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A R T I C L E S

RULE-BASED REASONING FOR UNDERSTANDING OPPORTUNITY EVALUATION

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Much research on opportunity in entrepreneurship and related fields centers on the origin of opportunities and the actions individuals take to exploit opportunities. However, our understanding of how individuals evaluate opportunities remains fragmented, with research spanning fields of study and using different terminology for similar concepts. Building on recent research suggesting that rule-based reasoning underpins how individuals evaluate opportunities, we integrate and synthesize the literature on opportunity evaluation and suggest rule-based reasoning as an overarching theoretical framework to understand opportunity evaluation across fields of study. Specifically, we illuminate how environmental factors, opportunity-related cues, and individual differences coalesce as one uses these factors as judgment rules to discern the personal attractiveness of an opportunity. Further, we explain how managers and entrepreneurs individuate opportunities, demonstrating why different individuals apply different rules and thus view similar opportunities differently. We conclude with implications of rule-based reasoning for opportunity evaluation across a broad set of management disciplines and offer directions for future research.

Although the concept of opportunity is central to the field of entrepreneurship (Short, Ketchen, Shook, & Ireland, 2010), the study of opportunity spans a significant spectrum of management research. In strategic management, scholars have explored interpreting external issues as opportunities versus threats and the link between opportunity and strategic actions (Dutton & Jackson, 1987; Jackson & Dutton, 1988) as well as the notion of strategic opportunity (Denrell, Fang, & Winter, 2003). In international business, cross-border opportunity seeking is a common theme (Mahnke, Venzin, & Zahra, 2007; Oviatt & McDougall, 1994, 2005). Within the context of technology and innovation management, new product development and innovation opportunities are often thought of as real options to be considered over time (Adner & Kapoor, 2010; Bowman & Hurry, 1993; Kogut & Kulatilaka, 2001), and research informs us that some technological environments are more conducive to opportunity than others (Zahra, 1996, 2008).

Intriguingly, across these different areas of research the notion of how individuals, teams, or organizations *evaluate* the worthiness of opportunities, once identified, discovered, or created, remains fragmented, inconsistently treated, and sometimes omitted altogether. For example, strategic issue interpretation research shows that managers readily identify issues as opportunities, but scholars could not link such interpretations to concrete strategic action, despite the potential of the opportunities

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(Chattopadhyay, Glick, & Huber, 2001; Thomas, Clark, & Gioia, 1993). This line of research leaves open the question of whether the opportunity, once interpreted as such, is worthy of pursuing. Similarly, work in internationalization suggests that many cross-border opportunities become known to organizations but go unrealized despite their seemingly high potential (Ellis, 2011; Liesch & Knight, 1999). Finally, a major stream of research in real options theory debates how to overcome the failure of missing technological opportunities or reconsidering miscalculations in prior opportunity evaluations (Brockner, 1992; Staw, 1981; Ziedonis, 2007).

The broad range of research outlined thus far suggests that opportunity evaluation, defined as assessing the attractiveness (for me or my firm) of introducing new goods, services, or business models to one or more markets (Haynie, Shepherd, & McMullen, 2009), is an important part of what managers and entrepreneurs do. However, it appears that opportunity evaluation has not received the attention it deserves given its importance in domains such as strategy formulation, internationalization, and technological innovation.

Even in the entrepreneurship literature, where opportunity represents a cornerstone of research efforts (Short et al., 2010), opportunity evaluation research lags behind other areas of opportunity-focused research such as opportunity exploitation (Davidsson, 2004) and the ways in which opportunities come into existence (Alvarez & Barney, 2007; Shane & Venkataraman, 2000). However, publication trends suggest a growing interest in the role of opportunity evaluation as a critical bridge between opportunities and the actions individuals or firms take to exploit them (e.g., Haynie et al., 2009; McMullen & Shepherd, 2006; Wood & McKelvie, 2015; Wood & Williams, 2014). These developments suggest that an increased understanding of how individuals and firms evaluate opportunities provides paths forward across a range of disciplines in management.

In that spirit, we integrate and synthesize research on opportunity evaluation, using the lens of *rule-based reasoning*—one type of cognitive structure individuals use to process information from the environment and give it form and meaning (Hastie, 2001; Walsh, 1995)—as a means of organizing extant research on opportunity evaluation. We draw heavily on the entrepreneurship literature due to the prominence of the study of opportunity in this field before cycling back to discuss what these conceptualizations and empirical findings imply for the future relevance of opportunity evaluation across the broader set of management disciplines.

FROM OPPORTUNITY ORIGINATION TO OPPORTUNITY EVALUATION

To address the process of opportunity evaluation, we begin with a brief primer on the origin of opportunities.[1] Early thinking conceptualized opportunities as objective phenomena available for discovery by enterprising individuals (Gaglio & Katz, 2001; Kirzner, 1979; Shane, 2003). More recent formulations have advanced the idea that opportunities are subjective phenomena (Foss, Klein, Kor, & Mahoney, 2008) that may be created (Alvarez & Barney, 2007), enacted (Wood & McKinley, 2010), or imagined (Klein, 2008).

Important differences exist between the objective discovery and subjective creation approaches.[2] Discovery theorists typically assert that opportunities are out there to be found and exploited. Therefore, entrepreneurship unfolds as enterprising individuals move through three distinct phases: (1) recognizing, (2) evaluating, and (3) exploiting opportunity (Ardichvili, Cardozo, & Ray, 2003; Shane & Venkataraman, 2000). By contrast, the subjective creation approach argues that opportunities are idiosyncratic to the individual because they emerge from entrepreneurs' visions of possible future states and actions trying to turn these visions into reality (Alvarez & Barney, 2007; Sarasvathy, 2001). This iterative and socially complex process leads to exploiting or abandoning the opportunity depending on the degree to which uncertainty can be reduced.

Despite important differences, these perspectives share significant commonality (Dimov, 2011). In both approaches, individuals objectify opportunities such that an opportunity is seen as an entity outside the mind (Wood & McKinley, 2010). When an opportunity is *recognized*, objectification happens early in

[1] The opportunity construct is elusive (Dimov, 2011), leading some scholars to suggest that the field move to different constructs such as venture idea (Samuelsson & Davidsson, 2009) or make the action the unit of analysis (Foss & Klein, 2012). Due to the overarching use of the term opportunity in extant literature, we maintain its use here so that we are consistent with the literatures we synthesize.

