



A multidimensional examination of a creativity-based opportunity recognition model

Opportunity
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Abstract

Purpose – This paper seeks to detail an exploratory examination of a multidimensional, creativity-based theoretical model of opportunity recognition originally proposed by Hills *et al.* and later refined by Lumpkin *et al.*, but never empirically tested. The paper also aims to examine the relationship between individual dimensions of the model and creativity.

Design/methodology/approach – Analyses were conducted using AMOS software on a sample of 145 entrepreneurs. One structural equation model (SEM) and three confirmatory factor analysis models were tested.

Findings – The five-dimensional model – consisting of preparation, incubation, insight, evaluation, and elaboration – was determined to be the best fitting model. The SEM model also indicated that incubation and elaboration were significantly related to creativity. Overall, a multidimensional, creativity-based approach to modeling opportunity recognition is supported by this study.

Research limitations/implications – Cross-sectional data do not allow for testing of the process aspect of the model; however, they do provide evidence that the model can stand up to empirical tests of the five elements of the model. Future research should examine opportunity using multiple dimensions and a creativity perspective. Additional research is needed to examine the process aspects of opportunity recognition.

Practical implications – Fostering opportunity recognition processes that are iterative and involve multiple stages is likely to promote more creative entrepreneurial outcomes.

Originality/value – This study provides one of the few examples of a multidimensional perspective on opportunity recognition as well as an empirical examination of a creativity-based theoretical model of opportunity recognition.

Keywords Entrepreneurialism, Marketing opportunities, Opportunity recognition, Creativity, Structural equation modelling

Paper type Research paper



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Introduction

Opportunities and creativity are central elements in the entrepreneurship literature. Opportunity is often cited as pivotal for understanding entrepreneurship (Shane and Venkataraman, 2000; Ardichvili *et al.*, 2003; Gartner *et al.*, 2003); creativity is frequently a defining feature of entrepreneurs (Schumpeter, 1942; Kirzner, 1999; Ward, 2004; Baron, 2008). Merging these two concepts can provide insights into entrepreneurial processes. Creativity has appeared as a component in a number of opportunity models, such as the conceptualization offered by Ardichvili *et al.* (2003). However these models typically consider creativity as only a component of the opportunity recognition process, rather than an inherent basis of the process (Sanz-Velasco, 2006). In fact, Dimov (2007, p. 723) states:

... [o]ne of the persisting and most intuitive notions in entrepreneurship is that the recognition of opportunities is, inherently, a creative process.

Thus, there is a need for models that describe opportunity recognition as a creative process as well as efforts to empirically examine them (Gartner *et al.*, 2003). A recent call to rectify this has suggested using a Csikszentmihalyi (1996)-inspired model (Endres and Woods, 2007).

Even more so than in models of the creative process itself, models of the opportunity recognition process are depicted as multidimensional. However, empirical studies often develop one-dimensional constructs for opportunity recognition (e.g. Chen and Yang, 2009). This inhibits researchers from examining how each dimension of a particular opportunity recognition model relates to various constructs of interest. For example, knowledge is often associated with opportunity recognition (Shane, 2000). A question that could be asked about a model by Ardichvili *et al.* (2003): does alertness, which is depicted as having a direct influence on the core processes of opportunity recognition, have a different relationship with the core process of perception compared to evaluation? If opportunity recognition is operationalized as a one-dimensional construct, this question cannot be answered. Thus, there is a need to examine the multidimensionality of opportunity recognition and to determine whether dimensions have differing relationships with important constructs such as creativity, knowledge and alertness.

Thus, there are two gaps in the literature:

- (1) modeling opportunity recognition as inherently creative; and
- (2) multidimensional empirical examinations of opportunity recognition models.

This study is intended as a start towards filling both of these gaps through the use of a multidimensional, Csikszentmihalyi (1996)-inspired model of opportunity recognition (Lumpkin *et al.*, 2004), and by examining the relationship of each dimension with creativity. As such, the paper makes several contributions. First, we empirically test a more fine-grained model of the opportunity recognition process to gain a deeper understanding of the nature of the process and the relationships between its key elements. Second, to promote more creative entrepreneurial outcomes, we highlight the importance of viewing opportunity recognition as a multidimensional process. Third, and perhaps most importantly, we examine the assertion that creativity is centrally important to the entrepreneurial process.

In the remainder of this paper, we will review:

- the use of creativity in the entrepreneurial opportunity literature; and
- the multidimensionality of opportunity recognition.

Then, we will describe a model that is appropriate for examining the creative and multidimensional nature of opportunity recognition. Next, we describe the study we conducted, our findings and how they relate to creativity and the multidimensional nature of opportunity. We conclude with implications and suggestions for future research.

