). The basic rationale for the systematic search view is that opportunity identification depends on a fit between entrepreneurs' prior knowledge and a particular venture idea, which may be discovered via systematic search (Fiet, 2002). The search capability captures entrepreneurs' ability to seek information to further explore the newly-associated concepts. Although the systematic view focuses more on "planned" and intentional search for useful information, both systematic search and search capability describe entrepreneurs' information-seeking behavior to develop and build their knowledge base. Thus, the following hypothesis is formulated:

**Hypothesis 1.** The scanning and search dimension of the alertness scale will demonstrate a stronger positive correlation with systematic search than the other two alertness dimensions.

**4.3.1.2. Creativity.** Association and connection reflect the entrepreneurs' ability to piece together previously unconnected information. Therefore, association should be related to individuals' creativity, or the ability to generate novel and appropriate ideas, products, processes, or solutions (Shalley, 1995). The study of creativity is typically an effort to understand why some individuals are more creative than others and focuses on the cognitive and motivational processes that might help explain this discrepancy. The results of a recent meta-analysis by Baas et al. (2008) indicate that positive affect enhances creativity overall, but is most likely to produce such effects when it is combined with high levels of activation (e.g., enthusiasm and elation) and a promotion regulatory focus (a focus on aspirations or accomplishments; Higgins, 2006). Cognitive processes relevant to creativity involve remote association, or the ability to see connections between seemingly different concepts; divergent thinking, or the tendency to prevent solutions that move away from established ways of doing things (Mumford and Gustafson, 1988); and flexible thinking, such as the capacity to generate different categories of response to a single problem (Torrance, 1974). Indeed, we suggest that when those high in creativity engage in associating information, they do so in an effective way.

**Hypothesis 2.** The association and connection dimension of the alertness scale will demonstrate a stronger positive correlation with creativity than the other two alertness dimensions.

**4.3.1.3. Intuition.** Entrepreneurs often use intuition to explain their actions and many other actions in the entrepreneurial domain, such as opportunity identification or the choice of partners, bankers, or suppliers. While there are numerous definitions of intuition in cognition research, entrepreneurial intuition, as a construct for research within opportunity recognition as a part of the distinctive domain of entrepreneurship, is defined as "the dynamic process by which entrepreneurial alertness cognitions interact with domain competence (e.g., culture, industry, specific circumstances, technology, etc.) to bring to consciousness an opportunity to create new values" (Mitchell et al., 2005, p. 667). Recent research has attempted to distinguish between entrepreneurs' attributions about intuition from their actual use of intuition (Blume and Covin, 2011). As a result, characteristics of entrepreneurs that increase the likelihood that they will attribute intuition as a basis for evaluation during the venture founding process (e.g., overconfidence bias, tolerance for ambiguity, and entrepreneurial self-efficacy) are distinct from the characteristics that contribute to the development and effective use of entrepreneurial intuition (e.g., emotional intelligence, metacognitive skill, and expert entrepreneurial schemas) (Blume and Covin, 2011). Given that the entrepreneurial intuition construct implies an inherent connection with alertness, it seems logical that intuition will highly correlate with alertness. More specifically, as the assessment capability of the alertness construct captures entrepreneurs' ability to select information that may lead to potential business opportunities, we expect evaluation and judgment capability to be the most highly related to intuition.

**Hypothesis 3.** The evaluation and judgment dimension of the alertness scale will demonstrate a stronger positive correlation with intuition than the other two alertness dimensions.

**4.3.1.4. Positive affectivity.** We suggest that the alertness construct will be related to an individuals' positive affectivity. We define positive affect as feelings or emotions that reflect a level of pleasurable engagement with the environment, such as happiness, joy, excitement, enthusiasm, and contentment (Watson et al., 1988). An extensive body of research evidence indicates that affect exerts strong effects on cognition, the processes through which information is entered into the memory, processed, and retrieved for later use (Forgas, 1995; Isen, 2002). Recent research has explored the potential role of affect in the entrepreneurial process such as opportunity recognition, acquisition of essential resources (financial and human), and the capacity to respond quickly and effectively to rapid change in highly dynamic environments (Baron, 2008). More specifically, Baron (2008) proposes that since affect exerts strong effects on perception, it seems possible that it is associated with alertness and opportunity recognition. Positive affect, by broadening individuals' perceptual fields and increasing their capacity to notice a wide range of events or stimuli (Matlin and Foley, 2001), may strengthen the influence of alertness on opportunity recognition. This leads us to state the following:

**Hypothesis 4.** All three dimensions of the alertness scale will correlate significantly and positively with positive affectivity.

#### 4.3.2. Discriminant validity

**4.3.2.1. Negative affectivity.** Negative affect refers to feelings or emotions that reflect a level of unpleasurable engagement with the environment, such as distress, upset, nervous, afraid, and hostile (Watson et al., 1988). By narrowing individuals' perceptual fields and reducing their capacity to notice external events, negative affectivity may reduce the impact of alertness on opportunity recognition (Baron, 2008). Baron (2008) proposes that negative affect, by reducing the vigor or scope of active searches, also may produce a weakening of the impact of alertness on opportunity recognition. Cognition research has shown that negative affect seems to encourage adoption of strategies involving exhaustive examination of all available alternatives in order to choose the best (Iyengar et al., 2006). While maximizing often yields superior choices, it is an approach that may not be feasible for entrepreneurs, who must often make evaluation and judgments very quickly (Baron, 2008). Therefore, we suggest that entrepreneurs with negative affectivity will be unable to exhibit the association, search, and evaluation capabilities well, thus demonstrating support for alertness' discriminant validity.

**Hypothesis 5.** Each of the three alertness dimensions will demonstrate discriminant validity with negative affectivity.

**4.3.2.2. Research and development (R&D) investment.** R&D investment can be defined as research and development expenditures financed by the company (Cohen and Levinthal, 1990). Typically, a firm's investment in R&D is influenced by the industry type (e.g., high-technology or low-technology firms), as well as entrepreneurs' ability to recognize potential profitable opportunities in which to invest. In return, a firm's R&D investment affects the firm's ability to exploit external knowledge (Cohen and Levinthal, 1990). Entrepreneurs with higher levels of alertness are more likely to identify valuable domains they believe profitable, and thus, to invest in for future benefits. However, the link between the individual level construct of alertness and the firm level concept of R&D might be so distal that there exists various mechanisms between them, such as entrepreneurs' ability to acquire the essential financial and human resources to invest in the opportunities, the creativity of individual entrepreneurs, the overall level of unpredictability of the industry, and so on. Thus, we suggest alertness is independent of firms' R&D investment.

**Hypothesis 6.** Each of the three alertness dimensions will demonstrate discriminant validity with firms' research and development (R&D) investment.