[2] A deep discussion of the ontological and epistemological differences between the creation and discovery perspectives is beyond the scope of our topic. For those interested, we point to a spirited debate in the *Academy of Management Review* (January 2013, Volume 38, Issue 1). Our focus here is on areas of commonality between the perspectives as they pertain to the topic of opportunity evaluation.

the process as alert entrepreneurs identify circumstances that represent opportunity (De Carolis & Saparito, 2006). When an entrepreneur creates an opportunity, objectification happens later as consensus builds around the viability of subjectively represented ideas, and they take on the quality of an external reality (Baker & Nelson, 2005).

Once objectification occurs, the entrepreneur's thinking shifts from cognitions about what the opportunity entails to considerations of whether or not it is desirable and feasible for me (or my firm) to pursue the opportunity. In the discovery context, this happens by assimilating and filtering information in attempts to predict the future (Kirzner, 1979; Shane, 2003), whereas in the subjective creation context, entrepreneurs focus on the elements of the environment they can control (Alvarez & Barney, 2007; Sarasvathy, 2008).

Once individuals objectify opportunities, they *evaluate* these opportunities for personal attractiveness as they decide whether or not to invest time and money in them. Shane and Venkataraman (2000) explicitly identified evaluation as a phase in the entrepreneurial discovery process, but the evaluation of opportunities is also critical in the creation approach, as Foss and Klein (2012, p. 79) asserted that "entrepreneurial judgments" are key drivers of action and involve "evaluating opportunities and deciding on which resources need to be assembled to realize an opportunity." Taken together, these lines of thinking point to the centrality of opportunity evaluation in both objective and subjective approaches, and we focus our efforts on synthesizing what researchers have learned about the phenomena of opportunity evaluation.

THEORETICAL UNDERPINNINGS OF OPPORTUNITY EVALUATION

Opportunity evaluation is a process of ambiguity reduction whereby an individual increasingly defines the subjective elements of circumstances and events (e.g., opportunity) such that they are seen (or not) as a desirable and feasible future reality (Dimov, 2010; Shepherd, McMullen, & Jennings, 2007).[3] Desirability and feasibility assessments can take a third-person form (is this an opportunity for someone?) or a first-person form (is this an opportunity for me?) (McMullen & Shepherd, 2006). Researchers tend to focus on opportunity evaluation as a first-person phenomena (e.g., Mitchell & Shepherd, 2010; Wood & Williams, 2014), as first-person evaluations are most tightly linked to entrepreneurial action (McMullen & Shepherd, 2006). Accordingly, we adopt Haynie et al.'s (2009) view that evaluating whether to pursue an opportunity is "not focused on whether the opportunity is 'attractive to someone'—but instead focused on whether the opportunity is 'attractive to me' in the context of existing knowledge, skills, and abilities" (p. 338). Thus, opportunity evaluations are future-focused judgments (or a series of judgments) where obscure events, outcomes, and consequences are inferred (Hastie, 2001) such that one may discern the attractiveness of the currently considered opportunity.

Entrepreneurs interpret opportunities as future-focused judgments by translating data into understanding by applying knowledge-based opportunity templates to decide on a course of action (Barreto, 2012). Klein (2008) further asserted that interpretative judgments about the possibility of taking entrepreneurial action are the essence of opportunities (i.e., judgments *are* opportunities). Specifically, when considering circumstances objectified as opportunity, individuals will reach different conclusions, "even if they share the same objectives and the data are presented to them in exactly the same manner, because they have access to different information, interpret the data in different ways, and so on (Lachmann, 1977; Casson & Wadeson, 2007)" (Foss & Klein, 2012, pp. 78–79). This suggests that opportunity evaluation is an interpretive process that results in entrepreneurs evaluating similar circumstances differently.

While there may be many explanations for why and how this happens, a promising line of research suggests that entrepreneurs reach different conclusions about similar circumstances because they develop different mental templates or images of opportunity (Baron, 2006; Dutton & Jackson, 1987; Fiske & Taylor, 1991; Krueger, 2000). Individuals use experience, education, and personal dispositions to develop images of ideal opportunity as well as comparison images stimulated by the circumstances under consideration (Baron & Ensley, 2006; Mitchell & Shepherd, 2010). In that way, entrepreneurs compare cognitive images of ideal and actual opportunity circumstances, and these comparisons act as perceptual screens to discern the

[3] Assessments of desirability and feasibility are akin to the construction of preferences in behavioral decision theory (e.g., Slovic, 1995) and are frequently used in the consumer choice literature (e.g., Bettman et al., 1998). Thus, the rules we discuss below are analogous to attributes that may be weighed against each other in the construction of preferences. Parallel with our arguments, construction of these preferences remains highly contingent on context.

personal attractiveness of an opportunity. Cognitive science research suggests a number of ways that individuals construct and compare mental images (cf. Hastie, 2001). However, individuals gravitate toward specific mental representations informed by experience and knowledge (Hastie & Pennington, 2000), and thus rule-based reasoning (Smith & DeCoster, 1998) is a key mechanism by which entrepreneurs form mental representations of opportunities (Wood, Williams, & Grégoire, 2012). Hence, rule-based reasoning serves as a useful framework for understanding how entrepreneurs evaluate the attractiveness of opportunities.

THE RULE-BASED APPROACH TO OPPORTUNITY EVALUATION

Complex decisions in uncertain and ambiguous situations, such as opportunity evaluation, necessitate a systematic way to think about and frame the decision (Dimov, 2010; Smith & Sloman, 1994). Cognitive science research finds that rule-based reasoning is a mechanism that allows individuals to organize information and frame decision problems by deliberately engaging in mental simulations of cause and effect relationships (e.g., reasoning rules). These simulations are derived from one's knowledge base (e.g., lessons from education, day-to-day experiences, and past interactions with others) and are used to conduct formal analyses and make probabilistic projections about the future (Sloman, 1996; Smith & DeCoster, 1998; Sun, 1995). Hence, we define rule-based reasoning within the context of opportunity evaluation as individuals' effortful engagement in cause–effect cognitive computations to form first-person beliefs about the degree to which introducing a new product or service to the market is desirable and feasible. They do so by cognitively comparing the degree to which images of current circumstances or events fit with images of ideal opportunity that they develop over time.

