STRATEGIC ENTREPRENEURSHIP JOURNAL

Strategic Entrepreneurship Journal
Strat. Entrepreneurship J., **6:** 355–381 (2012)
Published online in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/sej.1145

CAPABILITY DEVELOPMENT AND DECISION INCONGRUENCE IN STRATEGIC OPPORTUNITY PURSUIT

J. ROBERT MITCHELL[1]* and DEAN A. SHEPHERD[2]
[1]*Richard Ivey School of Business, University of Western Ontario, London, Ontario, Canada*
[2]*Kelley School of Business, Indiana University, Bloomington, Indiana, U.S.A.*

In strategic opportunity pursuit, decision incongruence (the gap between the decision-making rationale that an individual conveys to others and the rationale that informs his/her actual decisions) can lead to difficulties achieving the commitment necessary to grow a venture. To understand why some individuals have greater decision incongruence in strategic opportunity pursuit than others, we conducted a field experiment to test how a configuration of theoretically-based capability-building mechanisms—codification, general human capital, and specific human capital—affected 127 CEOs' decision incongruence. The results indicate that codification decreases decision incongruence the most for CEOs with low general but high specific human capital. Copyright © 2012 Strategic Management Society.

'*Being in control, I don't have to report to other partners or shareholders and I don't have to explain to many people about why I make a decision. I guess I will be willing to give up some of my control when I need further financing in my business.*' – Female, age 39

'*The business has changed so much, now that we have over 100 employees. I've always run it from the hip, and I just can't do that anymore. I have to do a crosscheck [of my decisions].*' – Male, age 61

INTRODUCTION

These quotations exemplify a tension that exists in entrepreneurship: as a business grows, the entrepreneur faces a need to rely more on other stakeholders and a need to increase the involvement of these stakeholders in decision making (cf. Kor, 2003). As the quotations also illustrate, one important element of such involvement is the articulation of knowledge about why the individual's decision makes sense. However, as Nisbett and Wilson (1977: 247) famously suggested, just as we can 'know more than we can tell' (as a result of our tacit knowledge), so too can we 'tell more than we can know' (as a result of difficulties accessing cognitive processes). The underlying premise of their research is that individuals are typically unable to engage in true introspection about their cognitive processes and that any assertions they make about these processes may not actually reflect the reality of these processes.

While Nisbett and Wilson's (1977) findings have a general appeal and applicability, they are not free from criticism (Ericsson and Simon, 1980; Sabini and Silver, 1981; White, 1980; White, 1988; Wright and Rip, 1981). In one notable critique, Smith and Miller (1978: 361) recognized the potential strength of the findings, but nonetheless emphasized the importance of understanding 'when (not whether)

Keywords: opportunity; capabilities; codification; knowledge resources; conjoint; experiment
*Correspondence to: J. Robert Mitchell, Richard Ivey School of Business, University of Western Ontario, 1151 Richmond Street North, London, ON N6A 3K7, Canada. E-mail: rmitchell@ivey.uwo.ca

people are able to report accurately on their mental processes.' It is to this issue that we speak in the current article. That is, while the question of when (not whether) individuals can access mental processes is clearly germane in general, we see entrepreneurship specifically as a domain wherein the boundary conditions of such access are highly salient, especially given the need for entrepreneurs to 'justify their ventures to relevant others to gain much-needed support and legitimacy' (Cornelissen and Clarke, 2010: 539).

Relating this back to the quotations with which we began, in an effort to understand 'how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited' (Shane and Venkataraman, 2000: 218), we seek to understand the conditions that would enable individuals to better articulate knowledge of their decision making about opportunities. Prior research on capabilities highlights how the ability to accurately articulate simple rules about opportunities results in better performance for firms (Bingham and Eisenhardt, 2011; Bingham, Eisenhardt, and Furr, 2007). Our expectation is that improved performance can result, for instance, as a result of individuals being able to convey this essential information to important others, thereby gaining their support in the strategic[1] pursuit of these opportunities. In decision making about new opportunities for a firm to pursue (whether the firm be new or existing), where the broader environment is uncertain, novel and often hurried (Baron, 1998; Bourgeois and Eisenhardt, 1988; McGrath and Nerkar, 2004), the importance of conveying the meaning underlying decision making such that it can be understood by others is often essential (cf. Cornelissen and Clarke, 2010; Hill and Levenhagen, 1995; McMullen and Shepherd, 2006). This is especially true when the entrepreneurial team is important to the pursuit of an entrepreneurial opportunity (cf. Cooper and Daily, 1997; West, 2007).