#### 4.3.3. Nomological validity

The construct validation process involves not only demonstrating dimensionality and internal consistency, convergent validity, and discriminant validity, but also nomological validity (Hinkin, 1995). Nomological validity is essential to the determination of any new construct's role in the predictability of important organizational phenomena (Hinkin, 1995). Thus, another purpose of Study 3 is to advance a model that tests the nomological validity of the alertness scale and indicates how alertness should behave within a system of related constructs (i.e., nomological net) (Nunnally and Bernstein, 1994). Specifically, this model highlights entrepreneurs' prior knowledge as a key antecedent of alertness. The model also proposes that the alertness scale will demonstrate significant predictive ability for firms' innovations. It is our contention that if prior knowledge and innovations are related to the alertness scale in the expected manner, we would have reason to believe the alertness scale really measures the underlying construct it claims to be measuring.

**4.3.3.1. Prior knowledge.** Prior knowledge refers to an individual's distinctive information about a particular subject matter and provides him or her with the capacity to identify certain opportunities (Shane and Venkataraman, 2000; Venkataraman, 1997). Prior knowledge plays a critical role in intellectual performance and increases the likelihood of opportunity identification (Gimeno et al., 1997; Shane, 2003). It assists in the integration and accumulation of new knowledge, as well as integrating and adapting to new situations (Weick, 1996). Shane (2003) identifies three major dimensions of prior knowledge that are important to the process of opportunity identification. The first is prior knowledge of markets, which enables people to understand demand conditions, therefore facilitating opportunity discovery. Second is prior knowledge of how to serve markets, which helps identify opportunities because people know the rules and operations in the markets. In particular, it helps determine the production or marketing gains from introducing a new product or service (Johnson, 1986). Finally, prior knowledge of customer problems or needs stimulates opportunity identification because such knowledge would help trigger a new product or service to solve customer problems or to satisfy unmet needs (Von Hippel, 1988).

Human capital theory postulates that increased knowledge in a particular field allows individuals to become increasingly efficient and to focus on the key dimensions that contribute to the positive outcome of decisions (Becker, 1964). Social cognition theory specifically asserts that a cognitive structure is an organized representation of individuals' prior knowledge and experiences (Neisser, 1967). The inference forming process is heavily dependent on the large amounts of stored knowledge (Fiske and Taylor, 1984). Thus, prior information influences the entrepreneurs' capability to associate, search, and decide on the new information in ways that those lacking the prior information cannot replicate (Roberts, 1991). Even if information about a market, particular ways to serve the market, and customer problems are disseminated broadly, only those who possess prior knowledge will be able to capitalize on this information to be more alert. In other words, each person's idiosyncratic prior knowledge creates a "knowledge corridor" that allows him/her to recognize certain opportunities that others do not (Venkataraman, 1997).

**Hypothesis 7.** Entrepreneurs' prior knowledge is positively associated with each of the three dimensions of alertness.

4.3.3.2. *Innovations.* Innovation is the introduction of something new such as a product, process, service, technology, strategy, or managerial practice (Edwards and Gordon, 1984). Innovation begins when a firm selects an idea or invention for development and ends with the commercialization and introduction of the invention to the market. Within the entrepreneurship context, innovation has been defined as the process of identifying and utilizing opportunities to create new products, services, or work practices (Van de Ven, 1986). Alert entrepreneurs are likely to discover something new, and to increase innovations of their firms. Researchers have long recognized that some ventures offer products or services that are truly novel and that represent new and different combinations of resources (Schumpeter, 1934), whereas other new ventures provide products or services that are nearly imitations of existing offerings, or reproduced with incremental variations (Kirzner, 1973). Current literatures have depicted types of innovation on a continuum along which one can indicate how discrepant a product, service, or process is compared to an industry's existing offerings and operating procedures (Gaglio, 2004; Shepherd and DeTienne, 2005). Given our conceptualization of alertness, we expect alertness to be significantly related to firms' innovations. This is consistent with Kirzner's (1997) work on alertness where he discusses entrepreneurs who actively initiate change, sometimes even aggressively. Thus:

**Hypothesis 8.** Each of the three dimensions of alertness is positively related to the firm's innovations.

#### 4.3.4. Method

4.3.4.1. *Sample and procedures.* The sample for Study 3 was drawn from two sources. The first source came from entrepreneurs who receive monthly e-newsletters from the entrepreneurship center of a Mid-Western university. The online survey link was included in two newsletters and generated 53 useable surveys. The second source of the sample was drawn from entrepreneurs located in the Southeast. Firstly, 154 entrepreneurs were identified through students who interviewed entrepreneurs for their case study assignment in an entrepreneurship course. Secondly, another 354 entrepreneurs' names and addresses were obtained from the Reference USA database. Surveys were sent along with self-addressed and stamped return envelopes to these 500 entrepreneurs. A total of 56 usable surveys were generated from the second source, reflecting a response rate of 11%. Results of *t*-test comparisons of the average firm size, respondents' business tenure with their firms, and the mean responses for the research variables revealed no differences in statistical significance ( $p > .10$ ) between the two samples. Thus, the two samples were combined to test the hypotheses in Study 3. Of the 109 respondents, 76.8% were male and 81% were Caucasian. The average number of employees per firm was 54 and the average number of years of previous business experience was 15.

4.3.4.2. *Measures.* Each construct was measured with multiple items and established scales were used where applicable. All measures were anchored on 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree).

The 13 items for *alertness* retained from the first two studies were used. To determine the factor structure of the alertness scale, we first performed the measure of sample adequacy test (Hair et al., 2006). Results showed that the KMO overall statistic was .81 and each individual KMO statistic was greater than .71, much higher than the recommended .60 threshold. Then all the 13 items were factor analyzed with principal axis method, an oblimin rotation, and the number of factors was set to 3 (Reis and Judd, 2000). Our observations to respondent ratio for this analysis were 8.4:1, which exceeds the 5:1 rule-of-thumb ratio (Hair et al., 2006). Three factors (see Table 4) had eigenvalues greater than 1 and explained a cumulative 53.83% of total variance. Results indicated that these 13 items loaded on three separate factors corresponding to the established structure of the scales. No items loaded on more than one factor, and in all cases the items that loaded on a factor did so at a magnitude of at least twice that of the non-loading items. The inter-correlations of the 3 factors ranged in magnitude from .30 to .52, suggesting that they reflect relatively distinct aspects of alertness. As noted in Table 4, the reliability estimate was .71 for search, .91 for association, and .83 for evaluation and judgment. Thus, the 13-item scale shown in Table 4 was used to test the hypotheses.