One implication of the rule-based reasoning approach is that opportunities are not "evenly appealing" (Dimov, 2010, p. 1124) because individuals develop different mental pictures of what circumstances mean for them in terms of future action. For example, many entrepreneurs espouse that an attractive entrepreneurial opportunity involves a product or service that clearly "takes away pain" or "solves an urgent problem" (Krippendorff, 2011). Thus, entrepreneurs following this reasoning logic would consciously consider the extent to which their image of a potential opportunity (i.e., current events and circumstances) compares with the pain/problem image characteristic of their ideal opportunity. The idea is that entrepreneurs derive their opportunity evaluation judgments, in part, by reasoning that when an opportunity clearly solves an urgent problem or takes away [a consumer's] pain, it matches their image of an ideal opportunity, and thus is considered more desirable and feasible for them personally. This line of thinking parallels extant entrepreneurship research asserting that focused analytic reasoning underpins the evaluation of market opportunities (Kickul, Gundry, Barbosa, & Whitcanack, 2009).

Origin, Evolution, and Application of Rules

Rule-based reasoning centers on the notion that individuals interpret the meaning of new information using symbolically represented and intentionally accessed knowledge in the form of normative rules (Sloman, 1996; Smith & DeCoster, 2000). The origins, evolution, and application of rules of reasoning have been addressed by a range of scholars in fields such as psychology, economics, and artificial intelligence. The general consensus is that rules are derived from learned and lived experience and range from formal axioms (like those of logic) to informal considerations (e.g., thinking of people as unique instead of stereotypes) (Chaiken & Trope, 1999).

Rules are frequently conceptualized as analytical knowledge structures used to make logical inferences and take the form of "if s_1, then if a_1, then c_1, where s represents a setting condition, a represents an antecedent, and c is a consequent" (Frye, Zelazo, & Palfai, 1995, p. 486). Making the connections between settings, antecedents, and consequences requires one to apply lessons learned from single or repeat experiences where the knowledge gained is integrated into the memory system and then recalled later to analytically guide processing of information relevant to the original experience. Rules do not have to come from direct experience but can be socially learned from "other individuals, the media, or other cultural sources" (Smith & DeCoster, 2000, p.112), and this includes collaboration with experts in the domain (Golding & Rosenbloom, 1996). Because they are inferences made from past experience, or learning from the experiences of others and applied to the circumstances at hand, rules are subjective, contextual, and interpretive.

With these insights in mind, we define opportunity evaluation rules as knowledge-driven cognitive

representations of likely cause–effect relationship outcomes that, when activated, serve as perceptual filters that individuals use to discern the personal attractiveness of pursuing an opportunity. In a weak form, an evaluation rule is a bundle of *inferences* about anticipated future occurrences derived from knowledge that is structurally similar to current circumstances but not directly related to the specific event or situation at hand (Abelson, 1981). In a strong form, an evaluation rule involves *expectancies* about the hierarchical order, direction, and magnitude of future outcomes calculated from expert domain knowledge that is directly related to opportunity circumstances (Larrick, Nisbett, & Morgan, 1993).[4]

A concrete example of this can be found in Autio and colleagues' (2013) recent study of opportunity evaluation in an online community. Specifically, they quote an entrepreneur as saying, "I evaluated the options [i.e., opportunity] to achieve financial return from doing something like selling this product. But I found it wasn't worth it; it was just too time consuming" (p. 1363). This entrepreneur evoked a decision rule that a potential opportunity must meet a specific financial return threshold, one that the opportunity he considered did not meet, specifically because it would take too much of his time. This suggests that the entrepreneur has developed an evaluation rule around financial return in the sense that he has a cognitive image of the minimum financial return needed to make it worth it for him to pursue the opportunity given the time required. Clearly this entrepreneur's minimum return threshold may differ from those of others, but the financial return rule is likely evoked by entrepreneurs broadly as they engage in rule-based reasoning to make probabilistic projections about the future.

Implicit in our discussion thus far is that rules can encompass a great many possible cause–effect relationships. However, rule application is stimulated by specific situational cues, and thus only a few rules would typically matter for a given opportunity (Abelson, 1981; Johnson-Laird, 1983; Sloman, 1998). This suggests that while a person may contain a breadth of knowledge that could be used to develop rules (i.e., imagine many cause-and-effect relationships), it is only those rules that are the most salient given current circumstances that will be applied. In that way, it is perceptions of circumstances and events that limit the set of possible imagined configurations that serve as rules in making probabilistic projections about the opportunity (Sloman, 1996; Sun, 1995).

The implication is that as entrepreneurs discern whether or not their business idea is viable, they attend to readily available sources of opportunity-related information (Fiet, 2007), and this information stimulates rule application. Therefore, entrepreneurs using rule-based reasoning will react in predictable ways to informational cues that map onto the judgment rules they have formed (McMullen & DeCastro, 2000; Wood & Williams, 2014). In that spirit, our review of the literature suggests that a synthesis of rule-based cues rests on two broad categories: (1) cues associated with the environmental context surrounding the opportunity, and (2) cues associated with the structural aspects of the opportunity. However, in each case (i.e., cues related to the environment and/or the opportunity), individual differences influence the utility and relevance of each cue. Table 1 provides exemplars from each of these categories, and Figure 1 highlights the synthesis of these different categories using rule-based reasoning.

RULE CUES AND OPPORTUNITY EVALUATION

Environmental Cues

Perceptions of the external environment are powerful determinants of individual cognition and action. Sociologists (Giddens, 1984), psychologists (Gibson, 1960), and organization theorists (Aldrich, 1990) have all concluded that one's interactions with the external environment (e.g., people, social structures, and organizations) and knowledge of others' interactions (e.g., experiences, events, and trends) stimulate and constrain perceptions of what one might be able to achieve within the immediate environment. Rule-based reasoning integrates these perspectives by asserting that past experiences coalesce into decision rules that guide future judgments. As individuals interact with their environment, they form mental images of the environment (Van Overwalle, 2009), which they then

[4] Rules are not heuristics used in the automatic associative reasoning system (see limitations section). Heuristics are automatically evoked irrespective of context (Kahneman, Slovic, & Tversky, 1982). Conversely, rules are applied effortfully based on contextual relevance (Sloman, 1996). Thus, heuristic-driven judgments result in predictable outcomes irrespective of context, whereas rule-based judgments vary across contexts (Masicampo & Baumeister, 2008).