Creativity in the entrepreneurial opportunity literature

Entrepreneurial opportunity has increasingly been associated with creativity in the entrepreneurship literature. A number of authors have described the opportunity recognition process either as being influenced by creativity or more specifically as a creative process in-and-of itself (see Ardichvili *et al.*, 2003; Baron, 2008; Corbett, 2005; DeTienne and Chandler, 2007; Long and McMullan, 1984). Scholars, particularly those bridging entrepreneurship and creativity research in the psychology domain, consider entrepreneurship to be a specific case of creativity (see Amabile, 1997; Gilad, 1984; Whiting, 1988). Indeed, Ward (2004) suggested the Geneplore model of creativity, involving generative and explorative processes, as one of several cognitive perspective views of creativity that would be useful for examining entrepreneurial processes. Additionally, recent researchers examining opportunity recognition have used methods borrowed from the creativity literature such as creative problem solving (Kitzmann and Schiereck, 2005) and divergent thinking (Walton, 2003), or idea generation exercises (Corbett, 2007; Shepherd and DeTienne, 2005; Ucbasaran *et al.*, 2009).

Scholars who consider opportunity recognition as being influenced by creativity, as opposed to being a creative process in-and-of itself, have considered creativity from at least two perspectives: either as a characteristic of the entrepreneur or an outcome of tasks performed (Walton, 2003). These represent person and product, two of the “four P’s” of creativity (Runco, 2004), (not to be confused with the four P’s of marketing); the remaining two being press (environmental pressures) and process, the latter of which we will discuss below. Ardichvili *et al.* (2003) presented one of the most notable examples involving creativity as a characteristic of entrepreneurs more likely to recognize opportunities. In their model, creativity is one of two personality traits “shown to be related to successful opportunity recognition” (Ardichvili *et al.*, 2003, p. 116). They further propose that high levels of creativity are related to high levels of entrepreneurial alertness and optimism or self-efficacy. In another example, Miller identifies creativity in the opportunity discovery process as a “personal aspect” (Miller, 2007, p. 64) and as an essential component in opportunity creation.

Rather than viewing creativity as an individual characteristic, scholars have more commonly considered it as an outcome or product. For example, Walton (2003) describes divergent thinking as one of the most researched conceptualizations of creativity. Divergent thinking is “the generation of varied ideas” (Walton, 2003, p. 147) that includes abilities of fluency (number of ideas), flexibility (diversity of ideas), originality (novelty of the ideas) and elaboration (detail of the ideas). One technique for doing this includes making a list of ways to use some ordinary object – (often a brick)

– as a way to generate ideas. This is consistent with the view of opportunity as a creative product (Dimov, 2007). In such studies, subjects are usually given the task to list as many ideas as they can given some protocol (e.g. Corbett, 2007; Gaglio and Taub, 1992), ideas they have had recently (DeTienne and Chandler, 2007; Ko and Butler, 2006), or by asking respondents how many “opportunities for creating or purchasing a business have you identified within the last five years” (Ucbasaran *et al.*, 2009, p. 105). These are all examples of fluency of divergent thinking. A few studies have also considered originality by looking at the creativity level of opportunities (DeTienne and Chandler, 2007; Ko and Butler, 2006). No studies, to our knowledge, have looked at flexibility or elaboration of creative business ideas or opportunities.

As noted above, opportunity and creativity have been linked even more strongly through the consideration of opportunity recognition as a creative process (Dimov, 2007; Sanz-Velasco, 2006). In a review of definitions in the opportunity literature, Hansen *et al.* (2011) found one stream of research that defines opportunity recognition as a creative process and offered the following definition: “opportunity creating” (as they labeled the process to distinguish between the different types of opportunity recognition process streams) is a creative process of generating new alternatives. While that is a process definition, it also implies the person and product components of creativity. As Endres and Woods (2007) suggest, Csikszentmihalyi (1996) presented a creativity process model that is useful for examining a creativity-based conception of opportunity recognition and Hills *et al.* (1999) introduced such a model. The model was later refined by Lumpkin *et al.* (2004).

Multidimensionality of opportunity recognition

Most opportunity recognition models, such as the creativity-based model (Hills *et al.*, 1999; Lumpkin *et al.*, 2004), are multidimensional (Kickul and Walters, 2002). For example Dimov (2007), Sanz-Velasco (2006) and Ardichvili *et al.* (2003) describe opportunity recognition as a development process that takes place over time and involves a variety of activities, which would suggest a multidimensional perspective. Ardichvili *et al.*'s (2003) depiction of the process, for example, shows a variety of influential elements, such as alertness, creativity and knowledge, plus several process elements, such as perception and evaluation. However, few studies have empirically examined opportunity recognition as such (Gartner *et al.*, 2003) or combined opportunity recognition with creativity (Chen and Yang, 2009). That is, most empirical studies of opportunity recognition operationalize it as a single dimension even though across the literature there are a variety of dimensions both conceptually and operationally (Hansen *et al.*, 2011). In fact, Hansen and colleagues found 49 different conceptual and 37 empirical elements of opportunity recognition used in the entrepreneurship literature. Given that opportunity recognition is often defined and modeled as multidimensional, we suggest the following hypothesis:

- H1.* A multidimensional model is a better fit for opportunity recognition than a one-dimensional model.