Of course, we recognize that knowledge of such meaning can be manufactured and, indeed, in many cases is (the underlying premise of the work of Nisbett and Wilson [1977]). Then again, in certain cases it is also not manufactured (Ericsson and Simon, 1980; Smith and Miller, 1978; Wilson and Kraft, 1990). We seek to better understand under what conditions this may be the case. In doing so, we suggest that for the individual who must convey the plausibility of the opportunity idea to others in order to gain their support (cf. Bonner and Baumann, 2012; Jelinek and Litterer, 1995; Weick, Sutcliffe, and Obstfeld, 2005), being able to convey the knowledge about decision making—i.e., the logic underlying the simple rules about opportunities (Bingham and Eisenhardt, 2011; Bingham *et al*., 2007)—is superior to conveying knowledge that is not accurate. This is true whether or not the decision turns out to be the 'correct' decision. Indeed, stakeholders are better positioned to gauge the correctness of a decision when the information that is conveyed to them about that decision is more accurate (Hirokawa, Erbert, and Hurst, 1996).[2]

Thus, while we recognize that certain individuals may have an easier time convincing others to support them in their pursuit of opportunity (as a result of charisma, expertise, trustworthiness, social skills, signaling, etc. [cf. Alvarez and Barney, 2005; Baron and Markman, 2003; Spence, 1973]), a low degree of decision incongruence—defined as the gap between the decision-making rationale that an individual conveys to others and the rationale that informs his/her actual decisions—will likewise be beneficial because it reflects a reduction of error (and, as a result, a more accurate and clearer depiction of risks [cf. Argyris and Schön, 1974; Hackner and Hisrich, 2001]). And although our use of a quasi-field experiment to test our hypotheses with individual CEOs precludes our ability to explicitly measure the performance benefits of a low degree of decision incongruence on group- or firm-level outcomes, previous research highlights how decreasing decision incongruence can enable key stakeholders to better gauge the correctness of a decision about an opportunity (Shepherd, 1999; Zacharakis and Meyer, 1998). This can, in turn, increase needed buy-in from these key stakeholders (cf. Brush, Greene, and Hart, 2001; Kor, 2003; Miller and Ireland, 2005) and can, as a result, facilitate coordination and higher-quality group decision making (cf. Bonner and Baumann, 2012; Hirokawa *et al*., 1996; van Dijk, de Kwaadsteniet, and De Cremer, 2009) and, importantly, improved performance (Bingham and Eisenhardt, 2011; Bingham *et al*., 2007).

[1] We view opportunity pursuit as strategic in the sense that it requires the commitment of important resources, it sets important precedents, and it directs important firm-level actions (Mintzberg, Raisinghani, and Théorêt, 1976).

[2] We nevertheless acknowledge that when an individual can pursue an opportunity without the need to convince others to join him or her (e.g., external parties to supply financial resources, potential joint venture partners, etc.), being able to convey knowledge about the actual logic underlying decision making may be less relevant.

DOI: 10.1002/sej

To understand the specific conditions whereby some individuals are able to decrease decision incongruence in opportunity decision making (Smith and Miller, 1978), we draw upon capabilities research in our theorizing (Zander and Kogut, 1995; Zollo and Winter, 2002). Our rationale for doing so is founded upon the importance of key learning mechanisms that assist in the development of capabilities: experience accumulation and knowledge codification, which can enable certain tacit knowledge that is 'bound up in action' to be shared (Poole, Seibold, and McPhee, 1996; Zollo and Winter, 2002). Of course, we acknowledge that the tacitness of knowledge is a matter of degree (Winter, 1987). Some tacit knowledge that is not articulated is nonetheless articulable (Winter, 1987). As Winter (1987: 172) described, 'the failure to articulate what is articulable may be a more severe handicap for the transfer of knowledge than tacitness itself.' It is this knowledge that is articulable but not yet articulated that we address herein. In doing so, we hypothesize that that the extent of decision incongruence about opportunities will depend on the configuration of CEO's application of knowledge codification as a capability-building activity in decision making and their experience—including both general human capital and specific entrepreneurial human capital (Zollo and Winter, 2002).

