

Distinguishing entrepreneurial approaches to opportunity perception

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Abstract

Purpose – Whether opportunities are discovered or created by entrepreneurs is a foundational question in entrepreneurship research. The purpose of this paper is to examine women entrepreneurs in high-growth new ventures and explore the cognitive resources that distinguish between three approaches to opportunity perception: opportunity discovery; opportunity creation; and a combined discover-create (ambidextrous) approach.

Design/methodology/approach – Using questionnaire responses from 165 women entrepreneurs in high-growth new ventures, K-means clustering was used to determine three approaches to opportunity perception. The cognitive resources associated with each approach were then identified using multiple discriminant analysis. Finally, multivariate analysis of variance was conducted to examine the relationship between opportunity perception and growth expectations.

Findings – These results demonstrate different approaches to opportunity perception among entrepreneurs in high-growth new ventures, the cognitive resources that reinforce each approach, and the expected new venture growth outcomes.

Research limitations/implications – The findings offer insight on the cognitive origins of opportunity perception by empirically identifying distinct approaches to opportunity perception and the cognitive resources that underlie each. The study relies on a unique sample of entrepreneurs to understand complex cognitive phenomenon.

Practical implications – Understanding the effects that cognitive factors have on opportunity perception provides direction for current and aspiring entrepreneurs. The findings and instrument may be used for professional development and to inform educational strategies.

Originality/value – The findings offer important contributions to entrepreneurial theory and practice by addressing repeated calls for research that examines the cognitive antecedents enabling opportunity formation (discovery, creation or both). This manuscript empirically does so, while opening up possibilities for future research.

Keywords Women entrepreneurs, Cognition, Growth expectations, Opportunity perception

Paper type Research paper

Introduction

Proximal to the field of entrepreneurship is whether opportunities are discovered or created by entrepreneurs. Opportunity discovery assumes an alert entrepreneur, who sees what others miss, while opportunity creation assumes an entrepreneur who uses available resources and abilities to form opportunity. A key distinction between these two approaches is whether the entrepreneur perceives the opportunity to be exogenous or endogenous. With discovery, opportunity is exogenous and forms through shifts in market conditions that the “alert” entrepreneur detects and exploits (Shane and Venkataraman, 2000). With create, opportunity is endogenous and forms through the actions of the entrepreneur, who brings opportunity into being (Baker and Nelson, 2005; Sarasvathy, 2001). Recent work (Alvarez *et al.*, 2013) suggests the possibility of simultaneously engaging in discovery and creation, which requires the entrepreneur not only to see things that others miss but also to interact with the market, to iterate, and to engage in intuitive decision-making.

A question that arises is whether entrepreneurs who discover opportunity think and reason differently from entrepreneurs who create opportunity, as well as from ambidextrous entrepreneurs who simultaneously discover and create opportunity. Researchers have begun to

operationalize the distinctive approaches that entrepreneurs take in exploiting opportunities (Chandler *et al.*, 2011; Dew *et al.*, 2009; Dutta and Thornhill, 2014; Fisher, 2012); however, the antecedent conditions to the chosen approach (i.e. discovery, creation or both) remains unexplored. While prior research examines how entrepreneurs might differ (e.g. Begley, 1995; Busenitz and Barney, 1997; Chen *et al.*, 1998; Miner and Raju, 2004; Stewart and Roth, 2001) or benefit (cf. Grégoire *et al.*, 2011) from various cognitive resources, this study extends this body of work by examining the cognitive resources that distinguish between each perspective.

While theoretically significant, the study of opportunity presents an empirical challenge (Dimov, 2011). Given that opportunity is an unobservable and empirically elusive phenomenon, Welter and Alvarez (2015) recommend examining the nature of the entrepreneur as a means of empirically testing opportunity types, which the authors suggest would move the literature from a solely theoretical to an empirical foundation. As noted above, opportunity discovery and opportunity creation reflect different approaches to opportunity perception. Unresolved is whether individual entrepreneurs may also perceive opportunity through both approaches – opportunity discovery and opportunity creation. This study explores these issues by addressing three research questions:

RQ1. What is the tendency for entrepreneurs in high-growth new ventures to engage in one, the other, or both approaches to opportunity perception?

RQ2. How do cognitive (psychological) resources of entrepreneurs distinguish those who tend to rely on a discovery, creative, or ambidextrous approach to opportunity perception?

RQ3. How does the entrepreneur's approach to opportunity perception influence new venture growth expectations?

These research questions are examined within the context of an understudied population – women who have founded high-growth new ventures. This context is particularly important for two reasons. First, while the body of entrepreneurship literature has grown substantially over the past decade, less is known about women entrepreneurs (Ahl and Nelson, 2010; Greene *et al.*, 2003). As Jennings and Brush (2013, p. 698) point out, “the proportion of women's entrepreneurship research published within top-tier journals has steadily declined since the mid-1990s.” These authors challenge researchers to expand knowledge of women entrepreneurs by investigating subpopulations and to examine issues around opportunity recognition, emotions and social entrepreneurship. Second, while research indicates that men and women cite similar motivations for starting a business (Cohoon *et al.*, 2010), women are underrepresented among the overall population of entrepreneurs (Mitchell, 2011; Coleman and Robb, 2009; Shane, 2008). In the USA, women are half as likely as men to become entrepreneurs (Kauffman Foundation, 2016). Worldwide, women are less likely to report entrepreneurial intentions and to participate in entrepreneurship. A study on women's entrepreneurship in 83 countries reported lower female intentions to start businesses across all regions, as well as lower female participation in total early stage entrepreneurship across all regions (Kelly *et al.*, 2015). With that said, some women do found high-growth businesses (Gundry and Welsch, 2001; Morris *et al.*, 2006). This study seeks to build on the understanding of female founders of high-growth new ventures.