TABLE 1
Recent Examples of Rule-Based Opportunity Evaluation Cues and Expectancies[5]

Environmental decision cue	**Opportunity evaluation expectancy generated**	**Example**
Window of opportunity	Evaluators prefer opportunities with longer time horizons in which to act (wide window).	Choi & Shepherd (2004)
Number of opportunities	Multiple alternative opportunities result in more positive evaluations.	Mitchell & Shepherd (2010)
Industry rates	Increases in the number of firms exiting the industry lead to more negative evaluations.	Wood et al. (2014)
Technological change	Greater rates of technological change lead to reduced opportunity evaluations.	McKelvie et al. (2011)
Opportunity decision cue	**Opportunity evaluation expectancy generated**	**Example**
Magnitude	The greater the magnitude or potential value, the more attractive the opportunity.	Dutton et al. (1989)
Novelty	Greater opportunity novelty leads to more positive evaluations.	Wood & Williams (2014)
Rarity	Greater information rarity leads to more attractive opportunities.	Haynie et al. (2009)
Perception of opportunity risk	The larger the perceived magnitude of loss (i.e., risk), the less attractive the opportunity.	Mullins & Forlani (2005)
Individual difference	**Opportunity evaluation expectancy generated**	**Example**
Affect or emotions	Greater positive (and some negative) emotions lead to more positive opportunity evaluations.	Welpe et al. (2012)
Illusion of control	Greater illusions of control lead to more positive opportunity evaluations.	Keh et al. (2002)
Fear of failure	High fear of failure leads to more negative opportunity evaluations.	Mitchell & Shepherd (2010)
Prior (related) knowledge	The greater the opportunity-related knowledge, the more attractive the opportunity.	Haynie et al. (2009)

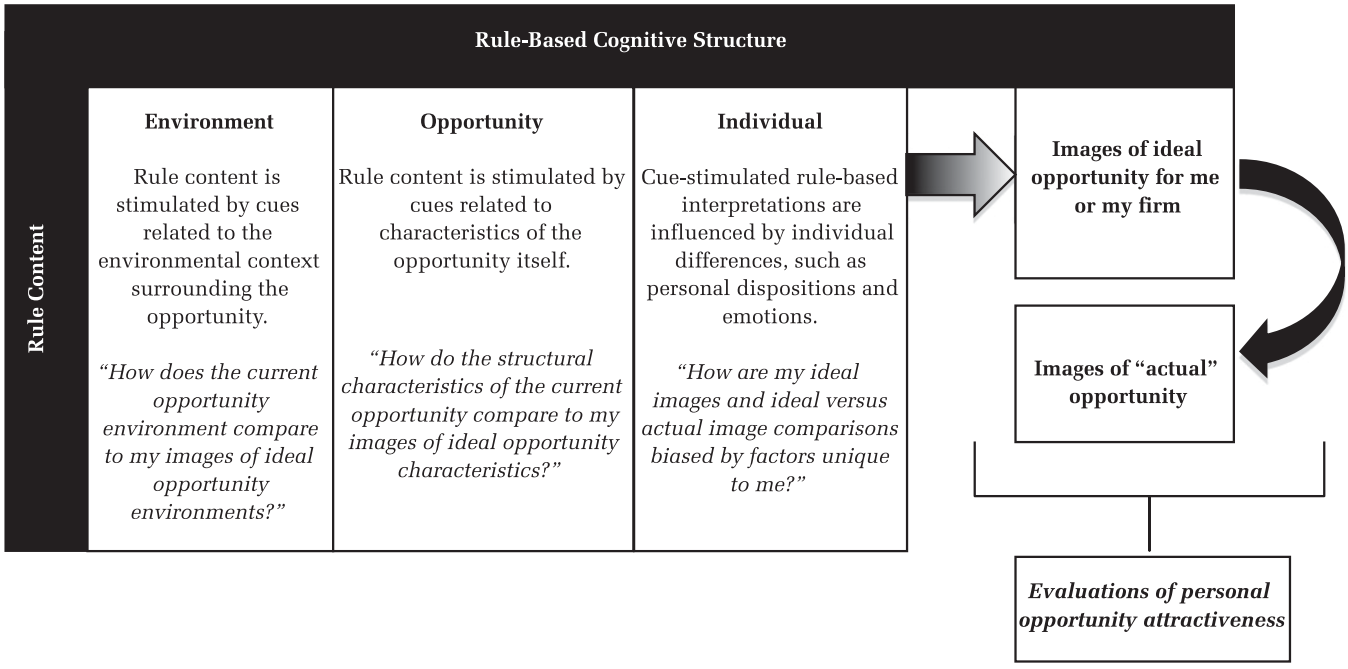
compare with knowledge-driven ideal images (e.g., rules) to discern a path of action (Smith & DeCoster, 2000). The cognitive comparisons made between the actual and ideal images embody rule application (see Figure 1). As such, scanning the environment (Russell & Ward, 1982) is considered an initiating step in rule-based reasoning as individuals attend to information cues and engage in top-down coherence processes (Thagard, 2000) to make inferences about the meaning of those cues. Specifically, individuals use commonalities and differences between their images of the actual and ideal environments to make probabilistic predictions about what can be achieved given current circumstances.

The idea of scanning the environment to identify cues about opportunities spans decades of research in strategic management. Early attempts to understand drivers of firm performance, for example, often focused on the external environment (e.g., Porter, 1980) and the fit between the firm's strategy and opportunities within its environment (Penrose, 1959). Building on this idea, the ubiquitous SWOT (strengths, weaknesses, opportunities, threats) analysis (Andrews, 1971, 1980) suggests that managers evaluate which external factors represent opportunities or threats to the organization. This broader external analysis conceptualization is also evident at the intersection of organization ecology and entrepreneurship (cf. Aldrich & Wiedenmayer, 1993).

Organization ecologists study the conditions under which organizations emerge, grow, decline, and die by focusing on trends within specific industries or niches. On the macro level, many studies demonstrate that indicators such as prior founding rates, dissolution rates, and density levels relate to subsequent foundings of new ventures (Baum & Oliver, 1996; Budros, 1994; Carroll & Hannan, 1989; Hannan & Freeman, 1987, 1988; Lomi, 1995). This has led some to speculate that hot industries (i.e., those with high founding rates) entice entrepreneurs to enter the market (Hannan & Carroll, 1992), while dying industries (i.e., those with a large number of exits) "signal an environment noxious to entrepreneurs" (Singh & Lumsden, 1990, p. 164). Thus, if growth is part of an entrepreneur's ideal

[5] Table 1 is not intended to be all inclusive. Rather, it illustrates recent advances in opportunity evaluation research.