The Hills *et al.* (1999) and Lumpkin *et al.* (2004) conceptualization is one such multidimensional model. Versions of the model have appeared in several recent journal publications (e.g. Tominc and Rebernic, 2007) as well as an entrepreneurship textbook (Barringer and Ireland, 2008). Scholars have mapped the model on to conceptual

frameworks such as Kolb's experiential learning styles (Corbett, 2005) and organizational learning (Lumpkin and Lichtenstein, 2005). However, neither of these examples has been empirically examined. While Ko and Butler (2006) fully described the components of the model, their empirical analysis did not make use of the model. Thus while the model has gained some conceptual acceptance among entrepreneurship scholars, it has yet to be tested empirically. Even so, the model is appropriate for addressing the research gaps described above given that it is a Csikszentmihalyi (1996)-inspired, multidimensional model. While Endres and Woods (2007) suggest the model as well-suited for "subjectivist" methods such as narratives and case histories, we feel the model is equally useful for methods involving quantitative data. Below we describe the components of the model primarily based on the Lumpkin *et al.* (2004) refinement.

Conceptual model

The Lumpkin *et al.* (2004) model draws on extensive literature in creativity. One of the earliest versions of the model appeared in a book by Graham Wallas (1926) and was based on the creative process described by scientists H.L.F. Helmholtz in 1891 and Poincaré in 1908 (Haefele, 1962). Updated and refined versions of the model have been used by a great number of creativity scholars and practitioners (Torrance, 1988) including Csikszentmihalyi (Csikszentmihalyi, 1996; Csikszentmihalyi and Sawyer, 1995). Helmholtz's original model described the creative process as consisting of three stages – preparation, incubation, and illumination – to which Wallas (1926) added verification in his version. Csikszentmihalyi renamed illumination "insight" and divided verification into two parts: "evaluation" and "elaboration". Hills *et al.* (1999) and Lumpkin *et al.* (2004) kept the latter framework, including the component nomenclature, when they applied the process to opportunity recognition. Each of the five components of the model are discussed next.

Preparation refers to the skills and knowledge one acquires or accesses to bring to the creative process (Lubart, 2000-2001). Wallas (1926) describes it as consciously accumulating knowledge and Csikszentmihalyi (1996) describes this element as one where individuals immerse themselves in solving a problem. In an entrepreneurial context, preparation would include identifying an "imprecisely-defined market need" (Chen and Yang, 2009, p. 400) or finding problems or "pain" in the market (Sanz-Velasco, 2006). Lumpkin *et al.* (2004) believe, based on the creativity literature, that preparation can be both conscious and purposeful as well as an unintended result of experience. Both prior knowledge (Shane, 2000) and existing knowledge are accessed (Endres and Woods, 2007). Skills and knowledge may come from sources such as one's personal background, work experience, education/training, hobbies, and social networks (Hills *et al.*, 1999). The most useful knowledge would be knowledge of markets, ways to serve markets and customer problems (Shane, 2000), but other knowledge sets would also be valuable.

Incubation is where the knowledge domains collide to create new associations (Lubart, 2000-2001). The creativity literature often describes this as a subconscious activity. Wallas (1926) described it as resting the mind and focusing on other issues. Csikszentmihalyi (1996) describes it as subconsciously mulling things over. Lumpkin *et al.* (2004, p. 79) state that it is not "conscious problem-solving or systematic analysis. Instead it is typically an intuitive, non-intentional style of considering possibilities or

options.” They describe this element as one where new combinations (Schumpeter, 1942) of possibilities emerge. More simply, according to some creativity literature, incubation is focusing on things other than the problem at hand or taking a break to free the mind and give it a rest (e.g. Hennessey, 2003). It is associated with creative attributes such as divergent thinking (Walton, 2003) and formation of unusual associations (Ward, 2004). Gaglio and Taub (1992) describe it as the “simmering of the pre-recognition stew.” Whether ideas simply sit in the back of one’s mind waiting for an impetus that may come from an external stimulus or because individuals change the domain of knowledge they are using for generating ideas (Paulus and Brown, 2003), incubation is often necessary for creative insights to emerge (Hennessey, 2003).

Insight refers to ideas coming forth from the subconscious mind or brought to the attention of an entrepreneur by others. In a problem solving context, it is a moment of realization – either that a problem is clearly formed or that a solution is at hand (Csikszentmihalyi and Sawyer, 1995). Wallas (1926) describes it as a “flash” and Csikszentmihalyi (1996) describes it as an “aha” experience interspersed with incubation, evaluation and elaboration. Indeed, many terms have been used to describe this element in the opportunity recognition literature, such as “eureka” (Gaglio and Taub, 1992), “aha” and “point of vision” (Long and McMullan, 1984). These terms elicit the serendipitous or accidental nature behind some insights. However, often times the idea will need to go back to preparation or incubation for further consideration, leading it to go through a loop process back to insight for another moment (or more likely multiple moments) of “aha”. According to Dimov (2007), this process is more typical than the one big insight that is often described as the foundation of new business ideas. Whether the insight occurs instantly or iteratively, it involves “breaking the means-ends framework” (Gaglio and Katz, 2001) that is, conceptualizing the problem or solution in a new way. This suggests that the process may take time (Endres and Woods, 2007). Additionally, there is a presumption that the entrepreneur is the originator of the idea; however, the insight may involve the recognition that an idea suggested by someone else may have value (Lumpkin *et al.*, 2004).