The study reported here offers a significant contribution to the literature by empirically examining approaches to opportunity perception. In doing so, the paper identifies the cognitive resources that distinguish between approaches and the growth expectations that result. By focusing on women who found high-growth businesses, the study also provides insight into an understudied group, as well as an opportunity to discuss practical implications. The paper presents a conceptual framework, followed by a description of the measures and methods, and concludes with the results and a discussion of the implications.

How opportunities are perceived

No matter the origin, “opportunities sojourn in the minds of aspiring entrepreneurs as venture ideas, propped by perceptions and beliefs [...]” (Dimov, 2011, p. 64). Prevailing schools of thought suggest that the origin of opportunity is either present in existing market structures or exists only because of entrepreneurial invention. Shane and Venkataraman (2000) argue that opportunity exists as an objective phenomenon that is not known to all individuals. Existing only when perceived by the individual, “[o]ppportunity by definition is unknown until discovered” (Kaish and Gilad, 1991, p. 38). According to this discovery view of opportunity perception, certain individuals are more alert to shifts and see gaps based on an acute ability to scan and to search systematically for new information (e.g. Kirzner, 1973; Chandler *et al.*, 2011; Tang *et al.*, 2012). Entrepreneurs who discover opportunity tend to set out purposefully, to search systematically, to engage in analysis, and to exploit existing knowledge and resources (Chandler *et al.*, 2011; Shepherd *et al.*, 2007).

Another view is that entrepreneurs bring opportunities into being through a creative process that relies on the entrepreneur’s efforts and actions (Sanz-Velasco, 2006; Sarasvathy *et al.*, 2010; Dutta and Thornhill, 2014). In the create view of opportunity perception, opportunities form as imagined possibilities that take shape based upon enacted actions. The viability of newly formed ideas is likely to be uncertain, so the entrepreneur initiates transformative and sensemaking processes to create opportunity (Alvarez and Barney, 2007; Klein, 2008; Wood and McKinley, 2010; Shane, 2012). The entrepreneur experiments and changes direction on the basis of new information (Dyer *et al.*, 2008) and through interactions with people in their networks (Fisher, 2012; Wood and McKinley, 2010). In this way, entrepreneurs engage in iterative learning (Sanz-Velasco, 2006; Mitchell *et al.*, 2008) and form opportunities that could not have existed without their actions. In this case, entrepreneurs are an integral part of opportunity emergence as they invent what they believe to be viable by relying on a set of deep and diverse prior experiences (Alvarez *et al.*, 2013), as well as an extended network of resources and people (Dyer *et al.*, 2009; Wood and McKinley, 2010).

As noted above, the literature also suggests that opportunity can be both discovered and created (Leyden and Link, 2015; Fisher, 2012; Sarasvathy, 2001) and that discovery and creation can form a virtuous and dynamic cycle, with context performing a discriminating role (Zahra, 2008). Leyden and Link (2015) theorize a two-step discovery-creation process, where entrepreneurs develop a social network and search for an innovation to pursue, and then use the social network to help bring the innovation into being. The work of Vaghely and Julien (2010) supports the notion that opportunity formation can result from simultaneous discovery and creation based on how the entrepreneur thinks and processes information. Based on a case study, they find that entrepreneurs rely on archived information and prior experience, as well as problem-solving and sensemaking and an ability to switch between modes of thinking.

The concept of ambidexterity is most often applied to the organization and its ability to engage simultaneously in competing strategies; e.g., flexible and efficient, explorative and exploitative, alignment and adaptability, search and stability, (cf. Simsek *et al.*, 2009). Organizations achieve ambidexterity through structural or contextual mechanisms that allow the firm to cope with contradictory tensions (Gibson and Birkinshaw, 2004; Raisch and Birkinshaw, 2008). Firms that handle contradictory tensions through structural ambidexterity do so through separate units or subdivisions that specialize in different, possibly inconsistent, functions. For contextual ambidexterity, firms design systems and processes that support individual choice in allocating resources among competing demands. This has led to a duality in ambidexterity research, whereby researchers examine the organization’s ability to navigate and channel contradiction either through structural differentiation or contextual integration (Raisch *et al.*, 2009).

While ambidextrous organizations realize superior performance (Gibson and Birkinshaw, 2004; He and Wong, 2004; Junni *et al.*, 2013; Lubatkin *et al.*, 2006), individuals are essential to organizational ambidexterity. For effective structural integration, individuals (e.g. senior executives) must integrate across differentiated units (Jansen *et al.*, 2009), while contextual integration requires individuals (e.g. decision makers) to use company-sanctioned systems and processes to reconcile competing demands (Raisch *et al.*, 2009). Therefore, it is the people within an organization who must have the capacity to manage conflicting goals, contradicting information and competing roles (Floyd and Lane, 2000; Gibson and Birkinshaw, 2004; Smith and Tushman, 2005). In applying the concept of ambidexterity to managers and entrepreneurs, prior research suggests that individuals are able to benefit the organization by operating in seemingly opposing ways (Mom *et al.*, 2009; Raisch *et al.*, 2009; Volery *et al.*, 2015) and has established specific behavioral, structural and social traits associated with managerial ambidexterity (Birkinshaw and Gibson, 2004; Jasmand *et al.*, 2012; Mom *et al.*, 2009). The current study adds to this understanding by empirically examining the cognitive resources that enable entrepreneurs to engage simultaneously in discovery and create approaches to opportunity perception.