FIGURE 1
Rule-Based Reasoning Framework for Opportunity Evaluation



industry image (i.e., a hot industry), comparing the actual industry situation to the ideal image primes the application of a rule that high founding rates must be present for the opportunity environment to be deemed attractive.

Indeed, recent empirical work tests the assertion that environmental-level data influence individuals' thinking about opportunities. McKelvie, Haynie, and Gustavsson (2011) found that the rate and predictability of technological change hurt entrepreneurs' opportunity evaluations. Similarly, Wood, McKelvie, and Haynie (2014) demonstrated that entrepreneurs evaluate opportunities as unfavorable in the face of high dissolution rates and high density levels, but evaluate opportunities as favorable when founding rates are high. Further, the level of opportunity munificence influences individuals' evaluations. Mitchell and Shepherd (2010) studied how executives of technology firms evaluate hypothetical opportunities and demonstrated that when executives perceive more opportunities, in general, they rate all opportunities more favorably.

Together, these findings suggest that environmental cues trigger the application of specific rules (e.g., a high rate of change indicates a weaker opportunity environment) that individuals use to make judgments about opportunities. These results are consistent with cognitive science research showing that individuals use intentionally accessed knowledge in the form of normative rules of reasoning (Smith & DeCoster, 2000), and parallels research on decision making that establishes that choice contexts matter and that rule content differs across different action–choice contexts (Fischhoff, 1991; Payne, Bettman, & Johnson, 1993; Slovic, 1995).[6]

Opportunity Cues

Building on the notion that scanning the external environment allows one to identify salient issues, strategic issue interpretation research links issue identification (opportunities versus threats) to action outcomes (Chattopadhyay et al., 2001; Dutton & Jackson, 1987). More specifically, this work empirically demonstrates that "cognitive rules" underpin opportunities (Jackson & Dutton, 1988, p. 383), and rules indicate situations for which "benefits will come by acting" or an individual "can gain personal advantage." Together, this literature applies specific labels to opportunities, such as "positive-gain" or

[6] We thank an anonymous reviewer for highlighting this linkage.

"controllable" (Thomas et al., 1993, p. 254), which increases the odds of action. Thus, the implied rule involves specific labels for sensed issues that result in more or less favorable evaluations (e.g., opportunities versus threats). This suggests that individuals develop rules around the characteristics of the opportunities themselves.

Along this line, entrepreneurship scholars confirm that entrepreneurs may draw on knowledge-driven rules related to a range of opportunity attributes. Not surprisingly, opportunity potential positively influences individuals' evaluations such that a higher potential opportunity is evaluated more favorably. Prior work conceptualizes this in terms of value (the ability of the opportunity to increase efficiency and/or effectiveness) (Haynie et al., 2009), return on assets invested (Bishop & Nixon, 2006), and economic viability (Perrini, Vurro, & Costanzo, 2010).

Beyond opportunity potential, Wood and Williams (2014) found that two specific opportunity characteristics (novelty and resource efficiency) positively charge entrepreneurs' evaluations of opportunities. Specifically, they show that, all else being equal, entrepreneurs prefer opportunities that are more novel and/or make the best use of available resources. Consistent with the resource-based view (Barney, 1991), Haynie and colleagues (2009) found that entrepreneurs rated opportunities as less attractive when they were imitable and/or unable to limit competition.

Perhaps the most widely studied opportunity characteristics relate to risk and uncertainty. In internationalization research, Kiss, Williams, and Houghton (2013) found that managers who perceive internationalization opportunities as less risky than objective indicators (what they call risk bias) find these opportunities to be more favorable (and ultimately exploit them in greater numbers). Research in entrepreneurship parallels this concern, despite prior conceptualizations of entrepreneurs as risk seeking (e.g., Stewart & Roth, 2001). Some opportunities are riskier than others (Bryant, 2007), and perceptions of the riskiness of a specific opportunity diminish entrepreneurs' evaluations of the opportunity such that when the worst-case scenario (Wood & Williams, 2014) or magnitude of loss (Mullins & Forlani, 2005) about a particular opportunity is high, entrepreneurs evaluate these opportunities unfavorably.

In addition to risk, models of opportunity evaluation and entrepreneurial action (cf. McMullen & Shepherd, 2006) highlight the key role of uncertainty in preventing or delaying entrepreneurial action, as entrepreneurs attempt to see through the fog of uncertainty to discern whether an opportunity makes sense for them rather than someone (or anyone) else. Consistent with this, McKelvie et al. (2011) drew from Milliken's (1987) constructs of state, effect, and response uncertainty to demonstrate that each form of uncertainty negatively influences opportunity evaluations of new product development decision makers in the Swedish software industry.

In sum, prior research highlights that different opportunity characteristics map onto normative judgment rules entrepreneurs have formed such that the presence, magnitude, and direction of these characteristics have positive and negative effects on opportunity evaluation. Although past research did not universally draw from rule-based reasoning to develop predictions, their findings parallel the idea that entrepreneurs think in terms of rule logic such as "if opportunity characteristic x is present, then the personal attractiveness of this opportunity is y" that underpins rule-based reasoning (Frye et al., 1995, p. 486; Smith & Sloman, 1994). This suggests that individuals evaluating opportunities use opportunity characteristics to develop images of actual opportunity and compare those to images of ideal opportunity (see Figure 1). These cognitive comparisons embody the application of opportunity characteristic rules and drive judgments regarding what does—and does not—represent an attractive opportunity.