The scale for *prior knowledge* ( $\alpha = .73$ ) was composed of three items following Shane (2000): (1) I know how to serve markets; (2) I am familiar with customer problems; and (3) I have rich knowledge about markets such as supplier relationships, sales techniques, capital equipment retirement, etc. *Innovation* was measured using Subramaniam and Youndt's (2005) 3-item scale. Respondents were asked to rate the innovativeness of the new products or services their firms have developed in the past five years: (1) innovations that reinforce how I currently compete; (2) innovations that reinforce my existing expertise in prevailing products/services; and (3) innovations that reinforce my existing product/service lines ( $\alpha = .92$ ). *Systematic search* was measured with a 3-item scale ( $\alpha = .71$ ) based on the work of Fiet (1996, 2002): (1) I search actively for business ideas; (2) I have engaged in a deliberate and systematic search for an idea for a new business; and (3) I have gone through several learning steps overtime to identify business opportunities. To measure *intuition* we modified Khatri and Ng's (2000) 3-item scale so that it applied to the entrepreneurship context: (1) On many occasions, I make important decisions based on a gut feeling; (2) I rely on gut level judgment in making important decisions; and (3) I place a great deal of emphasis on past experience in making important decisions ( $\alpha = .80$ ). The Perry-Smith (2006) measure of *creativity* ( $\alpha = .74$ ) was used to assess the creativity of each entrepreneur's work. Respondents were asked to rate how characteristic each of the five items was of their work over the past 2 years: (1) Novel long-term vision or application; (2) radical new ideas; (3) risk-taking; (4) new applications for existing technology; and (5) new ideas and approaches to customer problems. Positive (e.g., interesting, excited, enthusiastic) and negative (e.g., distressed, upset, irritable) *affectivity* ( $\alpha = .82$  and .83, respectively) were measured using the two separate 10-item scales (PANAS) scale developed by Watson et al. (1988). Finally, firms' *research and development (R&D) investment* was measured

by asking respondents to directly report the average investment in research and development in the past five years (Cohen and Levinthal, 1990).

A total of 8 control variables were included to reduce confounding effects due to entrepreneurs' differences in demographic and venture characteristics (Reynolds, 2000). Age was measured with 5 categories: (1) <25; (2) 25–34; (3) 35–44; (4) 45–54; and (5) >55 years old. Gender was measured with a dummy variable (0 = female, 1 = male). Education was coded as “1” for “less than high school degree;” “2” for “high school graduate;” “3” for “some college;” “4” for “4-year college graduate;” and “5” for “some graduate study beyond 4-year college degree.” Since the respondents represented 3 ethnic groups (Caucasian, African-American, and Asian, Pacific Islander, Native American), 2 dummy variables for ethnicity were constructed.

Business tenure was measured as the number of years the respondent has been working in the current business. Previous experience was measured with a 3-item scale that asked respondents to report their previous managerial, entrepreneurial, and industrial experience ( $\alpha = .90$ ). Firm size was measured by number of current employees in the firm. For business tenure, previous experience, and firm size, natural logs were used to account for skewed distribution within the data. Industry type was measured with North American Industrial Classification (NAIC) code. Originally 17 categories of industries were included in the survey. Since one key variable in this study is innovations of the entrepreneurial firms, the high-technology versus low-technology industry that the firm is in may impact the firm's development of innovations. Therefore, the 17 industries were categorized as high- or low-technology following Thornhill's (2006) categorization, which was on the basis of standardized scores for R&D intensity and the percentage of knowledge workers in each industry (Bolland and Hofer, 1998). As a result, high-technology industries (e.g., professional, scientific, technical services, manufacturing, and mining) were coded as 1, and low-technology industries (e.g., construction, transportation and warehousing) were coded as 0.

**4.3.4.3. Initial analyses.** Table 6 reports the Pearson's correlations among all variables. Alertness was significantly correlated with knowledge, systematic search, intuition, creativity, and positive affectivity in the direction expected. The correlations among the three dimensions of alertness (association, search, and evaluation) ranged from  $r = .31$  to  $r = .51$ . Therefore, we ran two additional analyses to ensure that the three dimensions of alertness are distinct. First, we compared a 3-factor measurement model with 1-factor model. Results show that the 3-factor model fit the data ( $CFI = .97$ ,  $NFI = .91$ ,  $RMSEA = .06$ ,  $\chi^2/df = 1.40$ ) while the one factor model did not ( $CFI = .77$ ,  $NFI = .72$ ,  $RMSEA = .20$ ,  $\chi^2/df = 5.27$ ). Second, we calculated the square root of the average variance explained for each of the three dimensions of alertness (Fornell and Larcker, 1981). These values for each of the three dimensions (.61 for search, .87 for association, and .75 for evaluation and judgment) are greater than the correlations among the scale dimensions. Thus, the three dimensions of alertness are distinct and measure different aspects of alertness.

We also conducted CFA on the scales used to test the antecedents and consequences of alertness to ensure their independence. We began with a 1-factor model where all the items for the 5 scales (search, association, evaluation and judgment, prior knowledge, and innovations) loaded on 1 factor. Results indicate that the model did not fit the data ( $CFI = .47$ ,  $NFI = .41$ ,  $RMSEA = .20$ ,  $\chi^2/df = 5.10$ ). Next we estimated a 5-factor model with one factor representing each of our variables. Model fit improved significantly ( $CFI = .96$ ,  $NFI = .86$ ,  $RMSEA = .03$ ,  $\chi^2/df = 1.12$ ). Finally we ran a model in which the alertness scale was modeled as a second order factor composed of 3 sub-scales (search, association, and evaluation and judgment). Model fit deteriorated ( $CFI = .92$ ,  $NFI = .83$ ,  $RMSEA = .06$ ,  $\chi^2/df = 1.43$ ). The chi-square difference test between the second order and first order 5-factor models ( $\chi^2_{\text{difference}} = 24.98$ ,  $df = 6$ ,  $p < .001$ ) was significant, favoring the first order 5-factor model. Altogether, these results suggest that the scales were distinct from one another and that collapsing the alertness items into one scale was inappropriate.

**4.3.4.4. Hypothesis testing.** To test convergent and discriminant validity, the 3 dimensions of alertness were correlated with other measures to which they were expected to relate (convergent validity) and not relate (discriminant validity). Hypothesis 1 proposed that scanning and search will demonstrate the strongest positive correlation with systematic search. The highest correlation with systematic search was found for evaluation and judgment ( $r = .29$ ,  $p < .05$ ), not scanning and search dimension ( $r = .22$ ,  $p < .05$ ), as predicted. Support was not found for Hypothesis 1. Hypothesis 2 proposed that association will demonstrate the strongest positive correlation with creativity. Results indicate that among the three dimensions, scanning and search demonstrated the highest correlation with creativity ( $r = .30$ ,  $p < .01$ ), although the correlation between association and creativity was significant as well ( $r = .29$ ,  $p < .05$ ). Hypothesis 2 was not supported. Hypothesis 3 proposed that evaluation and judgment will demonstrate the strongest positive correlation with intuition, which received support ( $r = .35$ ,  $p < .01$ ). Hypothesis 4 also received full support as all 3 dimensions of the alertness scale were significantly related to positive affectivity (search  $r = .39$ ,  $p < .01$ , association  $r = .25$ ,  $p < .05$ , and evaluation  $r = .21$ ,  $p < .05$ ).