Cognitive resources effecting opportunity perception

Building on the body of literature in cognitive psychology and social cognition theory, entrepreneurial cognition is defined as “the knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth.” (Mitchell *et al.*, 2002, p. 97). The body of literature that has developed subsequently suggests cognitive resources explain how entrepreneurs perceive opportunity. In reviewing cognitive research in entrepreneurship, Grégoire *et al.* (2011) identify a number of cognitive resources that have been examined for entrepreneurs. Among these are self-efficacy, decision biases, prior knowledge, learning and experience. These authors recommend that future research examine antecedents of entrepreneurial cognition, especially cognitive resources that enable opportunity perception. While recent research has begun to offer a behavioral and cognitive explanation for opportunity discovery (Dyer *et al.*, 2008; Neill *et al.*, 2015), this study explores the ability of a set of cognitive resources (i.e. self-efficacy, representativeness bias, uncertainty intolerance, risk propensity, exploiting, exploring and experience) to distinguish between the approaches entrepreneurs take to opportunity perception.

Self-Efficacy. Self-efficacy is formed by an individual’s collection of skills, experiences and assets and is defined as the individual’s belief in his or her ability to perform and to achieve goals (Bandura, 1997; Kasouf *et al.*, 2013). Entrepreneurial self-efficacy has the potential to influence entrepreneurial intent and the search and pursuit of opportunity (Drnovšek *et al.*, 2010). Prior research shows a positive relationship between self-efficacy and the likelihood of becoming an entrepreneur (Cassar and Friedman, 2009; Chen *et al.*, 1998; Zhao *et al.*, 2005) and the pursuit of valuable opportunities (Ardichvili *et al.*, 2003; Bayon *et al.*, 2015). Krueger and Dickson (1994) find that self-efficacy increases perceptions of opportunity. Self-efficacy is a key ingredient in the ongoing pursuit of high-growth opportunity (Gundry and Welsch, 2001; Sweida and Reichard, 2013).

Representativeness bias. Representativeness bias is the tendency to overgeneralize from a few characteristics or observations. This concept is also referred to as a belief in the law of small numbers. Exposure to different, and possibly ambiguous, information offers entrepreneurs source material for market insights and may require significant and non-linear leaps in thinking based on a few facts or observations (Mitchell *et al.*, 2007). Because entrepreneurs are unlikely to have access to or the resources for large-scale studies or market research, opportunity perception is often based on limited information (Busenitz and Barney, 1997; Keh *et al.*, 2002; Murmann and Sardana, 2012).

Uncertainty intolerance. Entrepreneurial actions are inherently uncertain (Markman and Baron, 2003; Hmieleski and Baron, 2009). Unlike risk, uncertainty cannot be estimated or predicted accurately (York and Venkataraman, 2010). Entrepreneurs have been found to have a high tolerance for ambiguity and are distinguished from non-entrepreneurs by their willingness to bear uncertainty (McMullen and Shepherd, 2006; York and Venkataraman, 2010). Tolerance for uncertainty enables the entrepreneur to innovate, to make decisions and to act in an ambiguous environment (Teoh and Foo, 1997; York and Venkataraman, 2010). An unwillingness to tolerate uncertainty prevents entrepreneurial action (McMullen and Shepherd, 2006). In fact, Fraser and Greene (2006) demonstrate that new entrepreneurs are more likely to exit when they experience high levels of uncertainty.

Risk propensity. Begley (1995) defines risk-taking propensity as the entrepreneur's willingness to take risks. Risk is a measurable unknown to which probabilities can be assigned (York and Venkataraman, 2010). Because risk is calculable, it can be mitigated by reward. The literature supports the notion that founding entrepreneurs are risk-takers who take chances and expect to profit handsomely as a reward for their risk bearing orientation (Begley, 1995; Stewart and Roth, 2001). By contrast, Brockhaus (1980) found that entrepreneurs tend to have only moderate risk-taking propensity; Palich and Bagby (1995) observed that entrepreneurs do not perceive themselves as being more predisposed to risk taking than non-entrepreneurs; and Miner and Raju (2004) report results from a meta-analysis indicating that entrepreneurs may be less likely to be risk prone. By examining motivations within a group of entrepreneurs, differences are noted with entrepreneurs seeking to pursue opportunity and a creative outlet being less risk averse than those motivated by necessity (Block *et al.*, 2015). While researchers differ on their conclusions about entrepreneurs' risk-taking propensity, agreement exists on the importance of risk propensity in the context of entrepreneurship.

Exploiting. Exploiting emphasizes reliance on existing knowledge and alternatives (March, 1991). Entrepreneurs do rely on expertise and past experience (Baron, 2006; Sarasvathy and Dew, 2005). For example, they rely on prior knowledge of a market, technology, industry or customers as a basis for detecting new opportunities (Ardichvili *et al.*, 2003; Baron and Ensley, 2006; Shane, 2000), leveraging what they know to "connect the dots" and identify if an opportunity is viable and distinctive (Santos *et al.*, 2015). Prior knowledge and skills enable entrepreneurs to recognize opportunities that others overlook (Baron and Ensley, 2006; Neill *et al.*, 2015; Ucbasaran *et al.*, 2009); hence, reliance on existing knowledge is an important element of opportunity perception (Corbett, 2007; Shane, 2000).

Exploring. While exploiting existing knowledge and skills is important, overreliance on the familiar may make identifying new opportunity difficult (Ucbasaran *et al.*, 2009). Entrepreneurs have to explore unknown domains, because opportunities often stem from new ideas, technologies, and markets (Dyer *et al.*, 2008). Politis (2005) suggests that entrepreneurs need to deviate from the "tried-and-true" in order to learn something new, and Sigrist (1999) notes that entrepreneurs spend time and effort engaging in learning that advances and deepens their capabilities. In short, entrepreneurs seek to acquire new capabilities and information and transform them into entrepreneurial opportunity (Corbett, 2007). In founding new ventures, the entrepreneur may be called upon to learn new knowledge and skills whether to discover or to create opportunity.