We make three primary contributions. First, we contribute to theory that has looked at the difficulties of accurately articulating mental processes (Ericsson and Simon, 1980; Sabini and Silver, 1981; Smith and Miller, 1978; White, 1980; White, 1988; Wright and Rip, 1981) by seeking to better understand the boundary conditions underlying decision incongruence in strategic opportunity pursuit. These efforts in the domain of strategic opportunity pursuit can then serve as the starting point for understanding how decision incongruence may be reduced in other strategic decision-making contexts. Second, our investigation of differences in CEOs' general and specific entrepreneurial human capital adds richness to discussions about differences across entrepreneurs (Sarasvathy, 2004). While prior research has investigated the effects of thinking differences between entrepreneurs and non-entrepreneurs on behavior (e.g., Begley and Boyd, 1987; Busenitz and Barney, 1997; Forbes, 2005), our study also investigates how the combination of general and specific entrepreneurial human capital impacts the extent to which knowledge codification enables a reduction in decision incongruence, thereby contributing to a rich literature on human capital in entrepreneurship (Becker, 1964; Corbett, 2007; Dimov and Shepherd, 2005; Gimeno *et al*., 1997; Wright *et al*., 2007). Finally, we contribute to research on capabilities by further illustrating the conditions under which knowledge codification is beneficial and when it is not (cf. Collis, 1994; Zollo and Winter, 2002).

Our research proceeds as follows: in the next section, we develop the concept of decision incongruence and position it as an individual-level construct that has implications for entrepreneurial action that also involves others. Next, we draw on capabilities research to develop our hypotheses explaining heterogeneity in decision incongruence. We then test these hypotheses and report the results. Finally, we discuss the theoretical and practical implications of our study.

DECISION INCONGRUENCE

Decision incongruence reflects the gap between the decision-making rationale that an individual conveys to others and the rationale that informs his/her actual decisions (cf. Argyris and Schön, 1974; Smith and Miller, 1978). Evidence that individuals may have a difficult time articulating their thinking is well documented in past decision-making research (cf. Argyris, 1977; Argyris and Schön, 1974; Nisbett and Wilson, 1977), whether it involves executives having a difficult time articulating corporate acquisition decisions (Stahl and Zimmerer, 1984) or venture capitalists struggling to articulate their investment decisions (Shepherd, 1999; Zacharakis and Meyer, 1998). In entrepreneurship, the downside of decision incongruence is especially salient when the pursuit of opportunity is understood as depending on more than one person (Cooper and Daily, 1997) and when, as the prior quotations illustrate, support from these others (either financially or otherwise) is needed. When an individual can pursue an opportunity without the need to convince these others to support him or her (financially or otherwise), decision incongruence is likely less (negatively) impactful. But when stakeholders—potential partners, investors, lenders, employees, customers, and suppliers as well as spouses, other family members, and friends—are making the decision about whether to support the pursuit of a specific opportunity, decision incongruence is implicated. Our argument is that individuals are best positioned to secure stakeholder support when the rationale for pursuing an opportunity is

DOI: 10.1002/sej

accurately portrayed (cf. Hackner and Hisrich, 2001), which we suggest is more likely to occur when decision incongruence is low.

But there is an irony. One of the key elements that enables opportunity pursuit—the asymmetric knowledge gained by the individual in the process of opportunity creation (cf. Alvarez and Barney, 2008)—also represents a potential stumbling block. If the individual cannot share this knowledge with relevant stakeholders through accurate articulation, these stakeholders are, in turn, less able to use this information to gain confidence in and provide support for the individual pursuing the opportunity (Alavi and Leidner, 2001). Because the communication of knowledge anchors one end of a proposed 'spiral of organizational knowledge creation' (Nonaka, 1994: 20), any inaccuracies in an individual's communicated knowledge about strategic opportunity pursuit that result from decision incongruence may be magnified as the process of opportunity pursuit unfolds. Further, any inaccuracies in an individual's communicated knowledge about strategic opportunity pursuit that lead potential investors to underestimate risks can, in turn, 'mak[e] it generally harder for entrepreneurs to finance operations . . . even for those companies with healthy financial structures and prospects' (Hackner and Hisrich, 2001: 87).