Once an idea survives an initial intuitive check, it enters the next phase because initial insights typically are not sufficient (Endres and Woods, 2007) and need further refinement to succeed (Dimov, 2007; Sanz-Velasco, 2006). Evaluation involves investigating the idea to determine whether or not it is viable. Csikszentmihalyi (1996) describes it as the conscious decision of whether an insight is valuable and worth pursuing. Evaluation includes, among others, preliminary market testing and informally “bouncing ideas off others” or assessing the business landscape (Lumpkin *et al.*, 2004). Keh *et al.* (2002) looked at cognitive functions in opportunity evaluation. They found that opportunity evaluation and risk perception had a negative relationship. They also found that cognitive biases, illusions of control and belief in the law of small numbers, influence evaluation of an opportunity.

The final element is elaboration, which refers to the work needed to refine the creative insight. Csikszentmihalyi (1996) describes this element as one where the creative individual (the entrepreneur) must pay close attention to and incorporate:

- their own feelings;
- new problems that arise; and
- the outside world (e.g., customers).

He also refers to elaboration as the 99 per cent perspiration of creativity (the rest being 1 per cent inspiration as suggested by Edison). This is the step in which a creative individual gains confidence that the idea is an entrepreneurial opportunity by interacting with others (Endres and Woods, 2007). This suggests that elaboration processes are not confined to the pre-launch stage (Hills *et al.*, 2005; Sanz-Velasco, 2006). Elaboration continues after launch because the interaction with the market is important for development (Sanz-Velasco, 2006).

Combining the description of the model components with the previously discussed idea that opportunity recognition is multidimensional, we test the following, more specific hypothesis:

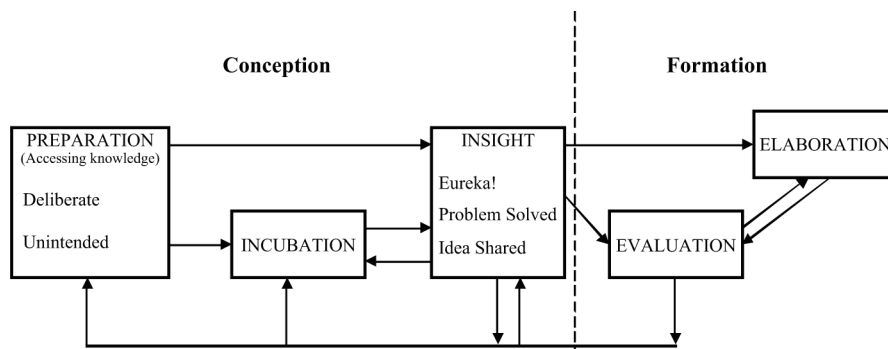
H2. Opportunity recognition can be modeled as a multidimensional process consisting of preparation, incubation, insight, evaluation and elaboration.

As can be seen in Figure 1, Lumpkin *et al.* (2004) divided the process into two phases – discovery, which we rename as conception, and formation. We changed discovery to conception because we felt the term better reflects the construct. Conception consists of the elements leading to the idea (i.e. the conception of the idea): preparation, incubation and insight. In addition, recent work has made a distinction between discovery and creation (Sarasvathy *et al.*, 2003; Alvarez and Barney, 2007), thus giving the term discovery a specific meaning (matching known supply with unknown demand or vice versa). Formation comprises evaluation and elaboration. This encompasses Wallas’ (1926) concept of verification, which includes “evaluating, refining, and developing one’s ideas” (Lubart, 2000-2001, p. 296). This distinction between the two phases suggests the following hypothesis:

H3. The five elements of a creativity-based model of opportunity recognition can be grouped into two stages – conception and formation.

Relationship between creativity and the model components

As discussed above, a primary rationale for constructing opportunity recognition as multidimensional is to consider differing relationships between dimensions and important constructs like creativity. In fact, we expect to find differing relationships between the model components and creativity. In a model similar to the one described above, Amabile (1988) suggested that creative thinking would most significantly



Source: Adapted from Lumpkin *et al.* (2004)

Figure 1.
Creativity-based model

influence the idea generation stage, which is similar to insight. Incubation should also be significantly influenced by creative thinking. As described above, incubation is where new associations (Lubart, 2000-2001) or new combinations (Schumpeter, 1942) are formed; it is associated with divergent thinking (Walton, 2003). Elaboration will likely require creative thinking as this is the stage in which details are worked out and problems must be overcome. Preparation and evaluation on the other hand are less dependent on creative thinking and more likely dependent on rational, analytical thinking (Lumpkin *et al.*, 2004). Therefore we offer the following hypotheses:

H4a. Incubation, insight and elaboration will be significantly related to creativity.

H4b. Preparation and evaluation will not be significantly related to creativity.