Experience. Prior research has examined either the effects of experience on firm performance or differences between novice and repeat entrepreneurs (Sarasvathy *et al.*, 2013; Westhead, Ucbasaran and Wright, 2005; Westhead, Ucbasaran, Wright and Binks, 2005; Zhang, 2011). Research examining the role of experience on opportunity perception for habitual and acquirer entrepreneurs has demonstrated that experienced entrepreneurs are more likely to perceive opportunity (Ucbasaran *et al.*, 2003). Subsequent research also found that experienced

entrepreneurs are more likely to discover and to create opportunity (Dew *et al.*, 2009; Politis, 2008); however, no difference between experienced and novice entrepreneurs was found with respect to the tendency to draw conclusions from limited information (Dew *et al.*, 2009).

Approach to opportunity perception and growth expectations

Growth expectation is the entrepreneur’s belief about the future development of a new venture. Prior research has demonstrated that high-growth-oriented entrepreneurs differ in experience, motivations, risk propensity, strategic growth intentions and perceived success factors from low-growth entrepreneurs (Gundry and Welsch, 2001; Miner and Raju, 2004; Morris *et al.*, 2006; Siegel *et al.*, 1993). Evidence also indicates that high-growth-oriented entrepreneurs exhibit high levels of practical, analytical and creative intelligence, which motivates entrepreneurial behavior (Baum and Bird, 2010); however, prior research has not considered that the approach to opportunity perception may influence the entrepreneur’s growth expectations. The mode applied to opportunity perception will influence where she believes her business will be relative to other firms in the industry after several years of operation (Figure 1).

Methods

Survey data collection

Data were gathered from 173 women who had previously sought one-time investment funding to start or sustain a new business from a group of investors focused on high-growth opportunities. The investment group actively sought to support women entrepreneurs in firms less than five years old with a credible plan and an innovative product or service that addressed a very sizable market in a scalable way. Firms of this age are classified as new ventures (Bantel, 1998; Zahra *et al.*, 2000) and are in an early stage of development that focuses on conceptualization and commercialization (Hanks *et al.*, 1993; Kazanjian, 1988). Private investor financing is of critical importance at this stage (Maxwell *et al.*, 2011). In addition to capital infusion, early stage investors provide support through expertise and resource connections (Dutta and Folta, 2016; Ehrlich *et al.*, 1994).

To be included in the study, respondents had to have met one or more of the following conditions: founding member, ownership share of at least 10 percent, senior (c-suite) manager, or board member. Given these requirements, eight respondents were removed from the study,

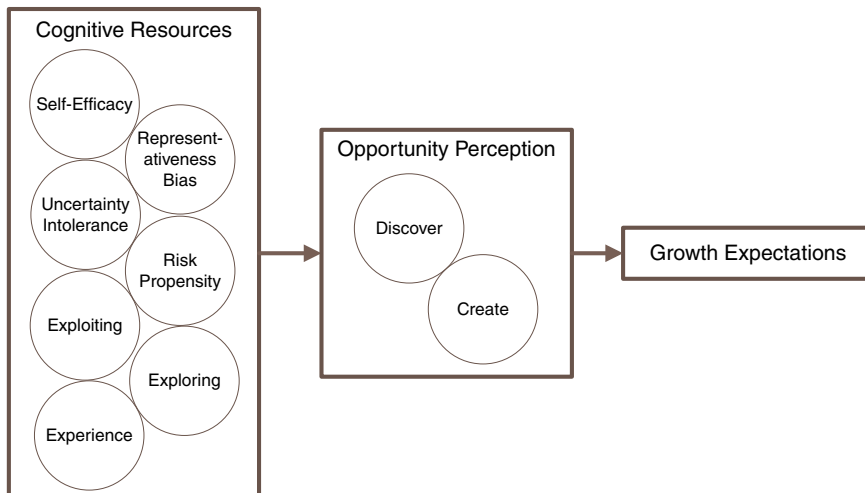


Figure 1.
Model of cognitive resources, opportunity perception and growth expectations

leaving 165 usable responses. The remaining respondents were firm founders (93 percent) with over ten years of work experience. On average, respondents had been highly involved in two new business ventures prior to the most recent. A majority of respondents (66 percent) were married; 52 percent had children; and 57 percent had attained a graduate or professional degree. Respondents also represented a broad mix of industries: software/internet (21 percent), healthcare/medical (15 percent), manufacturing (14 percent), biotechnology (10 percent), and the remaining 40 percent distributed across a range of other industries.

Identifying approaches to opportunity perception

To determine approaches to opportunity perception, the summed items of the discover and create scales were input into a cluster analysis. The clustering variables were standardized prior to analysis. A hierarchical procedure, using Ward's method, was employed to determine the number of groups based on the degree of similarity. Determining the number of clusters was based on the agglomeration coefficient, which allows the researcher to assess the distance between clusters at each successive step (Hair *et al.*, 2010). A large increase indicates the formation of a heterogeneous combination. K-means clustering was used to determine the final cluster membership, as this technique has proven robust in producing distinct, non-overlapping clusters (Milligan and Cooper, 1987).

Discriminating between approaches to opportunity perception

Multiple discriminant analysis was chosen as the goal was to identify groups (dependent variable) by explaining the bases for group membership using a set of metric independent variables; i.e., cognitive resources. The technique produces a set of discriminant functions based on the number of groups with each function representing a variate of independent variables that best discriminates one group from the others (Hair *et al.*, 2010). A step-wise approach was chosen to allow for the most parsimonious set of maximally discriminating variables with each variable entering the variate only if providing unique and significant discriminatory power beyond that already accounting for in the variate. For this study, each function identified the cognitive resources associated with one group while indicating the unique contribution that each resource offers to members within that group.