To understand the conditions whereby some individuals are able to decrease decision incongruence in opportunity decision making more than others and to understand how this understanding matters in entrepreneurship, we adopt a configurational approach. In this approach, we draw on capability theory (see e.g., Leiblein, 2011; Zander and Kogut, 1995; Zollo and Winter, 2002) to suggest that differences in the extent of decision incongruence about opportunities depend, in part, on the configuration of learning mechanisms that underlie capability-building activities in strategic opportunity pursuit (Zollo and Winter, 2002). As we discuss in more depth in the next section, we hypothesize that it is the configuration of general human capital, specific entrepreneurial human capital, and knowledge codification (as capability-building mechanisms) that explains decision incongruence.

KNOWLEDGE CODIFICATION AND EXPERIENCE ACCUMULATION

In complex and ambiguous entrepreneurial environments (see, e.g., Hill and Levenhagen, 1995; Lichtenstein *et al*., 2007) where information asymmetries between economic actors are likely high (cf. Hayek, 1945; Shane, 2000), decision incongruence is anticipated to be prevalent (cf. Argyris, 1976; Nisbett and Wilson, 1977) and potentially costly as a result of difficulties gaining support from others (Brush *et al*., 2001; Miller and Ireland, 2005). And while decreasing the imitability of knowledge to make it more usable by decision makers within firms is not without cost (Coff, Coff, and Eastvold, 2006; Dierickx and Cool, 1989), the cost of inaccuracy and error may exceed the cost of imitability (cf. Hackner and Hisrich, 2001)—especially given that the ability to share one's own knowledge is vital to the creation and renewal of firms (cf. Floyd and Wooldridge, 1999; Szulanski, 1996; Von Hippel, 1994; Zander and Kogut, 1995). This is evident for the individuals quoted earlier. For their businesses to grow, the individuals needed to develop the capability to share their knowledge about their decision making (Zander and Kogut, 1995; Zollo and Winter, 2002).

While the focus of capability theory tends toward the establishment of organizational capabilities (Leiblein, 2011; Teece, Pisano, and Shuen, 1997), the insights it offers also relate to the capabilities of entrepreneurial individuals (Felin and Hesterly, 2007; Teece, 2007). Bringing together individual-level and organizational-level capabilities research, Zollo and Winter (2002: 340) highlight the roles of knowledge codification, knowledge articulation, and experience accumulation as capability-building mechanisms. Because decision incongruence reflects an inability to accurately *articulate* knowledge, we devote our attention to the capability-building properties associated with the configuration of (1) knowledge codification and (2) experience accumulation as they concern the accurate articulation that is exemplified in reduced decision incongruence.

Knowledge codification and decision incongruence

Knowledge codification refers to the 'conversion of knowledge into messages which can be then processed as information' (Cowan and Foray, 1997: 596). Herein, the knowledge of interest is knowledge about opportunity decision making. In previous research, the application of knowledge codification processes has been suggested to result in increased accuracy, coordination, and efficiency (Cowan, David, and Foray, 2000; Cowan and Foray, 1997;

DOI: 10.1002/sej

Zander and Kogut, 1995). Knowledge codification has also been linked to the establishment of operating routines and the development of the capabilities that enable innovation and allow for existing routines to be modified (Cohendet and Meyer-Krahmer, 2001; Grimaldi and Torrisi, 2001; Lazaric, Mangolte, and Massue, 2003; Zollo and Winter, 2002). Along similar lines, knowledge codification can also serve as a signal of the capabilities possessed by an organization (Cohendet and Meyer-Krahmer, 2001). Conversely, in addition to the potential cost in time and effort of codification, it is also possible to overcodify knowledge if the process somehow prevents individuals from generating new knowledge, if it leads to organizational inertia, or if it becomes a commodity that is of less value to the organization as a result (Cohendet and Meyer-Krahmer, 2001; Cowan *et al*., 2000). In this sense, knowing the boundaries of when codification decreases decision incongruence (and when it does not) will be beneficial to decision makers deciding whether or not to codify their knowledge.