With respect to hypotheses regarding discriminant validity, Hypothesis 5, which proposed that the 3 alertness dimensions will demonstrate discriminant validity with negative affectivity, was fully supported (search  $r = -.14$ , association  $r = .10$ , and evaluation  $r = -.13$ , n.s.). Hypothesis 6, which proposed that the 3 alertness dimensions will demonstrate discriminant validity with firms' research and development (R&D) investment, also was fully supported ( $r = .13$ ,  $.10$ ,  $-.05$ , n.s.).

Results of the nomological validity tests are presented in Table 7. As Model 6 shows, two control variables significantly related to alertness. Male entrepreneurs and those in high-technology firms exhibit a higher level of evaluation and judgment capability than their female and low-technology firm counterparts. Hypothesis 7 predicts that prior knowledge is significantly related to each dimension of alertness. As expected, the effect of prior knowledge on each dimension of alertness was positive and significant (Models 2, 4, and 6). Hierarchical *F*-tests confirmed that the predictive power was significantly stronger after prior knowledge was entered. Hypothesis 7 was fully supported. Hypothesis 8 predicts that the 3 alertness dimensions are positively related to firm's

**Table 6**  
Means, standard deviations, and correlations (Study 3).

Variable	Mean	SD.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Age	3.48	1.20																			
2. Gender	.77	.42	-.13																		
3. Education	4.18	.94	-.11	-.05																	
4. White	.82	.39	.35**	.05	-.02																
5. Black	.14	.35	-.24*	-.05	-.05	-.86**															
6. Asian	.04	.20	-.26*	-.01	.12	-.44**	-.08														
7. Tenure	.84	.51	.61**	-.11	-.22*	.26**	-.22*	-.13													
8. Experience	1.10	.34	.70**	.09	-.09	.24*	-.17	-.17	.69**												
9. Firm Size	1.01	.70	.41**	.05	.02	.13	-.06	-.16	.51**	.54**											
10. Industry	.15	.36	.03	-.10	.01	-.02	.07	-.09	.15	.02	.17										
11. Knowledge	3.95	.68	.24*	-.01	-.14	.22*	-.18	-.10	.29**	.33**	.09	-.01									
12. Search	4.28	.69	.04	-.09	.19	.06	.01	-.13	.00	-.05	-.03	.12	.07								
13. Association	4.15	.77	.10	.03	.05	-.03	.11	-.14	.09	.17	.10	.16	.21*	.51**							
14. Evaluation	4.12	.58	-.01	.10	-.07	.05	-.04	-.04	.19	.10	.14	.16	.47**	.31**	.44**						
15. Innovations	3.52	1.12	.20	-.22*	.01	-.01	-.01	.04	.20*	.14	.13	.08	.11	.13	.06	.06					
16. Systematic Search	3.76	.90	.05	.29**	-.15	.08	-.08	.00	.06	.11	.02	-.07	.35**	.22*	.23*	.28**	-.07				
17. Intuition	3.49	1.04	.03	.06	-.05	.15	-.14	-.05	.05	.13	.06	-.15	.23*	.06	.06	.35**	.07	.18			
18. Creativity	3.98	.82	-.17	-.16	.22*	-.15	.20*	-.06	-.23*	-.19	-.10	.03	-.03	.30**	.28**	.09	.27**	.04	.05		
19. PA	4.17	.49	.04	-.15	.04	-.13	.13	.01	.05	-.03	.00	-.03	.26**	.39**	.25*	.21*	.17	.17	-.11	.38**	
20. NA	1.87	.61	-.24*	.19	.05	.06	-.05	-.03	-.26*	-.21*	-.10	-.13	-.12	-.14	.10	-.13	-.08	.11	-.07	.18	.01

N = 109. Note: PA = positive affectivity NA = negative affectivity.

\*\*  $p < .01$ .

\*  $p < .05$ .

**Table 7**  
Results of regression analysis for the antecedents and consequences of alertness<sup>a</sup> (Study 3).

Variable	Scanning and search		Association and connection		Evaluation and judgment		Innovation			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Control										
Age	.06	.12	.15	.14	-.14	-.12	.12	.10	.09	.14
Gender	-.03	-.01	.12	.09	.16	.20*	-.22*	-.22*	-.24*	-.25*
Education	.17	.16	.01	.01	-.05	.02	.06	.02	.06	.07
White	.09	.07	-.11	-.13	.04	-.01	.04	.02	.07	.03
Asian, Native	-.13	-.17	-.12	-.12	.00	-.01	.03	.07	.06	.03
Tenure	-.01	.12	.00	.03	.22	.20	-.35*	-.37*	-.37*	-.38*
Experience	-.02	-.21	.12	-.04	.02	-.13	.28	.30	.27	.27
Firm size	-.07	-.16	-.02	-.01	.03	.11	.07	.09	.08	.07
Industry	.07	.14	.10	.14	.18	.18*	.01	.00	-.01	-.02
Prior knowledge		.19*		.33**		.48***				
Scanning and search								.24*		
Association and connection									.19*	
Decision-making and judgment										.19*
R <sup>2</sup>	.07	.28	.09	.23	.11	.35	.11	.17	.15	.14
Adjusted R <sup>2</sup>	.03	.16	.01	.10	.01	.24	.01	.06	.04	.04
ΔR <sup>2</sup>	.07	.21	.09	.14	.11	.24	.11	.06	.03	.03
ΔF	.66	5.63**	.88	3.45*	1.11	7.01***	1.13	5.25*	2.98*	2.74*

<sup>a</sup> Standardized coefficients are reported.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

innovation. As expected, all 3 dimensions had positive and significant effects on innovation (Models 8, 9, and 10). Hierarchical  $F$ -tests confirmed that the predictive power was significantly stronger after the 3 sub-scales of alertness were entered. Hypothesis 8 was supported.

**4.3.4.5. Tests for common method variance (CMV).** In order to check for the presence of CMV we followed the suggestions of Williams et al. (1989) and estimated a full measurement model, then re-estimated the same model after adding an uncorrelated method factor. The idea behind Williams et al.'s (1989) approach is that if model fit is significantly improved by the addition of the method factor, common method variance may be an issue. The fit statistics (RMSEA = .07, CFI = .82, SRMR = .08) for the full measurement model indicate adequate model fit. Fit statistics after adding an uncorrelated method factor improved, but only slightly (RMSEA = .07, CFI = .90, SRMR = .07). However, the chi-square difference test between the two models indicated a significant difference ( $\chi^2 = 116.34$ ,  $p < .05$ ).