Results

Measurement results

The source and the content of the eight scales used are listed in Table I. All items were assessed using a seven-point agree/disagree scale. Unidimensionality was first assessed using exploratory factor and scale item analyses based on the following criteria: factor loadings of at least 0.50; item-to-total correlations of at least 0.35; average inter-item correlations of at least 0.15; and Cronbach's α of at least 0.70 (Netemeyer *et al.*, 2003). The measures were further subjected to confirmatory factor analysis with all eight constructs modeled as first-order factors in LISREL 8.8 using the covariance matrix as input. This approach allowed for an examination of both loadings and measurement error to identify candidates for removal. Based on this procedure, three self-efficacy items were removed.

Fit statistics and internal consistency coefficients were used to assess the reliability, model fit, and discriminant validity of the measures. The results indicated that the estimated measurement model adequately represented the observed input matrices, with a χ^2 of 1,094.45 with 751 degrees of freedom (df), a standardized root mean square residual of 0.08, and comparative fit index of 0.89. To determine that each measure was empirically distinct, discriminant validity was assessed and supported in all cases, as the square of the parameter estimate (ϕ) between each pair of constructs was less than the mean of the pair's average variance extracted estimates. Table II presents the internal consistency estimates and descriptive statistics for the study measures.

Measure	Scale items
Discover ^a	I discover opportunities that others do not see Opportunities are already formed and awaiting discovery by my alertness Opportunities result from market or industry changes that I notice To discover opportunities, I must systematically scan the environment I believe external shocks form opportunities Opportunities exist as objective phenomena just waiting for me to discover them
Create ^b	I create the future that I seek Opportunities emerge as the results of my actions Opportunities are the outcome of my efforts and actions I believe that opportunities are created, rather than discovered Opportunities are created by my actions and reactions I am an integral part of opportunity emergence as I invent what I believe to be viable
Self-efficacy ^c	I will be able to achieve most of the goals that I have set for myself When facing difficult tasks, I am certain that I will accomplish them In general, I think that I can obtain outcomes that are important to me I believe I can succeed at most any endeavor to which I set my mind I will be able to successfully overcome many challenges
Representativeness bias ^a	I can recognize opportunities by observing just a small number of cases I only need a few observations to have confidence in my decisions If a few potential buyers like an idea, it's a valid opportunity I do not require a lot of data to identify a marketable opportunity I am able to recognize opportunities from a few direct experiences
Uncertainty intolerance ^d	When it's time to act, uncertainty paralyzes me When I am uncertain, I cannot go forward When I am uncertain, I cannot function very well The smallest doubt can stop me from acting
Risk propensity ^e	I am willing to take a big risk in order to realize higher gains I like taking big risks I choose alternatives with less chance for success and higher rewards I choose a strategy that offers higher rewards but has a lower probability of success I believe that higher risks are worth taking for higher rewards I like to take chances, although I may fail To earn greater rewards, I am willing to take higher risks
Exploiting ^a	I would rather work with familiar routines Given a choice, I stick to what I know best I like to work with proven ideas I think it is best to work with what you know
Exploring ^a	My preference is to develop new knowledge and skills I like to develop original ideas I like to experiment with new approaches I believe it is important to develop new knowledge and skills

Notes: ^aNeill *et al.* (2015); ^bnew scale; ^cChen *et al.* (1998); ^dBerenbaum *et al.* (2008); ^eNeale and Bazerman (1991)

Table I.
Measurement
scale items

Classification results

Based on Ward's method results, the agglomeration coefficient indicated a rather large percentage increase going from three to two clusters signaling the formation of a heterogeneous combination. As such, the three-cluster solution was selected for subsequent analysis using the K-means approach. The standardized mean values for the two groups representing the discover and create approaches to opportunity perception are reported in Table III. The one-way analysis of variance results indicate that the cluster analysis succeeded in generating three distinct groups with an overall Wilk's λ statistic of 0.15 ($F = 144.52$; $df = 4, 362$; $p < 0.01$). These results are summarized in Table III.

Measure	Composite reliability	Average variance extracted	Mean	SD
Discover	0.72	0.30	6.55	0.48
Create	0.78	0.38	5.68	0.80
Self-efficacy	0.88	0.59	6.40	0.65
Representativeness bias	0.83	0.50	4.60	1.25
Uncertainty intolerance	0.89	0.67	1.60	1.00
Risk propensity	0.84	0.45	5.39	0.95
Exploiting	0.84	0.57	3.50	1.35
Exploring	0.78	0.47	6.60	0.60
<i>Experience</i>				
Work	–	–	15.45	8.70
Administrative	–	–	10.74	8.33

Note: All scales assessed using a seven-point agree/disagree scale, except for experience which is in years

Table II.
Internal consistency
and descriptive
statistics

Dependent variable	Wilk's λ	F-value	η^2	Significant contrasts ^a
Multivariate	0.15	144.52*	–	
Univariate				
Create	–	173.59*	0.66	1-2, 1-3, 2-3
Discover	–	134.05*	0.60	1-2, 1-3, 2-3
<i>Standardized means and SD</i>				
Cognitive approach	Cluster 1: discovery	Cluster 2: creation	Cluster 3: ambidextrous	
Create	–1.58 (0.63)	0.14 (0.68)	0.52 (0.53)	
Discover	–0.29 (0.90)	–1.13 (0.62)	0.67 (0.52)	
Percentage of sample	20	26	54	

Notes: ^a1 = discovery, 2 = creation, 3 = ambidextrous. * $p < 0.05$

Table III.
Multivariate and
univariate analysis
of variance results

The three clusters represent three different entrepreneurial approaches to opportunity perception. Cluster one represents 20 percent of the sample. The mean values indicate that this group relies more on discovery and has the lowest tendency to employ a creation approach. Cluster two (26 percent of sample) reports greater reliance on creation and exhibits the lowest degree of discovery; as such, this group is labeled creation. The third group (54 percent of sample) emphasizes both discover and create, exhibiting a more ambidextrous approach to opportunity perception.