Method

The model was examined using a comprehensive mail survey of entrepreneurs in a large Midwestern US metropolitan area. A randomly selected group of 1,500 organizations with revenues between \$5-100 million were selected from a total of 18,000 in the Dun and Bradstreet (D&B) database. Prior to data collection, 81 were eliminated because the entity was either a charitable non-profit organization or the contact individual was not the owner, president or CEO. Respondents included in the final sample were all owners, presidents and/or CEOs who stated they had either founded the business or started a new major portion of the business. A cover letter and questionnaire were mailed to 1,419 individuals from the D&B list. Following the first mailing, another 128 of the 1,419 in the sample were eliminated because:

- the firm had either moved or gone out of business and had not provided a forwarding address;
- the individual to whom the survey was addressed was no longer with the firm; or
- the survey responses revealed the entity was a charitable non-profit organization.

This left a total potential sample of individuals representing 1,291 firms. Following the mail survey and one postcard follow up, 190 useable surveys were returned for a response rate of 14.7 per cent. Surveys from respondents that did not found or co-found the firm or start a major new portion of the business were not included. Incomplete surveys were also dropped leaving a final usable sample of 145 respondents, or 11.2 per cent. Non-respondents and respondents were compared; the differences between the two in annual revenues and number of employees were not statistically significant.

A survey instrument to gain general insights into opportunity recognition was developed and refined over an 18-month period. First, five focus groups were conducted, yielding a rich discussion of opportunity recognition and related issues. These results were valuable for the questionnaire design. In addition to numerous new survey items, the questionnaire replicated and modified items used in other studies, such as Schwartz *et al.* (2005). The questionnaire was extensively pre-tested and modified based on feedback from focus groups and a convenience sample of 47 entrepreneurs.

To test our hypotheses, we used three questions for each element that best represented the five elements of the model. The items were selected based on the best

fit with the description of each element by Csikszentmihalyi (1996). All items were measured on a scale of one to five, with one representing strongly agree and five representing strongly disagree. Items used to measure preparation assessed the entrepreneurs' ability to acquire and access market knowledge by listening to customers (PREP1), immersing themselves in an industry (PREP2), or getting to know the customer (PREP3). Incubation is measured by respondents' willingness to explore possibilities (INCUB1), focus on things other than the problem at hand (INCUB2) and engage different knowledge domains or contexts (INCUB3). Insight is measured by how ideas came forth – such as serendipitously (INSIT1), accidentally (INSIT2) or from other people (INSIT3). Evaluation is measured by the respondents' use of general preliminary “checking the landscape” and other informal research (EVAL1, EVAL2, EVAL3). Elaboration is measured by actions used to make the idea work. Based on Csikszentmihalyi's (1996) description, the entrepreneur must pay close attention to and incorporate their feelings about the idea (ELAB1), make changes based on new problems that arise, especially from customer feedback (ELAB2) and generally interact with the outside world (ELAB3). A complete list of items is included as an Appendix (Table AI).

Analysis

Several procedures were conducted to assess the validity and reliability of the constructs. To begin, examination of the data indicated that there were no problems with univariate or multivariate normality, or multicollinearity. To assess discriminant and convergent validity, we followed Anderson and Gerbing's (1988) recommendations. For discriminant validity, we compared the measurement model with all six constructs set to freely correlate with another model in which the correlations between the six constructs were constrained to one. The significant difference ($p < 0.001$) in chi-squares (χ^2) suggested divergent validity. Anderson and Gerbing (1988) further recommend repeating the process for each pair of correlations as a more rigorous test of discriminant validity. We conducted 15 such comparisons with each $\Delta\chi^2$ significant at the $p < 0.005$ level, thus demonstrating discriminant validity.

According to Anderson and Gerbing (1988) convergent validity is demonstrated by statistically significant path loadings. We found significant loadings for all constructs except for preparation and one marginally significant loading for elaboration ($p = 0.053$). We conducted a chi-square difference test comparing the measurement model with and without preparation. The $\Delta\chi^2$ between models was insignificant ($p > 0.1$). Furthermore, some fit statistics showed a slight decrease in overall fit. Thus, we decided to conduct the analyses below with preparation included, in order to more accurately represent the theoretical model and fully test the hypotheses.

Finally, we assessed internal reliability via Chronbach's alpha and composite reliability. Unfortunately all of the constructs except for evaluation had scores below 0.70. While this is a cause for concern, a few points are worth noting. First, low alphas attenuate (underestimate) relationships (Schmitt, 1996). That is, we should be less likely to find significant relationships among constructs with low reliabilities because they will likely be underestimated. However, as will be shown below, two of the model constructs were found to be significantly related to creativity, despite the low alphas. Second, as the description of the model components and low alphas suggest, the components may be multidimensional, which would support the assertion in

hypothesis one that opportunity recognition is multidimensional. Construct correlations, Chronbach alphas and composite reliabilities can be found in Table I.