OPPORTUNITY EVALUATION AS AN INDIVIDUATION PROCESS

Images of ideal and realized opportunities occur within the minds of individuals. As such, each individual brings idiosyncratic cognitive resources to bear as he or she defines subjective elements of circumstances and events (e.g., opportunity) and thus develops and evokes different rules depending on personal characteristics such as levels of expertise, motivations, and goals. Building on the work of Fiske and Pavelchack (1986), this phenomenon has been described by Wood et al. (2014) as individuating—a process by which entrepreneurs make opportunities personal by linking environmental and opportunity cues with their own preferences, knowledge, emotions, and so on. This suggests that evaluation rules are person-centric, as individuals interpret what each cue-rule relationship means for them and for their businesses given their idiosyncratic characteristics. The implication is that individual differences influence assessments of opportunity. Hence, we use the rule-based reasoning lens to synthesize research on the effects of stable dispositions such as risk

propensity and fear of failure as well as fluid differences such as knowledge, experience, and emotion on individuals' evaluations of opportunities. We focus on these differences because each has received significant attention in the literature, suggesting that these factors play an influential role as individuals develop and apply the knowledge structures that underpin rule-based reasoning in opportunity evaluation.

Stable Personal Dispositions

Risk propensity has long been considered an important part of an entrepreneur's makeup. Traditionally, research characterizes entrepreneurs as risk seekers (Stewart & Roth, 2001, 2004), but entrepreneurs vary significantly in their propensity and tolerance for risk (Forlani & Mullins, 2000; Miner & Raju, 2004). This is important because just as variations in opportunity-specific risk influence evaluations of opportunity attractiveness, so do stable risk propensities. Keh and colleagues (2002) found that variations in entrepreneurs' risk perception influence opportunity evaluations. Similarly, Mullins and Forlani (2005) showed that entrepreneurs would rather miss than sink the boat and make relatively risk-averse choices with respect to opportunities. This line of research suggests that entrepreneurs appear to quantify risk in terms of affordable loss (Dew, Sarasvathy, Read, & Wiltbank, 2009), thereby applying a rule that environmental and opportunity-related cues must signal a level of risk that meets the affordable-loss threshold for one to see the opportunity as personally attractive.

Related to the idea of affordable loss is fear of failure. Atkinson (1957, p. 360) portrayed fear of failure as the "propensity to experience shame upon failure," thus defining failure as an unacceptable event. A growing number of studies document the moderating influence that fear of failure has on opportunity and environmental cues in the evaluation process. Mitchell and Shepherd (2010), for example, found that fear of failure strengthened the relationship between potential value and likelihood of investment in an opportunity, but it also weakened the relationship between number of opportunities available and likelihood of investment.

More germane to rule-based reasoning, some have conceptualized fear of failure as a pre-failure bias that interferes with the trial-and-error learning that entrepreneurs use to build expertise, and this may lead to misattributions during the evaluation process (Mitchell, Mitchell, & Smith, 2008). The implication is that those with a high fear of failure will be extremely conservative in their evaluations of opportunities, presumably by developing ideal images that require very low chances of failure. The resulting hesitancy to consider certain opportunities as viable constrains the learning process required to develop tried and true evaluation rules for effective predictions of antecedent–consequence relationships that drive rule-based opportunity evaluations.

The extant literature has also considered other personal dispositions that appear to influence the development and application of opportunity evaluation rules. Lee and Venkataraman (2006) highlighted the role of an individual's aspiration level in the likelihood that an opportunity will be pursued. Likewise, Baron, Hmieleski, and Henry (2012) proposed that, at very high levels, positive dispositional affect (the stable tendency to experience positive moods and emotions) interferes with specific aspects of cognition, resulting in poor performance in opportunity evaluation. Finally, Gupta and colleagues (2014) found that gender differences influence opportunity evaluation such that men evaluate opportunities more favorably than women. However, this effect is contingent on gender stereotypes affiliated with the opportunity. Taken together, the above research suggests that a range of stable individual dispositions influence knowledge-driven cognitive representations of anticipated cause–effect outcomes and thereby augment or mitigate individuals' development and application of rules for opportunity evaluation.

Fluid Individual Differences

Research also documents that fluid individual differences influence how one individuates opportunity. Principal among these is knowledge, which, as previously argued, is the essential element in the rule-based reasoning framework (Smith & DeCoster, 2000). The rules evoked for opportunity evaluation discussed thus far are stable but not static; instead, they evolve through learning and the accumulation of knowledge. Thus, the knowledge an individual has on hand when evaluating an opportunity plays a prominent role in determining which normative rules of reasoning he employs.

Extant research draws attention to the key role of matching specific knowledge to a specific opportunity. Thus, when an opportunity is related to one's current knowledge, entrepreneurs are better able to develop expectancies rather than inferences, and thus entrepreneurs with highly related knowledge

evaluate the opportunity more positively (Haynie et al., 2009). Similarly, when the entrepreneur's prior knowledge matches the situation at hand and her learning style matches the opportunity characteristics, she rates the opportunity more favorably (Dimov, 2007). Linking back to models of entrepreneurial action, knowledge seeking reduces demand uncertainty, thus increasing opportunity evaluations and increasing the likelihood of entrepreneurial action (Autio, Dahlander, & Frederiksen, 2013). Not surprisingly, these findings parallel those on strategic issue interpretation, demonstrating that experts (i.e., more knowledgeable individuals) more easily, quickly, and effectively make sense of such information (Day & Lord, 1992). Thus, knowledge context matters such that individuals apply specific rules under conditions of knowledge fit (Chaiken & Trope, 1999).

Individuals' stocks of knowledge also play a major role in attenuating or intensifying the application of rules based on cues from the opportunity or the environment. For example, McKelvie and colleagues (2011) found that more domain-specific expertise (i.e., industry and situation-specific) weakened the negative impact of effect uncertainty on opportunity evaluations. Similarly, Wood and Williams (2014) demonstrated that both market knowledge and technical knowledge accentuated the positive effects of resource efficiency and novelty; however, interestingly, both types of knowledge also strengthened the (negative) effects of considering the worst-case scenario for a particular opportunity. For their part, Haynie and colleagues (2009) found that when an entrepreneur's existing knowledge, skill, and ability are high, relative to a specific opportunity, this intensifies the effects of rules regarding value yet diminishes the effects of rules regarding rarity and limits on competition.

In addition, significant research centers on the role of affect and emotion in the entrepreneurial process (Baron & Tang, 2011; Baron et al., 2012; Cardon, Foo, Shepherd, & Wiklund, 2012), notably that affect and emotion alter the way in which entrepreneurs evaluate opportunities. Grichnik, Smeja, and Welpe (2010), for instance, showed that positive emotions positively influence opportunity evaluations, whereas negative emotions have no influence. Relatedly, Foo (2011) found that inducing anger and happiness lowers the risk perceived in pursuing an opportunity. For their part, Welpe and colleagues (2012) demonstrated that joy and, surprisingly, anger positively influence evaluation, and fear reduces opportunity attractiveness.