To determine the extent of the influence of common method variance, the variance explained by the method factor was calculated by summing the squared loadings. The total amount of variation due to the method factor was 9%, much less than the average amount of method variance (25%) observed by Williams et al. (1989). Our results suggest that measurement error does not overwhelm the variance captured by the construct (Vandenberg, 1996). Although the model tested benefits from the addition of a method factor, the gain in fit is quite small and more importantly the method factor appears to account for very little variation in the data. Therefore, any possible method effects in the data were likely to be minimal.

## 5. Discussion

### 5.1. Key findings and contributions

While examining process issues such as garnering resources and developing growth strategies are helpful for understanding the success of new ventures, it is also important that we start to make important strides in understanding nascent activities and how opportunities get identified. In that regard, our study makes several important contributions to alertness and opportunity recognition research. First, we carefully articulate alertness drawing on existing theories. The fuzziness of entrepreneurial alertness research to this point has stymied researchers from further exploring this concept (Alvarez and Barney, 2002). In an effort to move the field forward, we redefine and refocus research on alertness by presenting an integration of Kirzner's alertness theory and McMullen and Shepherd's (2006) later development on alertness. Specifically, we present alertness as comprising three dimensions: (1) systematically or non-systematically scan the environment and search information; (2) associate or piece together previously unconnected information; and (3) make evaluations and judgments about the commercializability of the idea. These dimensions complement each other and give the individual a foundation on which to identify new business ideas.

Second, social cognition theory confirms that the inference process can be improved with formal training or constant reminders of appropriate inferential techniques (Fiske and Taylor, 1984). Such efforts may begin by alerting the individual to the problem and instructing the individual to pay special attention to inferential errors. When people have some awareness of the

evaluation and judgment process, they can draw on that awareness at will, thus improving the inferences made. Alertness represents an individual capability that can be learned and improved, and thus, may offer guidance to aspiring entrepreneurs in how to mindfully discover opportunities with business potential.

Third, we answered Busenitz's (1996) call for improved alertness construct development and measurement by developing and validating a theoretically justified measure for alertness. Our scale was found to reflect solid psychometric properties as indicated by the confirming evidence across three different samples. The items retained after three rounds of validation tests indicated strong internal reliability. Study 3 demonstrated that prior knowledge significantly predicted all three dimensions of alertness. This finding resonates with the observations of previous research (e.g., Gimeno et al., 1997) that prior knowledge increases the likelihood of identifying opportunities. The nomological model tested in Study 3 advances current understanding of the relationship between alertness and innovation, which has been a central concern of innovation research. Past research has seldom measured alertness itself due at least in part to the lack of a validated scale. Instead empirical work has tended to focus on the relationships between knowledge and innovations (e.g., Thornhill, 2006). Such approaches are clearly underspecified as they do not integrate alertness and how individual processes advance knowledge. By measuring alertness directly, we are now able to assess the contributions of alertness and how it impacts the pursuit of new opportunities. In the context of this research, all three dimensions of alertness had large total effect on innovation. These results suggest that, viewed as an asset, the extent to which entrepreneurs are alert to business ideas strongly influences the innovative performance of their new ventures.

### 5.2. Limitations and strengths

Since Study 2 was based on CEOs from Korean firms while the sample for Study 3 was drawn from U.S. entrepreneurs, there may be a concern that the model was not consistent across countries. To determine if the factor structure of the three-dimensional alertness model was invariant across the Korean and U.S. samples, we performed a 2-group measurement invariance test following procedures outlined by Byrne (1994). Results from each step revealed no differences across the samples, demonstrating evidence of measurement invariance across the Korean and U.S. samples. In addition, the Global Entrepreneurship Monitor reports similar entrepreneurial activities in Korea and U.S. (Bosma et al., 2007). Although data collected across these two countries are consistent and promote the generalizability of our study, caution should be used when interpreting our results. In addition, since two convergent validity tests regarding search and association dimensions were not supported, future research is warranted to fully examine the correlations, or distinction, between and among the three dimensions of alertness. Finally, not all of our factor loadings were statistically significant in our final EFA results. Given that our factor loadings were statistically significant in our other EFA analyses, we attribute these results to the fact that our sample size was only 109 in the final EFA and encourage others to replicate our findings using a larger sample.

This study has several notable strengths. First, the re-conceptualization and operationalization of alertness presented here builds on current work. Integrating Kirzner's early (1973) and later (1999) theory of alertness with McMullen and Shepherd's (2006) recent development on entrepreneurial action offered additional insight into how the three dimensions of alertness interplay with each other to enhance the recognition of new opportunities. The second strength is the refined multi-dimensional measure of alertness that has been subject to tests from three different samples across cultures. Given the variance of our samples on industry, firm size, and culture, the final instrument should provide researchers with a valuable tool for probing the information and evaluation processes of exploring opportunities. Finally, this study represents a first test of the antecedents and consequences of alertness. By establishing these important links, our study signals the potential for future research to focus on conceptual and empirical exploration of alertness and various entrepreneurial activities.

### 5.3. Implications for future research

Extant research on entrepreneurial alertness has delivered scales that are inadequate (Busenitz, 1996) and do not fully capture the richness of this construct. Consequently, our understanding of the role and the interconnectedness of alertness in the process of identifying new opportunities remains limited (e.g., Hills and Shrader, 1998; Ko and Butler, 2003). In spite of these major limitations, entrepreneurial alertness remains a central part of theoretical models seeking to explain the identification of new opportunities (Ardichvili, et al., 2003; Baron, 2006). The theoretical foundation and rigorous scale development reported in this article provide rich future research opportunities. Some potential studies of particular interest include isolating antecedents to alertness, exploring the interworking of the different dimensions of alertness, and outlining potential outcomes that forthcoming research could examine.

With the development of this new entrepreneurial alertness scale, the door is now open to investigate a number of antecedent variables. Our initial findings reveal that entrepreneurs' prior knowledge is positively related to alertness. Human capital theory maintains that both knowledge and experience provide individuals with increases in their cognitive abilities (Becker, 1964). Both broad labor market experience and specific vocationally oriented experience are theoretically predicted to increase human capital (Becker, 1964). In the context of alertness and identifying new opportunities, both industry and previous startup experience may play a key role in enhancing entrepreneurs' alertness. According to social cognition theory, the level of alertness can be impacted by actively engaging in behavior, cognition, action, and experiential learning (e.g., Corbett, 2005; Lumpkin and Lichtenstein, 2005). Organizational learning processes such as intuiting, interpreting, integrating, and institutionalizing also may have implications for scanning and search, association and connection, and evaluation and judgment of entrepreneurial opportunities (Dutta and Crossan, 2005).