Discriminating approaches to opportunity perception

A discriminant analysis was performed to determine the relationship between the cognitive resources and the three approaches to opportunity perception. Cluster membership was the dependent variable, and the seven cognitive resources were the independent variables. To identify a parsimonious set of discriminating variables, a step-wise estimation procedure was used to derive the discriminant functions (Hair *et al.*, 2010). This approach selects variables that maximize the discrimination between the most similar groups and continues for each variable that contributes additional significant discrimination. Table IV summarizes the multiple discriminant analysis results, which indicates a two-function solution based on five discriminating variables (i.e. self-efficacy, representativeness bias, exploit, explore and years of administrative experience). Table V provides standardized canonical coefficients, rotated structure matrix and mean values of the discriminating variables for each group.

To validate the discriminant results, hit ratios were calculated using the analysis and a holdout sample of 20 additional women entrepreneurs not used in the initial model estimation. The classification accuracy based on the percentage correctly classified of the analysis sample is 58.10 percent for the analysis sample and 72.70 percent for the holdout sample. Both hit ratios compare favorably to a proportional chance criterion of 39.55 percent – exceeding this threshold value by more than 25 percent. As an additional statistical test for discriminatory power, Press’s *Q* is calculated as 42.66, which exceeds the critical value of 6.63 at a significance level of 0.01. These results, along with the significant Wilk’s λ results, provide support for the relationship between the cognitive resources and the three approaches to opportunity perception.

Testing the effect of approaches to opportunity perception on growth expectations

To examine the relationship between the three approaches to opportunity perception and growth expectations, a multivariate analysis of variance was conducted. Results are presented in Table VI. The overall Wilk’s λ statistic was 0.85 ($F = 1.70$; $df_{16,320}$; $p < 0.05$). The univariate *F* tests and the corresponding significant contrasts indicate significant differences for growth expectations based on cognitive approach.

Overall, the results suggest that the ambidextrous approach had higher expectations on the following growth indications: partner network, geographic reach, market share, and employment growth. This ambidextrous approach also had higher growth expectations than the discovery approach for capital investment and revenue growth, and for the creation approach for innovative products. Further analysis provides some support that discovery-types are more likely motivated to seek a lifestyle business, while creation- and ambidextrous-types initially seek to grow to IPO size or be acquired ($\chi^2 = 8.50$; $df = 4$; $p < 0.10$). While less

Statistic	Function 1	Function 2
Eigenvalue	0.18	0.08
Percent of common variance	69.8	30.2
Canonical correlation	0.39	0.27
Wilk’s λ	0.79	0.93
χ^2 (df)	35.56 (10)*	11.07 (4)*

Note: * $p < 0.05$

Table IV.
Discriminant analysis results

Discriminating variable	Standardized canonical coefficients		Rotated structure matrix		Mean values by cognitive approach		
	Function 1	Function 2	Function 1	Function 2	Discovery	Creation	Ambidextrous
Self-efficacy	0.38	-0.99	0.56	-0.80	6.18	6.42	6.62
Representativeness bias	0.40	0.34	0.35	0.19	4.68	4.36	4.80
Uncertainty intolerance ^a	-	-	-0.17	0.18	1.71	1.44	1.64
Risk propensity ^a	-	-	0.13	0.03	5.21	5.18	5.60
Exploit	0.55	0.24	0.36	0.10	3.87	3.65	4.07
Explore	0.52	0.52	0.54	0.16	6.57	6.39	6.71
Work experience ^a	-	-	0.29	0.14	15.55	13.64	16.32
Administrative experience	0.47	0.20	0.35	0.20	10.95	8.77	11.77

Note: ^aVariable not used in the analysis

Table V.
Canonical coefficients, structure matrix and mean values

Dependent variable	Wilk's λ	F-value	η^2	Significant contrasts ^a
Multivariate	0.85	1.70*	–	
Univariate				
Capital investment	–	2.52**	0.03	1-3
Partner network	–	4.42*	0.05	1-3, 2-3
Geographic reach	–	5.85*	0.07	1-3, 2-3
Market share	–	5.32*	0.06	1-3, 2-3
Revenue growth	–	2.11*	0.03	1-3
Employment growth	–	1.91**	0.02	1-2, 1-3
Intellectual property	–	0.88	0.01	–
Innovative products	–	2.13*	0.03	2-3
<i>Means and SD</i>				
Growth expectation indicator	Cluster 1: discovery	Cluster 2: creation	Cluster 3: ambidextrous	
Capital investment	4.17	4.66	5.00	
Partner network	5.03	5.14	5.61	
Geographic reach	4.67	4.72	5.40	
Market share	4.86	4.87	5.52	
Revenue growth	5.34	5.43	5.75	
Employment growth	4.61	5.26	5.20	
Intellectual property	5.37	5.04	5.21	
Innovative products	5.89	5.47	5.78	

Table VI.
Multivariate and univariate analysis of variance results

Notes: Each indicator assessed on a seven-point scale comparing growth expectations after the first several years of operation with other firms in the industry. ^a1 = discovery, 2 = creation, 3 = ambidextrous. * $p < 0.05$; ** $p < 0.10$

than ten percent of the sample of entrepreneurs in high-growth new ventures were pursuing a lifestyle business, half of these were discovery-types though this group represents only 20 percent of respondents.