The analysis began with confirmatory factor analysis (CFA) to test the measurement model. The CFAs and all further analyses were conducted using maximum likelihood estimation with AMOS software (Arbuckle, 2006). The first step was to test how well the measures loaded onto the five lower order constructs (preparation, incubation, insight, evaluation and elaboration). To test hypotheses one and two, a five-factor CFA model was created using the items described above as well as a single factor model. To test hypothesis three the model added the higher order factors, conception and formation. AMOS was unable to estimate this model. Therefore, an additional CFA model was tested. The lower order factors were removed from this model, leaving the respective measures to load directly onto the higher order conception and formation factors. This model is referred to below as the two-factor model. To test *H4a* and *H4b*, a structural equation model was constructed. The model used fixed unstandardized loadings from the five-factor CFA model. Creativity was measured using two items with which respondents self-assessed their level of personal creativity (CREAT1) and time set aside to be creative (CREAT2).

Results

Summary results of the CFAs and structural model are displayed in Table II. The fit statistics indicate that the five-factor model is a better fit than either the two-factor model or the single-factor model. In addition, a chi-square difference test further indicates that the five-factor model is a better fit (two-factor: $\Delta\chi^2 = 61.84, df = 9, p < 0.001$; one-factor: $\Delta\chi^2 = 73.95, df = 10, p < 0.001$)[1]. This supports hypothesis one which asserted that opportunity recognition is better represented as

Table I.
Construct descriptive statistics, correlations and reliability

	Mean	SD	1	2	3	4	5	6
1. Preparation	1.95	0.74	(0.32/0.30)					
2. Incubation	2.46	0.84	-0.012	(0.47/0.50)				
3. Insight	3.36	0.84	-0.099	0.055	(0.46/0.49)			
4. Evaluation	3.03	1.04	-0.163	0.119	0.158	(0.78/0.77)		
5. Elaboration	2.08	0.70	0.020	0.265*	0.228*	0.017	(0.35/0.37)	
6. Creativity	2.31	1.01	0.053	0.495*	0.036	-0.107	0.155	(0.54/0.43)

Notes: * $p < 0.01$ (two-tailed); $n = 145$; Cronbach alphas/composite reliabilities are in parentheses

Table II.
Fit statistics for models

Model	df	χ^2	p	χ^2/df	RMR	GFI	CFI	RMSEA
Five-factor CFA model	80	93.47	0.144	1.17	0.091	0.924	0.935	0.034
Two-factor CFA model	89	155.31	0.000	1.74	0.123	0.876	0.679	0.072
One-factor CFA model	90	167.42	0.000	1.86	0.131	0.862	0.626	0.077
Creativity model	124	156.76	0.025	1.26	0.115	0.892	0.878	0.043

Notes: RMR = root mean square residual, GFI = goodness-of-fit index, CFI = comparative fit index, RMSEA = root mean square error of approximation

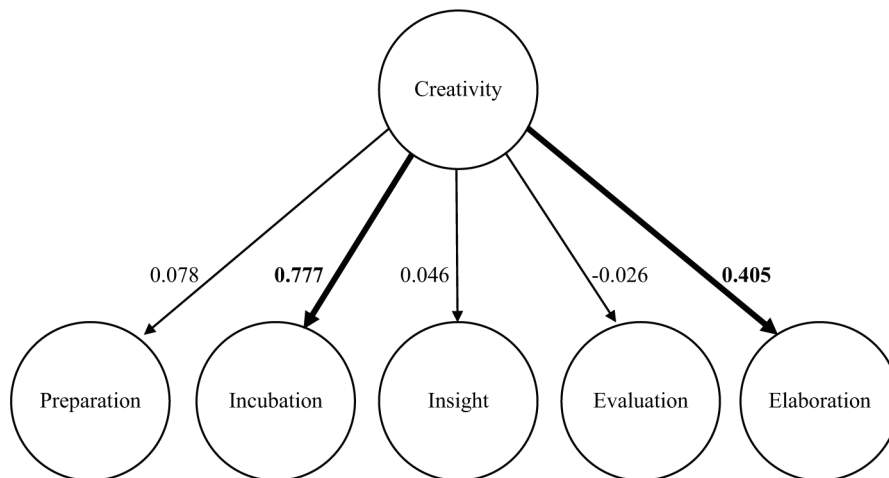
multidimensional. The fit statistics also suggest support for hypothesis two: opportunity recognition can be modeled as a multidimensional process consisting of preparation, incubation, insight, evaluation and elaboration. However, the low construct reliabilities for all but evaluation and the lack of convergent validity for preparation – suggest a lack of support for *H2*. *H3*, dividing the elements into two phases – conception and formation – is not supported by the analysis because AMOS was unable to estimate a multi-level model with the five components loaded onto two higher order variables. Furthermore, the five-factor model has a significantly better fit than the two-factor model.

The fit statistics for the structural equation model, shown in Table II, indicate that this model is a moderately good fit. As can be seen in Figure 2, creativity has significant relationships with incubation (standardized path coefficient = 0.777, $p < 0.001$) and elaboration (standardized path coefficient = 0.405, $p = 0.014$). The relationship between creativity and the other dimensions – preparation, insight and evaluation – were not significant. This partially supports *H4a* and fully supports *H4b*.