Recent research on affect as well as passion could lead to some interesting investigations on how these constructs lead to cognitive processes such as judgments, perceptions, and entrepreneurial alertness (Baron, 2008; Baron and Tang, 2011; Cardon et al., 2009). Further investigations could lead to some important insights on the entrepreneurial process including the identification of new opportunities. For example, the area of social entrepreneurship (Short et al., 2009) seems like an excellent context in which to examine how an individual's passion for a specific human need may lead to greater alertness.

Outcome variables also need to examine the entrepreneurial alertness process and their impact. For example, it seems highly plausible that higher levels of entrepreneurial alertness are also likely to lead to the identification of more new ideas but is that actually the case? Do varying levels of entrepreneurial alertness or variations in the alertness process lead to more of one type of opportunity discovery than another (recognition, creation, or discovery)? Key organizational outcomes such as the actual pursuit of new initiatives or the creation of new ventures or even startup performance and follow-on innovations might be worth pursuing. For example, the failure rates of developing initiatives remain a major challenge with approximately 33% of new products and services failing prior to launch (Corbett et al., 2007). Now the question remains: do the roots of such failures possibly reach back into the entrepreneurial alertness process?

To expand the boundaries of entrepreneurial alertness, researchers modeling entrepreneurial alertness would better serve us if they applied the role of alertness in international entrepreneurship, that is, the discovery, enactment, evaluation, and exploitation of opportunities across national borders to create future goods and services (Oviatt and McDougall, 2005). In addition, the role of alertness may be extended to the field of social entrepreneurship (Short et al., 2009). Researchers need to investigate if entrepreneurial alertness can be applied in the search of not-for-profit initiatives, socially responsible practices of businesses, or opportunities to alleviate social problems and expedite social transformation.

Finally, we recognize the roles and importance of the different components of an entrepreneurial alertness. Future research should examine the relationships among the three components and their influence on how opportunities get identified and developed. By specifying and examining these three dimensions of alertness, we clarify the development and linkage of alert scanning and search, association and connection, and evaluation and judgment that are central to the analysis of entrepreneurial thinking and cognition. The interactions of these three dimensions on the identification of new opportunities could indeed be exciting to pursue.

## 6. Conclusion

Scale development is an iterative process. While we used three sequential studies to develop and initially validate the scale of alertness, further confirmations of these findings are needed. Aldrich (1992) specifically noted that more replication studies are necessary to substantiate initial findings, particularly in the entrepreneurship area. We welcome researchers interested in alertness to incorporate our scale into their investigations and encourage them to further advance and test the alertness model. We are hopeful that this work will provide a foundational tool to further pursue insightful scholarly research on this important topic.

## References

- Aldrich, H., 1992. Methods in our madness? Trends in entrepreneurship research. In: Sexton, D.L., Kasarda, J.D. (Eds.), *The State of the Art of Entrepreneurship*. PWS-Kent Publishing, Boston, Mass, pp. 191–213.
- Alvarez, S.A., Busenitz, L.W., 2001. The entrepreneurship of resource-based theory. *Journal of Management* 27, 755–775.
- Alvarez, S.A., Barney, J.B., 2002. Resource-based theory and entrepreneurial firms. In: Hitt, M.A., Ireland, R.D., Camp, S.M., Sexton, D.L. (Eds.), *Strategic Entrepreneurship: Creating a New Mindset*. Blackwell Publishers, Oxford.
- Anastasi, A., 1982. *Psychological Testing*, 5th ed. MacMillan, New York.
- Ardichvili, A., Cardozo, R., Ray, S., 2003. A theory of entrepreneurial opportunity identification and development. *Journal of Business Venturing* 18 (1), 105–123.
- Baas, M., De Dreu, C.K.W., Nijstad, B.A., 2008. A meta-analysis of 25 years of mood-creativity research: hedonic tone, activation, or regulatory focus? *Psychological Bulletin* 134, 779–806.
- Baron, R.A., 2004. The cognitive perspective: a valuable tool for answering entrepreneurship's basic "why" questions. *Journal of Business Venturing* 19, 221–239.
- Baron, R.A., 2006. Opportunity recognition as pattern recognition: how entrepreneurs "connect the dots" to identify new business opportunities. *Academy of Management Perspectives* 20 (1), 104–119.
- Baron, R.A., 2008. The role of affect in the entrepreneurial process. *Academy of Management Review* 33 (2), 328–340.
- Baron, R.A., Tang, J., 2011. The role of entrepreneurs in firm-level innovation: Joint effects of positive affect, creativity, and environmental dynamism. *Journal of Business Venturing* 26 (1), 49–60.
- Barr, S.H., Hitt, M.A., 1986. A comparison of selection decision models in manager versus student samples. *Personnel Psychology* 39, 599–617.
- Becker, G.S., 1964. *Human Capital*. University of Chicago Press, Chicago.
- Blume, B.D., Covin, J.G., 2011. Attributions to intuition in the venture founding process: Do entrepreneurs actually use intuition or just say they do? *Journal of Business Venturing* 26 (1), 137–151.
- Bolland, E.J., Hofer, C.W., 1998. *Future Firms*. Oxford University Press, New York.
- Bosma, N., Jones, K., Autio, E., Levie, J., 2007. *Global Entrepreneurship Monitor 2007 Executive Report*. Babson College and London Business School.
- Brislin, R.W., 1980. Translation and content analysis of oral and written materials. In: Triandis, H., Berry, J. (Eds.), *Handbook of Cross-Cultural Psychology*, vol. 2. Allyn and Bacon, Boston, pp. 389–444.
- Busenitz, L.W., 1996. Research on entrepreneurial alertness. *Journal of Small Business Management* 34 (4), 35–44.
- Byrne, B.M., 1994. Testing for the factorial validity, replication, and invariance of a measurement instrument: a paradigmatic application based on the Maslach Burnout Inventory. *Multivariate Behavioral Research* 29, 289–311.
- Cardon, M.S., Wincent, J., Sing, J., Drnovsek, M., 2009. The nature and experience of entrepreneurial passion. *Academy of Management Review* 34, 511–532.
- Carlson, D.S., Kacmar, K.M., Williams, L.J., 2000. Construction and initial validation of a multi-dimensional measure of work-family conflict. *Journal of Vocational Behavior* 56 (2), 249–276.
- Cohen, W.M., Levinthal, D.A., 1990. Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly* 35, 128–152.