In sum, the research above illustrates the substantial effort devoted to understanding how idiosyncratic dispositions, knowledge, and emotion integrate with situational variables to affect how entrepreneurs assess the attractiveness of an opportunity. As a result, a number of fascinating insights have emerged, and there appears to be convergence around the idea that individual differences moderate the influence of rules that flow from environmental and opportunity cues. Ultimately, these findings compare favorably to psychology research highlighting the contextual and contingent nature of rule-based reasoning (Chaiken & Trope, 1999).

IMPLICATIONS FOR MANAGEMENT SCHOLARSHIP

Scholars have long focused on the origin of opportunities (e.g., how do entrepreneurs come up with new ideas?) and opportunity exploitation (e.g., what steps do entrepreneurs take to bring ideas to the marketplace?). However, opportunity evaluation bridges these parts of the entrepreneurial process. Whether it is an executive pursuing opportunities for corporate growth or a student thinking about starting his or her first business, an opportunity must be evaluated before action can (or should) take place. Rule-based reasoning is a useful lens for articulating how individuals evaluate opportunities and documenting the judgment criteria used. This improved understanding, derived primarily from entrepreneurship research, has important implications for the future applicability of opportunity evaluation across the broader set of management disciplines. Below, we outline a few paths forward for researchers in management-related disciplines.

Implications for Strategic Management Research

The rule-based reasoning perspective provided above informs research in strategic management by bringing to the fore the strategic interpretation literature that has lost momentum over the years. Past research successfully linked antecedents of strategic issue interpretation, such as managers' decision processes (Kuvaas, 2002; Thomas et al., 1993) or cultural differences (Barr & Glynn, 2004), to the characteristics of an issue (such as the potential for gain or loss) and the labeling of the issue as a threat or an opportunity. Further, such interpretations have been linked to action, yet this stream of research found consistent effects for actions to respond to

threats but not to opportunities (Chattopadhyay et al., 2001; Thomas et al., 1993). As noted by Barreto (2012, p. 362), the authors themselves recognize the potential problem: "Perhaps our lack of results with regard to opportunities is related to our inability to discriminate between opportunities of varying magnitude (Chattopadhyay et al., 2001, p. 951)."

Thus, prior work on strategic issues neglected to account for the difference between third-person opportunities (is this an opportunity for someone?) and first-person opportunities (is this an opportunity for me or my firm?) (McMullen & Shepherd, 2006). Moreover, prior work failed to account not just for the attractiveness of the opportunity (cf. Julian & Ofori-Dankwa, 2008) but also for the various rules—at the individual and firm levels—that increase or decrease the opportunity attractiveness. Extant strategic management research suggests a host of factors that could influence the attractiveness of an issue interpreted as an opportunity. For example, the rich literature on diversification highlights the importance of the relatedness of an opportunity to the firm's existing capabilities (Markides & Williamson, 1994). Further, a key strategic opportunity characteristic is when prices for a resource fail to reflect its best use (Denrell et al., 2003). Each of these suggests a rule that managers could evoke when considering potential opportunities.

At the intersection of strategic management and entrepreneurship, research examines how resource flow affects opportunity pursuit, specifically the prominent role of angel investors and venture capitalists (VCs) in providing the resources required to bring an opportunity idea to market (Bruton, Filatotchev, Chahine, & Wright, 2010). However, the resources investors provide also extend to access to knowledge, experience, and social capital (Florin, Lubatkin, & Schulze, 2003; Petkova, Wadhwa, Yao, & Jain, 2014). This suggests that investors hold unique knowledge and experience, and therefore the opportunity images they develop may be different from those of entrepreneurs and managers (see Figure 1). If these opportunity images rest on rule-based reasoning, the implication is that some degree of congruence likely must be achieved between the rules strategic leaders and investors use to discern the attractiveness of the opportunity under consideration. Murnieks, Haynie, Wiltbank, and Harting (2011) provided evidence of this as they found that VCs evaluate opportunities more favorably when the entrepreneurs pursing the opportunity have a decision-making process similar to their own. Thus, rule-based reasoning may serve as an integrative framework for exploring how firm leaders, for example, and investors develop shared images of an opportunity, which leads to resource investment or not.

Implications for Management-Related Fields

Technology and innovation management. Technology and innovation management research may benefit by using the rule-based reasoning framework to investigate firm-level decisions to imitate existing technology or offer unproven radical innovations (e.g., Semadeni & Anderson, 2010). A major challenge of innovation is the balance between the needs to be new and to remain credible in market offerings (Abrahamson, 1991; Deephouse, 1999). As such, managers must carefully consider opportunities to introduce innovative offerings by discerning the optimal level of innovativeness. This decision process parallels the evaluation process documented above, and thus managers may use rule-based reasoning as one way to make imitate-versus-innovate decisions. In that vein, environmental cues (e.g., competitor offerings; Greve, 1998) and opportunity cues (e.g., teachability or complexity; Zander & Kogut, 1995) likely prime specific rules as managers discern the attractiveness of pursuing an innovation.

Interestingly, technology and innovation management research often uses real options theory to explain how managers deal with these uncertain decisions (Amram & Kulatilaka, 1999). Integrating the above research findings with extant work on real options theory in managerial decision making offers fruitful avenues for future research. Past research finds that managers fail to abandon poorly performing options, thus falling into option traps, often because there remains uncertainty regarding whether the option may still one day have value (Adner & Levinthal, 2004). Thus, the challenge is to reduce uncertainty by employing contextually derived rules for option attractiveness to determine when an option should be continued versus abandoned. For example, a rule to abandon may be based on cash flows of the option in comparison with the other potential opportunities (cf. Dixit & Pindyck, 1994).

International business. Another area of management research that may find value in rule-based reasoning is international business research, specifically the rich research on international market selection. Early research in this area focused on psychic distance between a firm's home country

and the potential foreign market (Johanson & Wiedersheim-Paul, 1975), but more recent work centers on the match between the firm's resources and capabilities and those of the foreign market (He & Wei, 2011) as well as on a need for a more opportunity-oriented approach to internationalization (Dimitratos, Voudouris, Plakoyiannaki, & Nakos, 2012). Extant research often takes an ex post approach to studying internationalization decisions, analyzing firm and market characteristics after such decisions are made. Thus, it is important for research to address what factors managers actually consider when making key internationalization decisions (see Devinney, Midgley, & Venaik, 2003, and Williams & Grégoire, 2015).