Discussion

Most models of opportunity recognition depict the process as complex and involving many dimensions (Kickul and Walters, 2002). However, many empirical studies use a one-dimensional construct. The results of this study suggest that a multidimensional empirical approach provides more information. We examined one particular multidimensional model, suggested by Hills *et al.* (1999) and Lumpkin *et al.* (2004), which is based on the creativity literature. This study provides one of the first empirical examinations of the model and supports Endres and Woods' (2007) call to use a Csikszentmihalyi (1996)-based model to examine entrepreneurial opportunity recognition.

The model we used can be considered relatively simple compared to more complex models, such as the one suggested by Ardichvili *et al.* (2003). While our five factors



Notes: Numbers represent standardized loadings. Bold indicates significance at the $p < 0.05$ level

Figure 2.
Creativity model

have some limitations, the results showed that five dimensions are a better fit than two dimensions, which are a better fit than one dimension. In fact, the low reliabilities of our constructs suggest that the five factors may be further dimensionalized. For example, given Csikszentmihalyi's (1996) description of elaboration, it may be further divided into three sub-dimensions: believing in the idea, dealing with problems and interacting with the outside world. Clearly the process of recognizing opportunities is complex and needs to be empirically examined as such.

One reason to consider a multidimensional model of opportunity recognition is that one can examine the relationships between the model dimensions and other constructs of interest, such as creativity. We assessed the relationship between creativity and the five elements of the model. We had hypothesized that incubation, insight and elaboration would be related to creativity and preparation and evaluation would not be significantly related. We did find a significant relationship between creativity and the model components incubation and elaboration, partially consistent with *H4a*. This is in spite of the low reliabilities, which reduce the likelihood of finding significant relationships. The relationship between incubation and creativity is rather intuitive. This is the stage just prior to the "eureka" moment where the brain is bouncing around ideas just "below the threshold of consciousness" (Csikszentmihalyi, 1996, p. 79) and is often associated with creativity (think about the oft-cited notion that ideas come when taking a shower). Throughout elaboration, many flaws in an idea will be revealed. It takes creativity to overcome these obstacles. Given that low reliabilities attenuate relationships, the relationship between creativity and the model components of incubation and elaboration are particularly strong. We did not find a significant relationship between insight and creativity. This may be due to the low reliability, but also may be because people view incubation as the real source of creativity and the idea that emerges in insight is just an outcome.

We did not find, nor did we expect to find, a significant relationship between creativity and either preparation or evaluation. Preparation involves accessing and acquiring knowledge. While this is necessary, it is not often associated with creativity. However the lack of significance should be considered with caution given the low reliability and lack of convergent validity of the preparation construct. Likewise, evaluation, while a significant part of most creativity practitioner approaches to creativity, is not often associated with creativity. These results suggest that a multidimensional approach to examining opportunity recognition is warranted in order to determine the differing relationships between the dimensions and important constructs like creativity.

While this study supports opportunity recognition using multidimensional measures, it also supports the relationship between opportunity recognition and creativity. Additionally, the creativity-based model of opportunity recognition, proposed by Hills *et al.* (1999) and Lumpkin *et al.* (2004) is partially supported by this study. Although the model tested is somewhat more parsimonious than other opportunity recognition models (e.g. Ardichvili *et al.*, 2003), it sets forth a multistage process that is clearly linked to the creativity literature. This has important practical implications. First, it highlights the importance of viewing opportunity recognition as a multidimensional process. Prior attempts to integrate creativity into entrepreneurial process models have minimized the iterative and staged nature of creative processes. Practitioners seeking more creative entrepreneurial outcomes can benefit from

acknowledging that creativity enters into multiple stages of the opportunity recognition process. Further, this research supports the central role that creativity plays in the opportunity recognition process. As such, management initiatives and consulting interventions aimed at improving the creativity of an organization's workforce can be deployed in ways that make entrepreneurial outcomes more creative.

Limitations and future research

As with any study, especially exploratory studies such as ours, there are some limitations. First, it could be said that we have tested only one opportunity recognition perspective. Alvarez and Barney (2007) distinguish between discovery and creation approaches to understanding entrepreneurship and highlight the Austrian economics origins of the discovery view, which holds that market forces yield opportunities that exist objectively awaiting discovery by alert entrepreneurs. In this paper, we have examined the creation view which emphasizes the dynamic and subjective nature of opportunities that emerge from iterative processes unfolding over time (Davidsson, 2003). Future research might address whether a creativity-based process is useful for assessing and improving "established" opportunities or whether alert entrepreneurs engage in multistage creative processes.

Another limitation is that our data is cross-sectional and therefore we could not examine the processual nature of opportunity recognition. Future research should use methods that would allow for examination of process dynamics. This could include using narratives (Endres and Woods, 2007; Pentland, 1999), which would also allow for examination of context (Ucbasaran *et al.*, 2001). A more comprehensive study of the opportunity recognition process may involve both qualitative and quantitative data and address multiple levels and/or units of analysis (Chiles, 2003). Such a study should avoid the limitation of self-report measures and minimize the likelihood of common method variance.