- Corbett, A.C., 2005. Entrepreneurial learning within the process of opportunity identification and exploitation. *Entrepreneurship Theory and Practice* 29 (4), 473–491.
- Corbett, A.C., Neck, H.M., DeTienne, D.R., 2007. How corporate entrepreneurs learn from fledgling innovation initiatives: cognition and the development of a termination script. *Entrepreneurship Theory and Practice* 829–852 (November).
- Csikszentmihalyi, M., 1996. *Creativity*. HarperCollins, New York.
- Dimov, D.P., Shepherd, D.A., 2005. Human capital theory and venture capital firms: exploring “human runs” and “strike outs”. *Journal of Business Venturing* 20, 1–21.
- Dutta, D.K., Crossan, M.M., 2005. The nature of entrepreneurial opportunities: understanding the process using the 4I organizational learning framework. *Entrepreneurship Theory and Practice* 29 (4), 425–449.
- Edwards, K.L., Gordon, T.J., 1984. Characterization of innovation introduced on the U.S. market in 1982. U.S. Small Business Administration No. SB-6050-0A-82.
- Ericsson, K.A., Krampe, R.T., Tesch-Romer, C., 1993. The role of deliberate practice in the acquisition of expert performance. *Psychological Review* 100 (3), 363–406.
- Fiet, J.O., 1996. The informational basis of entrepreneurial discovery. *Small Business Economics* 8, 419–430.
- Fiet, J.O., 2002. *The Systematic Search for Entrepreneurial Discoveries*. Quorum, Westport, CT.
- Fiet, J.O., Clouse, V.G.H., Norton, W.L., 2004. Systematic search by repeat entrepreneurs. In: Butler, J.E. (Ed.), *Opportunity Identification and Entrepreneurial Behavior*. Information Age Publishing, Greenwich, Connecticut, pp. 1–27.
- Fiske, S.T., Taylor, S.E., 1984. *Social Cognition*. Addison-Wesley Publishing Company, Reading, MA.
- Forgas, J.P., 1995. Mood and judgment: the affect infusion model (AIM). *Psychological Bulletin* 117, 39–66.
- Fornell, C., Larcker, D., 1981. Structural equation models with unobservable variables and measurement error. *Journal of Marketing Research* 18, 39–50.
- Friede Westring, A.J., Oswald, F.L., Schmitt, N., Drzakowski, S., Imus, A., 2009. Estimating trait and situational variance in a situational judgment test. *Human Performance* 22, 44–63.
- Gaglio, C.M., 1997. Opportunity identification: review, critique and suggested research directions. In: Katz, J.A., Brockhaus, R.H. (Eds.), *Advances in Entrepreneurship, Firm Emergence and Growth*, vol. 3. JAI Press, Greenwich, CT.
- Gaglio, C.A., 2004. So what is an entrepreneurial opportunity? In: Butler, J.E. (Ed.), *Opportunity Identification and Entrepreneurial Behavior*. Information Age Publishing, Greenwich, CT, pp. 115–134.
- Gaglio, C.M., Katz, J.A., 2001. The psychological basis of opportunity identification: entrepreneurial alertness. *Small Business Economics* 16, 95–111.
- Gimeno, J., Folta, T., Cooper, A., Woo, C., 1997. Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative Science Quarterly* 42, 750–783.
- Hair, J.E., Black, W.C., Babin, B.J., Anderson, R.E., Tatham, R.L., 2006. *Multivariate Data Analysis*, 6th ed. Prentice-Hall, Upper Saddle River, NJ.
- Higgins, E.T., 2006. Value from hedonic experience and engagement. *Psychological Review* 113, 439–460.
- Hills, G.E., Shrader, R.C., 1998. Successful Entrepreneurs' Insights into Opportunity Recognition. *Frontiers of Entrepreneurship Research*. Babson College, Wellesley, MA.
- Hinkin, T.R., 1995. A review of scale development practices in the study of organizations. *Journal of Management* 21, 967–988.
- Isen, A.M., 2002. Missing in action in the aim: positive affect's facilitation of cognitive flexibility, innovation, and problem solving. *Psychological Inquiry* 13 (1), 57–65.
- Iyengar, A.S., Wells, R.E., Schwartz, B., 2006. Doing better but feeling worse. *Psychological Science* 17, 143–150.
- Johnson, P., 1986. *New Firms: an Economic Perspective*. Allen and Unwin, London.
- Kacmar, K.M., Carlson, D.S., 1997. Further validation of the perceptions of politics scale (POPS): a multi-sample approach. *Journal of Management* 23, 627–658.
- Kaish, S., Gilad, B., 1991. Characteristics of opportunities search of entrepreneurs versus executives: sources, interests, general alertness. *Journal of Business Venturing* 6, 45–61.
- Khatry, N., Ng, A., 2000. The role of intuition in strategic decision making. *Human Relations* 53, 57–86.
- Kirzner, I.M., 1973. *Competition and Entrepreneurship*. University of Chicago press, Chicago.
- Kirzner, I.M., 1979. *Perception, Opportunity, and Profit*. University of Chicago Press, Chicago.
- Kirzner, I.M., 1985. *Discovery and the Capitalist Process*. University of Chicago Press, Chicago.
- Kirzner, I.M., 1997. Entrepreneurial discovery and the competitive market process: an Austrian approach. *Journal of Economic Literature* 35, 60–85.
- Kirzner, I.M., 1999. Creativity and/or alertness: a reconsideration of the Schumpeterian entrepreneur. *Review of Austrian Economics* 11, 5–17.
- Ko, S., Butler, J.E., 2003. Alertness, Bisociative Thinking Ability, and Discovery of Entrepreneurial Opportunities in Asian Hi-Tech Firms. *Frontiers of Entrepreneurship Research*. Babson College, Wellesley, MA.
- Koestler, A., 1964. *The Act of Creation*. Penguin Books, London.
- Lehrer, J., 2008. The eureka hunt. *The New Yorker – Annals of Science* July 28.
- Lumpkin, G.T., Lichtenstein, B.B., 2005. The role of organizational learning in the opportunity-recognition process. *Entrepreneurship Theory and Practice* 29 (4), 451–472.
- Matlin, M.W., Foley, H.J., 2001. *Sensation and Perception*. Allyn and Bacon, Boston.
- McMullen, J.S., Shepherd, D.A., 2006. Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Academy of Management Review* 31 (1), 132–152.
- Mitchell, J.R., Friga, P.N., Mitchell, R.K., 2005. Untangling the intuition mess: intuition as a construct in entrepreneurial cognition research. *Entrepreneurship Theory and Practice* 30, 653–679 (November).
- Mitchell, R.K., Busenitz, L., Bird, B., Gaglio, C.M., McMullen, J., Morse, E., Smith, B., 2007. The central question in entrepreneurship cognition research. *Entrepreneurship Theory and Practice* 31 (1), 1–27.
- Mullins, T.W., 1982. Interviewer decisions as a function of applicant race, applicant quality and interviewer prejudice. *Personnel Psychology* 35, 163–174.
- Mumford, M.D., Gustafson, S.B., 1988. Creativity syndrome: integration, application, and innovation. *Psychological Bulletin* 103, 27–43.
- Neisser, U., 1967. *Cognitive Psychology*. Appleton-Century-Crofts, New York.
- Nunnally, J.C., 1978. *Psychometric Theory*, 2nd ed. McGraw-Hill, New York.
- Nunnally, J.C., Bernstein, I.H., 1994. *Psychometric Theory*, 3rd ed. McGraw-Hill, New York.
- Oviatt, B.M., McDougall, P.P., 2005. Defining international entrepreneurship and modeling the speed of internationalization. *Entrepreneurship Theory and Practice* 29, 537–553.
- Perry-Smith, J.E., 2006. Social yet creative: the role of social relationships in facilitating individual creativity. *Academy of Management Journal* 49 (1), 85–101.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *The Journal of Applied Psychology* 88 (5), 879–903.
- Polanyi, M., 1967. *The Tacit Dimension*. Routledge and Kegan, London.
- Reed, S.K., 2004. *Cognition: Theory and Applications*, 6th ed. Wadsworth/Thomson Learning, Belmont, CA.
- Reis, H.T., Judd, C., 2000. *Handbook of Research Methods in Social and Personality Psychology*. Cambridge University Press, New York.
- Reynolds, P., 2000. National panel study of U. S. business start-ups: background and methodology. In: Katz, J. (Ed.), *Advances in Entrepreneurship, Firm Emergence, and Growth*, 4. JAI Press, Stanford, CT, pp. 153–227.
- Roberts, E., 1991. *Entrepreneurs in High Technology: Lessons from MIT and Beyond*. Oxford University Press, New York.
- Sarasvathy, S.D., Dew, N., Velamuri, S.R., Venkataraman, S., 2003. Three views of entrepreneurial opportunity. In: Acs, Z.J., Audretsch, D.B. (Eds.), *Handbook of Entrepreneurship Research: an Interdisciplinary Survey and Introduction*. Kluwer, Dordrecht, The Netherlands, pp. 141–160.
- Scandura, T.A., Williams, E.A., 2000. Research methodology in management: current practices, trends, and implications for future research. *Academy of Management Journal* 43 (6), 1248–1264.
- Schneider, D., 1991. Social cognition. *Annual Review of Psychology* 42, 527–561.
- Schriesheim, C.A., Powers, K.J., Scandura, T.A., Gardiner, C.C., Lankau, M.J., 1993. Improving construct measurement in management research: comments and a quantitative approach for assessing the theoretical content adequacy of- and-pencil survey-type instruments. *Journal of Management* 19 (2), 385–417.
- Schumpeter, J.A., 1934. *The Theory of Economic Development*. Harvard University Press, Cambridge, MA.