Discussion

In addressing the first research question on the tendency for entrepreneurs in high-growth new ventures to engage in one, the other, or both approaches to opportunity perception, the results suggest that about a fifth of respondents rely more on a discovery approach believing that opportunity exists as an independent phenomenon. Another quarter of respondents tend to rely more on a creation approach where opportunity forms based on the actions and interactions of the entrepreneur. The findings also reveal that a majority of entrepreneurs in high-growth new ventures engage in both the discovery and creation of opportunity. This ambidextrous group sees opportunity as emerging from both external sources as well as by their own doing. Thus, for these entrepreneurs, opportunity may form exogenously through market conditions detected by the entrepreneur, endogenously through actions of the entrepreneur, or both exogenously and endogenously through a process of recognition and development. This insight responds to the call for empirical support to add to the theoretical understanding of the opportunity construct (Dimov, 2011; Welter and Alvarez, 2015).

By revealing cognitive resources that distinguish the path to opportunity perception, the results address the second research question and offer important implications on the role of entrepreneurial cognition in empirically determining opportunity types. Entrepreneurs who rely on discovery and ambidextrous approaches to opportunity perception depend on a number of cognitive resources. The entrepreneurs who perceive an opportunity as exogenous are distinguished by having more prior managerial experience, exploring the unknown while exploiting the known, and drawing conclusions on the basis of a small

number of observations. These entrepreneurs can rely on their experience, use what they know, learn what they need to know and take the leap based on limited external cues – to discover an idea that others overlooked and do something about it. Opportunity creation could be described as an almost naïve approach. The entrepreneurs who perceive opportunity as forming by their own interactions are distinguished by their lower levels of experience, reliance on known parameters, acquisition of new knowledge and skills, or weak signals; however, individuals comprising this group do exhibit greater belief in their own capabilities to succeed. In combining discovery with creation, the entrepreneurs comprising the ambidextrous group are the most likely to leverage experience, learning, and cognitive leaps. They are also highly confident in their capacity to succeed.

In examining how cognitive resources distinguish between each approach to opportunity perception, both interesting and unexpected findings emerge in relation to the extant literature. First, entrepreneurs comprising the opportunity creation group score lower on the exploit and explore scales than entrepreneurs comprising the discover cluster. These results are surprising and contrary to what might be expected. Opportunity creation would seem to require venturing into an unknown space and to be predicated on experimentation and the development of new knowledge and skills (Dyer *et al.*, 2009), as well as on the ability to use the means at one's disposal (Sarasvathy and Dew, 2005). For the entrepreneurs in the opportunity creation group, the enactment of opportunity creation appears to be based on sheer will, rather than on learning and a preference for developing new knowledge and skills.

Second, entrepreneurs in the creation group score lower on representativeness bias than the entrepreneurs in the discovery group. Opportunity creation is about connecting the dots and associational thinking, whereas opportunity discovery is predicated on a search for and an analysis of all possible information. Consequently, one might expect entrepreneurs in the discover cluster to seek and to analyze information more aggressively, and to rely less on a heuristic, such as representativeness bias. The results suggest otherwise.

Third, the create cluster contains entrepreneurs who reported less managerial or administrative experience than the entrepreneurs in the discover cluster. Dyer *et al.* (2008) highlight the extent and breadth of experience required for opportunity creation. Additionally, Dew *et al.* (2009) found that experts identified more new markets than novices; therefore, one might expect entrepreneurs in the creation group to have more experience than entrepreneurs in the discovery group.

Fourth, reported scores on self-efficacy across all three clusters of entrepreneurs are consistent with what one might expect – discoverers report the lowest, ambidextrous entrepreneurs report the highest, and creators report self-efficacy scores between the two other groups. Opportunity creation is predicated on imagined possibilities, experimentation and learning from failures, and using one's skills and capabilities to bring an imagined future into being (Sarasvathy and Dew, 2005). The confidence to act on imagined possibilities requires high levels of self-efficacy, which is evident in the creation and ambidextrous groups.

Finally, entrepreneurs comprising the ambidextrous group report higher scores across all cognitive factors. Alvarez *et al.* (2013) note that ambidextrous entrepreneurs must be comfortable with decision-making that relies on data collection and analysis, as well as decision-making that relies on iteration, induction and intuition. The findings identify a cluster of entrepreneurs who rely on prior information and experience, as well as venturing into unknown space where new knowledge and skills develop and associations are unformed. These individuals pursue and resolve competing discover and create approaches to opportunity perception. Based on experience, learning, and a confidence in one's ability to succeed, the ambidextrous entrepreneur benefits from the inherent contradictions and tensions that exist between discover and create. Ambidextrous entrepreneurs engage in contradictory but mutually enabling approaches: one that is systematic and purposeful

(discovery) and the other that enables them to create what they believe to be viable based on experimentation, learning and leveraging the resources at their disposal.

In addressing the third research question on how the entrepreneur's approach to opportunity perception influences new venture growth expectations, the results indicate that the ambidextrous group held the highest growth expectations. While the ambidextrous and discovery groups share common cognitive resources, these two groups were particularly different in terms of growth expectations with some evidence that the discover group had more moderate, lifestyle growth expectations. By contrast, the creation group differed from the ambidextrous group on multiple cognitive resources but shared similar capital investment and revenue growth expectations. Though the creation group was distinct in the cognitive underpinnings and perception of opportunity, this group's growth expectations were no different than the discovery group except for higher expectations of employment growth. While prior research has identified differences between the growth ambitions of entrepreneurs (Gundry and Welsch, 2001; Miner and Raju, 2004; Morris *et al.*, 2006; Siegel *et al.*, 1993), this study is the first to examine differences in entrepreneurs in high-growth new ventures and to link these differences to how to opportunity is perceived.

Conclusions

The findings offer insight on the cognitive origins of opportunity perception. The study validates distinct paths to opportunity perception and that entrepreneurs rely on different levels of cognitive resources in the path taken, which result in different growth expectations. Whether opportunity exists independent of the individual or as an artifact of the entrepreneur remains a debatable premise (Ramoglou and Zygliopoulos, 2015). The current study focuses on what the entrepreneur perceives to be true as to the origin of opportunity and demonstrates that a set of cognitive resources – explore, exploit, self-efficacy, representativeness bias – distinguish how opportunity is perceived. Moreover, the study provides some insight into the role that experience performs in opportunity perception-with managerial experience performing a distinguishing role. Understanding the differences in how opportunity is perceived is important to the field of entrepreneurship and, by uncovering a set of cognitive resources that distinguish entrepreneurial perception, this study adds to the literature on entrepreneurial cognition.