In one of the few studies to examine managers' in situ decision making, Buckley, Devinney, and Louviere (2007) found that in the choice of foreign direct investment location, "managers appear to follow fairly rational rules" but that such decisions appear "less aligned to traditional models" (p. 1069) and thus "less easy to reconcile with existing theory" (p. 1086). These authors call for more research that elucidates managers' decision criteria along a variety of choice contexts. We echo this call and suggest that rule-based reasoning provides a useful theoretical lens to examine the rules used by managers when expanding internationally, especially when evaluating internationalization opportunities.

Organization theory. Finally, rule-based reasoning may be insightful for organization theory research, specifically research on organizational routines—patterns for accomplishing work through generative systems that provide stability (Feldman & Pentland, 2003). Past work explored how routines are formed and evolve and how they enable and constrain value creation. Some scholars have argued that an essential component of routines is trial-and-error learning (Rerup & Feldman, 2011). This parallels the concept of rule formation, as rules rest on knowledge and learning from one's past experience (Golding & Rosenbloom, 1996). This suggests that rules, at the level of the individual decision maker, may be analogous to routines at the level of the organization.[7] By connecting rule-based reasoning and organization routines, researchers may be able to model the similarities between how individuals systematically evaluate opportunities and how the process is routinized within organizations.

[7] We thank an anonymous reviewer for highlighting this linkage.

LIMITATIONS AND FUTURE RESEARCH

While rule-based reasoning is a useful lens for understanding opportunity evaluation research, it has limitations. Rule-based reasoning is clearly one way entrepreneurs and managers can think about opportunity attractiveness, but alternatives exist. Evans (2008) and Kahneman (2011), for example, argued that the mind uses two cognitive systems, and rule-based reasoning is a product of the slower, deliberative, analytical system (i.e., system 2) while associative reasoning (e.g., intuitive judgments) is produced by the faster, automatic, involuntary system (i.e., system 1). This suggests that creative and intuitive system 1 processes could be used to evaluate opportunities, and indeed Bryant (2007, p. 742) found evidence of an intuitive "trusting gut" approach used by some Australian entrepreneurs. In many cases, however, these intuitions took the form of a first screen to immediately eliminate poor opportunities. Interestingly, while entrepreneurs in Bryant's (2007) study used gut instinct to reject opportunities, they then engaged in more careful and effortful evaluation of the remaining opportunities. This suggests that while associative processes like intuition can be used to quickly evaluate opportunities, it appears that they serve as a broad filter and that those opportunities that survive are then evaluated at a deeper level using more deliberate and analytical processes such as rule-based reasoning.

In line with this notion, Kickul et al. (2009) found important differences in the ability of individuals to evaluate opportunities using intuitive versus analytical cognitive styles. If we consider that the adequacy of inferences made from rule-based reasoning are contingent on the relatedness of the knowledge (e.g., rule-based reasoning breaks down as one moves to areas of unrelated knowledge; Golding & Rosenbloom, 1996), it becomes clear that associative reasoning may be useful for evaluating opportunities in unrelated contexts—contingent, of course, on the expertise of the entrepreneur (Kahneman & Klein, 2009). Based on our synthesis of the literature, a rule-based approach appears most consistent with prior research; however, exploring the role of alternate reasoning models presents a much-needed area for future research to provide a more nuanced understanding of the applicability of analytical versus associative reasoning (or other relevant cognitive processes and structures) in opportunity evaluation.

Our synthesis of the opportunity evaluation literature also points to limitations of extant research. First, there is a growing body of research suggesting

that entrepreneurs may also use internal cues as stimuli for opportunity evaluation. In these instances, entrepreneurs pay less attention to creating images of actual opportunity (i.e., the way things are) in favor of focusing on creating images of the way things could be. Sarasvathy's (2008) effectuation logic and Wood and McKinley's (2010) enactment concept are examples of this type of approach. These concepts highlight that entrepreneurs develop rules about the viability of creating an imagined future rather than matching existing characteristics to an image of ideal opportunity. Accordingly, the judgment rules entrepreneurs employ when using effectual or enactment logic might be different from those outlined in Table 1 because they would be about the subjective components of opportunity, such as the degree to which one can build consensus around the imagined future (Wood & McKinley, 2010) or which resources (i.e., means) currently exist (Sarasvathy, 2001). Thus, the consideration of internal stimuli that impel entrepreneurs on their journey would lead to a more comprehensive theory of opportunity evaluation.

Second, research to date has focused predominantly on identifying the criteria (rules) entrepreneurs use as they decide which opportunities are attractive for themselves or their firms. Despite the advances made by such research, which we examine in this manuscript, scant research has paid attention to the normative implications of such rule following. Future research ought to consider the implications of whether the application of different rules by different entrepreneurs leads some entrepreneurs to perform better—or worse—than others.

Finally, much of the research discussed above is cross-sectional in nature, studying individuals' evaluations of opportunities at a single point in time. Although such studies have led to great progress in understanding how such evaluations are made, they also neglect the concept of evaluation as a process that occurs over time. The logic behind rule-based reasoning suggests that an individual's evaluations of opportunities will change as the individual's knowledge grows as well as when the opportunity circumstances change (i.e., is developed) (Dimov, 2007). Recently, Holmes and colleagues (2013) presented a behavioral model of entrepreneurs' judgments over time where such judgments took place over four stages: ideation, feasibility, desirability, and action. Such a model explicitly accounts for how such evaluations may evolve over time as the entrepreneur moves from idea to new venture.

CONCLUSION

A critical mass of knowledge on opportunity evaluation exists. However, because findings are fragmented across a range of literatures and use different terminology, the scope of our knowledge to date is unnecessarily obscured. Using a rule-based reasoning framework, we have synthesized these studies into a theoretically consistent ensemble. Doing so paints a clearer picture of the knowledge we have accumulated to date and provides insight to inform scholarship not just in entrepreneurship but in management and related disciplines. Together, this research raises interesting future research questions regarding how opportunity evaluations unfold in the minds of individuals and how these evaluations facilitate or constrain opportunity pursuit.

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