- Seers, A., Woodruff, S., 1997. Temporal pacing in taskforces: group development or deadline pressure? *Journal of Management* 23, 169–187.
- Shalley, C.E., 1995. Effects of coaction, expected evaluation, and goal setting on creativity and productivity. *Academy of Management Journal* 38, 483–503.
- Shane, S., 2000. Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science* 11 (4), 448–469.
- Shane, S., 2003. *A General Theory of Entrepreneurship*. Edward Elgar, Northampton, MA.
- Shane, S., Venkataraman, S., 2000. The promise of entrepreneurship as a field of research. *Academy of Management Review* 25, 217–226.
- Shepherd, D.A., DeTienne, D.R., 2005. Prior knowledge, potential financial reward, and opportunity identification. *Entrepreneurship Theory and Practice* 29 (1), 91–112.
- Shepherd, D.A., McMullen, J.S., Jennings, P.D., 2007. Formation of opportunity beliefs: a coherence theory perspective. *Strategic Entrepreneurship Journal* 1 (1–2), 75–95.
- Short, J.C., Moss, T., Lumpkin, G., 2009. Research in social entrepreneurship: past contributions and future opportunities. *Strategic Entrepreneurship Journal* 3, 161–194.
- Short, J.C., Ketchen, D.J., Shook, C.L., Ireland, R.D., 2010. The concept of “opportunity” in entrepreneurship research: past accomplishments and future challenges. *Journal of Management* 36, 40–65.
- Stinchcombe, A., 1968. *Constructing Social Theory*. University of Chicago Press, Chicago, IL.
- Subramaniam, M., Youndt, M., 2005. The influence of intellectual capital on the nature of innovative capabilities. *Academy of Management Journal* 48 (3), 450–464.
- Swets, J.A., 1992. The science of choosing the right decision threshold in high-stakes diagnostics. *The American Psychologist* 47, 522–532.
- Taylor, S.E., 1981. The interface of cognitive and social psychology. In: Harvey, J. (Ed.), *Cognition, Social Behavior, and the Environment*. Erlbaum, Hillsdale, N.J.
- Thornhill, S., 2006. Knowledge, innovation, and firm performance in high- and low-technology regimes. *Journal of Business Venturing* 21, 687–803.
- Torrance, E.P., 1974. *Torrance Tests of Creativity Thinking*. Personnel Press, Lexington, MA.
- Tripsas, M., 2008. Customer preference discontinuities: a trigger for radical technological change. *Managerial and Decision Economics* 29 (2/3), 79.
- Van de Ven, A.H., 1986. Central problems in the management of innovation. *Management Science* 32, 590–607.
- Van der Vegt, G.S., Van de Vliert, E., 2005. Effects of perceived skill dissimilarity and task interdependence on helping in work teams. *Journal of Management* 31 (1), 73–89.
- Vandenbosch, M.B., 1996. Confirmatory compositional approaches to the development of product spaces. *European Journal of Marketing* 30 (3), 23–46.
- Venkataraman, S., 1997. The distinctive domain of entrepreneurship research: an editor's perspective. In: Katz, J., Brockhaus, R. (Eds.), *Advances in Entrepreneurship, Firm Emergence, and Growth*. JAI Press, Greenwich, CT, pp. 119–138.
- Von Hippel, E., 1988. *The Sources of Innovation*. Oxford University Press, New York.
- Watson, D., Clark, L.A., Tellegen, A., 1988. Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology* 54, 1063–1070.
- Weick, K., 1996. Drop your tools: an allegory for organizational studies. *Administrative Science Quarterly* 41, 301–314.
- Williams, L.J., Cote, J.A., Buckley, M.R., 1989. Lack of method variance in self-reported affect and perceptions at work: reality or artifact? *The Journal of Applied Psychology* 74, 462–468.
- Yu, T.F.L., 2001. Entrepreneurial alertness and discovery. *The Review of Austrian Economics* 14 (1), 47–63.