The findings also have important implications to practice by bringing attention to the cognitive resources that influence the approach to opportunity perception. This knowledge can help to identify individuals with high-growth potential based on how opportunity is perceived. For aspiring and current entrepreneurs, the results of this study suggest that opportunity perception is based on the nature of the entrepreneur, i.e., her belief in her own abilities, her experience and expertise, and how she learns and draws conclusions. For practical purposes, the instruments could be used by investors to assess attributes of entrepreneurs that influence growth expectations. The women in this study demonstrated a link between the ability to discover and create opportunity and the vision to found high-growth business, thus providing positive role models and dismantling gender stereotypes associated with high-growth entrepreneurship.

For the first-time entrepreneur particularly, an awareness of cognitive styles may improve the chances of success by indicating not only the entrepreneur's strengths, but also potential vulnerable points. While this does not mean the entrepreneur needs to move away consciously from her dominant style, it may indicate that she should look for co-founders or key early employees who provide a balance and, in a sense, create an ambidextrous team. For example, York and Danes (2014), in a review of risk-reducing techniques for startups, suggest that founders conduct all customer development processes in pairs in order to reduce errors from representativeness bias.

Policy makers, investors, and entrepreneurial educators can also benefit from an awareness of the impacts of cognitive resources on opportunity perception. With the rapid growth in private-sector, government, and university startup accelerators and incubators, interventions that support the creation of successful ventures and mitigate risk for investors and program sponsors are essential. Most programs supporting the creation of new ventures currently favor approaches that focus on customer development practices and highly iterative hypothesis testing, which might suit the create entrepreneur more closely. Through experimentation and learning, the create entrepreneur comes to “know” and is able to leverage available resources to create opportunity. On the other hand, the systematic and purposeful research, which is characteristic of the discover approach to opportunity perception, is also useful. Clearly new ventures need both, as entrepreneurs navigate an uncertain environment. Given the higher growth expectations of ambidextrous entrepreneurs, encouraging a dynamic ambidextrous approach to opportunity perception in these early stages of venture development may lead to better returns on the program sponsor’s investment of both time and money.

This research also has implications for entrepreneurship educators, who can teach their students to engage in the contradictory, yet mutually enabling methods that the create and discover approaches to opportunity perception represent. Students can be taught to build skill sets that are characteristic of the create approach to opportunity perception (experiment, learn, leverage the resources at their disposal), as well as skill sets that are characteristic of the discover approach to opportunity perception (systematic, purposeful research and analysis).

Limitations and opportunities for future research

Several issues arise from this study with implications for further research. Grégoire *et al.* (2011) note the lack of clarity with respect to whether cognitive differences in entrepreneurs predate their entrepreneurial efforts and actions or whether the experience of entrepreneurship actually shapes cognitive differences. The current study – with its focus on experienced female entrepreneurs at a particular point in time – does not shed light on this research question. Distinguishing between factors that predate entrepreneurial action and factors that result from entrepreneurial action is a fruitful area for future research.

Focusing on context rather than cognitive resources, Zahra (2008) suggests that opportunity discovery is more apt to occur when technologies are emerging, the industry knowledge base is young, and the firm is specialized or focused on a particular emerging technology with a coherent strategic focus. Zahra (2008) further suggests that opportunity creation is more likely to occur when the firm is diversified technologically and seeking to deepen or broaden its skills and capabilities. In contrast, Sanz-Velasco (2006) finds that opportunity discovery occurs in situations of low risk and opportunity creation occurs in more uncertain situations. The current study does not examine the impact of context on opportunity perception; wherein, situational cues might trigger one form or both. The addition of context provides an avenue for future inquiry.

The current study examines a unique sample of women entrepreneurs in high-growth new ventures with over ten years of work experience and involvement in founding multiple businesses. A study of less experienced or “low growth” entrepreneurs may yield differences with regard to the role that cognitive resources play in opportunity discovery and opportunity creation, as might a study of male entrepreneurs. Likewise, a study examining managerial perceptions on corporate entrepreneurship (cf. Neill and York, 2012) might produce different implications. Hence, exploring the role that cognitive factors perform in opportunity perception in different populations may yield interesting comparisons.

This study is not without limitations, which should be acknowledged for their implications. Seeking parsimonious explanations of complex cognitive phenomenon

introduces limitations and warrants caution in interpreting the results. Although the cognitive resources examined here are not exhaustive, the current study provides a starting point for future research. The effects tested are based on a cross-sectional survey design of a unique sample of high-growth-oriented entrepreneurs. A more diverse sample would serve to increase generalizability, while a case-based approach might isolate time-dependent and contextual effects. For example, future research might examine whether industry-level environmental dynamism is an important boundary condition to these results (e.g. Baron and Tang, 2011).

In summary, entrepreneurs vary in their cognitive approaches to opportunity perception, with some relying more on opportunity discovery, others on opportunity creation, and yet others who engage in both opportunity discovery and opportunity creation. The current study highlights the extent to which the cognitive resources of self-efficacy, decision biases, prior knowledge, learning, and experience influence opportunity discovery and opportunity creation in a sample of high-growth-oriented women entrepreneurs. Understanding the effects that these cognitive factors have on opportunity perception adds to the literature and provides direction for future research as well as professional development and educational strategies for current and aspiring entrepreneurs. While more research is needed, this study contributes to understanding the cognitive origins of opportunity.

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