In our discussion of decision incongruence, which indicates difficulties in articulation, the distinctions between knowledge codification and knowledge articulation matter (cf. Zollo and Winter, 2002). Whereas knowledge articulation involves *saying*, knowledge codification involves the conversion of knowledge into identifiable rules and relationships which are then physically *recorded* so they can be better communicated (Cowan and Foray, 1997; Kogut and Zander, 1992). Like knowledge articulation, knowledge codification involves the transformation of tacit knowledge into explicit knowledge (Nonaka, 1994). However, unlike articulation, which can exacerbate error as a result of manufactured logic (Branch, 1961; Nisbett and Wilson, 1977), knowledge codification goes further and forces 'the drawing of explicit conclusions about the action implications of experience' (Zollo and Winter, 2002: 349). It requires an individual to expose the underlying logic of his/her beliefs and reveal implicit assumptions (Zollo and Winter, 2002: 342). Thus, while inconsistencies in beliefs and implicit assumptions can lead to inaccuracies in articulation (Nisbett and Wilson, 1977), knowledge codification may serve as a countervailing force that instead increases the accuracy of beliefs—at least in certain instances, as our configurational model is intended to illustrate (Smith and Miller, 1978).

For our purposes, knowledge codification occurs as decision makers structure their knowledge *about their decision making* into identifiable rules and relationships which are then recorded (Cowan, 2001; Cowan and Foray, 1997; Kogut and Zander, 1992). Because this process makes causal linkages explicit (Zollo and Winter, 2002: 342), knowledge codification can also serve to calibrate what individuals *say* they do to what they *actually* do, reflecting a kind of learning that facilitates a more accurate, clear, and justifiable representation of knowledge (cf. Argyris and Schön, 1974). In this way, decision makers who codify their knowledge might be expected to have lower decision incongruence than those decision makers who do not. Thus,

> *Hypothesis 1: Decision makers who engage in knowledge codification will have lower decision incongruence in strategic opportunity pursuit than those who do not engage in knowledge codification.*

Experience accumulation and human capital

But the story is not so simple. As we have described, while this expectation that knowledge codification can decrease decision incongruence in general would seem to make sense given previous research (Cowan *et al*., 2000; Cowan and Foray, 1997; Zander and Kogut, 1995), our expectation is that the efficacy of knowledge codification in decreasing decision incongruence in opportunity decision making depends on the kinds of experience accumulated by the individuals making these opportunity decisions (cf. Baron, 2009; Dew *et al*., 2009; Zollo and Winter, 2002). Herein, we conceptualize this experience in terms of: (1) general human capital and (2) specific entrepreneurial human capital (Becker, 1964; Corbett, 2007; Dimov and Shepherd, 2005; Gibbons and Waldman, 2004; Gimeno *et al*., 1997). As we will elaborate, in our configurational approach, we expect that each type of human capital will uniquely shape the influence that codification has in the reduction of decision incongruence. This expectation, that general human capital and specific entrepreneurial human capital will have differential effects on decision incongruence, is consistent with prior research on human capital in entrepreneurship and strategic management that has found differences in the effects of each type of human capital (e.g., Colombo and Grilli, 2005; Dimov and Shepherd, 2005; Pennings, Lee, and van Witteloostuijn, 1998; Zarutskie, 2010).

DOI: 10.1002/sej

General human capital

From the perspective of prior entrepreneurship research, general human capital is defined as the basic knowledge stock that an individual possesses (Becker, 1964) that is gained through education and overall experience (Corbett, 2007; Dimov and Shepherd, 2005; Gimeno *et al*., 1997; Wright *et al*., 2007). This knowledge can come in the form of life experience that comes with age, work experience, or completion of university education (Cooper, Gimeno-Gascon, and Woo, 1994; Davidsson and Honig, 2003; Gimeno *et al*., 1997). As prior research indicates, this experience is key to economic outcomes generally (Becker, 1964), but also for entrepreneurship specifically. Indeed, the impact of such experience is evident in the effect of general human capital on entry and engagement in entrepreneurship (Davidsson and Honig, 2003), innovation (Marvel and Lumpkin, 2007), growth (Colombo and Grilli, 2005), and firm performance (Gimeno *et al*., 1997).