The data in our study had additional limitations, most notably the coefficient alphas. As noted above, low alphas lead to an underestimation of relationships. However, in spite of the low alphas, we found two significant relationships between creativity and the model components of incubation and elaboration. The low alphas also suggest that opportunity recognition is indeed multidimensional. As an aside we further tested the internal reliability for the constructs in the two-factor and one-factor models and found them to be considerably lower, further suggesting multidimensionality. Also as noted above, the descriptions of the model components suggest that they may be further divided into sub-dimensions. Future research should consider constructing these sub-dimensions, which should lead to higher reliabilities, as adding more items should improve alpha scores (Cortina, 1993).

Another potential limitation of our study relates to survival bias inherent in our data collection procedure. Although we did compare respondents with non-respondents and found no significant differences, our results are based only on thriving firms. Future researchers could benefit by investigating how opportunity recognition processes, or lack thereof, might contribute to firm failure.

This study used a model that includes five elements, providing support for conceptualizing opportunity recognition as a multidimensional construct. Thus, future research should use multiple dimensions when measuring opportunity recognition. Opportunity recognition may involve fewer or more than five dimensions. To

determine the appropriate number of opportunity recognition dimensions, researchers should use either theory as a conceptual foundation or a grounded theory building approach (Glaser and Strauss, 1967). Additionally, although we did not find support for splitting the model conceptually into conception and formation, the fact that opportunity recognition is so often described as consisting of two sub-processes, such as attention and evaluation (McMullen and Shepherd, 2006) or identification and development (Ardichvili *et al.*, 2003) or creation and elaboration (Sanz-Velasco, 2006), suggest that further research into a two-dimensional view of opportunity recognition is needed.

The problem of low reliability in this study may be indicative of why other studies have not used a multidimensional approach. We hope that by presenting our results, future researchers can build on our work and continue to examine multiple dimensions of opportunity recognition. While the statistical limitations of this study suggest its results should be interpreted with caution, we can safely conclude that there are important relationships between different aspects of opportunity recognition and the commonly related construct of creativity. This suggests that future researchers need to consider constructing multidimensional empirical models so that they may examine potentially different effects.

This study has posited and supported the view that a significant relationship exists between opportunity recognition and creativity. This suggests several opportunities for future research. First, as noted, creativity research is often classified into four categories (Runco, 2004). Of those, person and product have received the most attention in the literature. While there is need for further research on these two, there is an even greater need for more research in the other two categories: process and press (contextual forces). As mentioned, longitudinal qualitative data-based or mixed method studies are needed to examine the process and press aspects of creativity in opportunity recognition. Additionally, it was also noted that divergent thinking involves four abilities. Fluency and originality have received some empirical examination in the opportunity literature. However, more research is needed to determine how these relate to "successful opportunity recognition" (Ardichvili *et al.*, 2003). Additionally, research is needed to examine whether or not flexibility and/or elaboration of ideas have any relation to the opportunity recognition process. Finally, our results found a significant relationship between creativity and the dimensions of incubation and elaboration but not the dimensions of preparation, insight or evaluation. These relationships need further research.

Conclusions

In summary, our examination of a creativity-based model of entrepreneurial opportunity recognition suggests that a multidimensional approach is needed to explain the phenomenon more precisely. This is in contrast with prior studies of opportunity recognition that have used a uni-dimensional approach in empirically examining construct relationships. We have also provided evidence that opportunity recognition is inherently creative as opposed to simply being influenced by creativity. This is consistent with prior research that considers creativity as important to opportunity recognition, but moves beyond much of that research which usually limits creativity to a role of antecedent or moderator. We hope these findings and the theoretical insights suggested by this study provide an impetus for future researchers

to further explore the extent to which entrepreneurial opportunity recognition is an inherently creative multidimensional process.

Note

1. The chi-square differences also hold at the $p < 0.001$ level without preparation included.

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Appendix

PREP1	I listen extremely well to what customers say they want and don't want as a way of identifying opportunities
PREP2	Identifying good opportunities usually requires "immersion" in a particular industry and marketplace
PREP3	I knew who the first customers would be before introducing our first product/service
INCUB1	I enjoy just thinking about and/or looking for new business opportunities
INCUB2	I often think of new business ideas when I am totally relaxed, doing something unrelated to business
INCUB3	Our venture idea, or closely related one, was actually seen in another context
INSIT1	The idea behind this business just seemed to suddenly appear
INSIT2	Our venture idea came for an accidental process that just happened to uncover the concept
INSIT3	Other people bring new venture business ideas to me
EVAL1	In-depth, formal customer surveys are usually more costly than can be justified
EVAL2	It is often better to enter a market and, if necessary, make changes than to take the time and money to first do formal marketing research
EVAL3	In-depth market analysis is often used more for impressing financial sources than for actual decision making
ELAB1	The most important thing is to believe in the idea
ELAB2	On entering the market with a new venture, I made major changes based on customer feedback
ELAB3	It is easier to see the real opportunities after you begin to enter a new market (compared with before you start)
CREAT1	I am not a very creative person (R)
CREAT2	I set aside a few minutes each day or week to be creative

Note: (R) = Reverse scored

Table AI.
Questionnaire items used
in this study

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