In practice, general human capital and the knowledge codification process have similar characteristics. Like codification, which entails the conversion of knowledge into identifiable rules and relationships which are then recorded so they can be better communicated (Cowan and Foray, 1997; Kogut and Zander, 1992), the development of general human capital frequently involves the formalization of knowledge in the form of 'formal' education or investments in general training (Davidsson and Honig, 2003; Preisendörfer and Voss, 1990). For this reason, the very processes that lead to the development of general human capital—through the transfer of knowledge between individuals (Wright *et al*., 2007)—are likely to act as substitutes for knowledge codification as a result of experience and expertise in 'formalizing' knowledge. In this sense, general human capital may minimize any impact that codification would have on decision incongruence because of its substitutionary role. Thus,

> *Hypothesis 2: In strategic opportunity pursuit, the impact of knowledge codification on lowering decision incongruence will be less for decision makers with high general human capital than for those with low general human capital.*

Specific entrepreneurial human capital

While general human capital represents broad-based knowledge that can be shared between individuals (Wright *et al*., 2007), prior research has defined specific human capital as the knowledge and ability that is gained through experience in a particular industry or task setting (Becker, 1964; Cooper *et al*., 1994; Corbett, 2007). Because of the task specific nature of specific human capital (Gibbons and Waldman, 2004; Preisendörfer and Voss, 1990), it is essential to first understand the nature of the task in question. In our study, we investigate decision making in strategic opportunity pursuit, which plays an important role in entrepreneurial action (Busenitz and Barney, 1997; McMullen and Shepherd, 2006). In strategic opportunity pursuit, the 'task-specific learning by doing' that results in specific entrepreneurial human capital (Gibbons and Waldman, 2004: 203) can come from experience founding a venture, experience in a specific industry, or experience pursuing opportunities through starting other ventures (Cooper *et al*., 1994; Dimov and Shepherd, 2005; Patzelt, 2010). Those individuals who have experience in founding a venture will have firm-specific experience with strategic decision making and technology-specific expertise surrounding that decision making which, in combination, form the basis of the venture (Kor, 2003; Patzelt, 2010). Likewise, those with greater industry-specific experience will have an understanding of the industry that gives them insight into competitive forces of the industry, especially of the opportunities that might exist in the industry (Kor, 2003). This experience identifying and pursuing other opportunities represents a task that is of central importance to new venture creation (cf.Alvarez and Busenitz, 2001; Baron, 2007).

The 'learning-by-doing' elements of specific entrepreneurial human capital (Gibbons and Waldman, 2004; Preisendörfer and Voss, 1990) are especially salient for understanding how specific entrepreneurial human capital will have a distinctly different impact on the effectiveness of knowledge codification relative to general human capital. For instance, prior research suggests that founders, as a result of learning-by-doing, possess tacit knowledge that can serve as a resource, but may at the same time be difficult to share with other important stakeholders (Kor, 2003; Winter, 1987). Indeed, the very processes that lead to the creation of this specific entrepreneurial human capital also lead this knowledge to be more tacit and holistic in nature (Gordon, 1992; Simon, 1987) and, as a result, harder to communicate (Gordon, 1992; Mieg, 2001).

For those with high general human capital, the possession of specific entrepreneurial human capital should not represent a problem, as their experience

DOI: 10.1002/sej

transferring knowledge between individuals (Wright *et al*., 2007) can serve to assist them in communicating this knowledge to others. Similarly, those with little specific entrepreneurial human capital in the first place lack the tacit knowledge that comprises specific entrepreneurial human capital and, as a result are likely to see minimal benefit from knowledge codification. Instead, their knowledge is expected to be more conscious and effortfully employed (cf. Mitchell, Friga, and Mitchell, 2005). For those who lack general human capital but possess specific entrepreneurial human capital, knowledge codification is expected to be essential because it will assist them in making causal linkages explicit (Zollo and Winter, 2002) and will serve to calibrate what individuals *say* they are doing and what they are *actually* doing (Argyris and Schön, 1974). Those with neither general human capital nor specific entrepreneurial human capital do not possess tacit knowledge in the first place. For them, the simple rules about opportunities are already explicitly represented in the mind. In this sense, we expect decision makers with both low general human capital and low specific entrepreneurial human capital to enjoy little benefit from knowledge codification. Conversely, however, we expect decision makers who have a configuration of low general human capital but high specific entrepreneurial human capital to especially benefit from codifying their knowledge. Thus,

> *Hypothesis 3: In strategic opportunity pursuit, the impact of knowledge codification on lowering decision incongruence will be greater for decision makers with high specific entrepreneurial human capital than for those with low specific entrepreneurial human capital, but more so when general human capital is low than when it is high.*

RESEARCH METHODS

We tested our hypotheses in a quasi-field experiment with a pretest, posttest control group design (Campbell and Fiske, 1959) that involved both decision-level data collection (in the form of a metric conjoint analysis task) and individual-level data collection (in the form of an experimental manipulation and a set of self-report questionnaires). Our rationale for adopting such an experimental approach was threefold. First, a field experiment provided external validity (cf. Cook and Campbell, 1979) in that it allowed us to investigate the decision incongruence of CEOs who actively make decisions about opportunities for their firm. Second, a field experiment provided internal validity (cf. Cook and Campbell, 1979) in that it allowed us to randomly assign CEOs to an experimental condition (a knowledge codification task) or control condition (a distracter task), thereby allowing us to control for confounding effects (Campbell and Fiske, 1959). Through use of a premanipulation measure of decision incongruence (Time 1) and postmanipulation measure of decision incongruence (Time 2), we could then test the hypothesized effects of our experimental manipulation on decision incongruence. Third, use of a nested design in a field experiment (strategic decisions about opportunities, nested within individuals) permitted us to more accurately measure decision incongruence by capturing the gap between the decision-making rationale that informs the CEO's actual decisions (using metric conjoint analysis) and the decision-making rationale that the CEO conveys to others (using a set of self-report questions), while also allowing us to capture the individual-level variables that are central to our model. In the following subsections, we describe the procedures of our field experiment in more detail.

Data gathering

To test our hypotheses, we identified a sample of CEOs using the OneSource CorpTech database. We used CEOs in technology firms[3] because of an expectation that CEOs operating in high-ambiguity (Hill and Levenhagen, 1995; Stone and Brush, 1996) and high-velocity (Eisenhardt, 1989) environments would face a need to constantly seek and, thus, actively make decisions about new opportunities for their firm (Hughes, 1990). With this database, we identified companies based on three criteria: (1) geographical location, (2) the inclusion of information about the CEO, and (3) firm size. First, geographic location was important because the study required one-on-one meetings with CEOs. Accordingly, we contacted only companies in the surrounding three area codes of a large Midwestern city (i.e., within a three-hour drive). Second, because our focus was on the strategic decisions about opportunity pursuit, we included only firms for which information about the CEO of the company was provided. We did so

[3] We note that the CorpTech database includes both high-tech and low-tech firms.

DOI: 10.1002/sej

because of the CEO's central role in decisions about opportunity. This meant that we excluded firms that only provided contact information for a chairman of the board, a plant manager, a vice president, etc. Lastly, and related to the previous point, firm size was an important consideration in the research because, practically speaking, we anticipated that CEOs in small- to medium-sized firms (10 to 500 employees) would likely have a larger role in making *specific* decisions about which opportunities to pursue than CEOs in large firms (500+ employees). This meant that we excluded firms which, in the database, reported less than 10 or more than 500 employees. All told, there were 459 firms that met these criteria.

To arrive at the final sample and to ensure that it was representative of the larger population, we randomly selected a subsample of 240 CEOs at these companies to contact over a five-month period. A total of 127 of the CEOs agreed to participate (a number consistent with other field experiments [e.g., McNatt and Judge, 2004]) to result in a response rate of 53 percent.[4] The data were collected in-person with each of the CEOs at their office in an hour-long meeting. To test for participation bias, we used logistic regression, wherein we regressed whether or not a CEO responded (1 or 0) on firm age, firm size, and firm type (information that we had for all 240 firms). None of the factors in the regression were significant, thus providing no evidence of participation bias. The mean age of CEOs' firms was 35 years (median age was 24 years) and the mean size of CEOs' firms was 98 employees with $23 million in sales (median size was 40 employees with $5 million in sales). The mean age of CEOs was 52 years (median age was 51 years), 95 percent of the sample were men, and 58 percent of the CEOs were founders of the firm.

To investigate whether differences exist beyond accumulated experience between those with low versus high general human capital and low versus high specific entrepreneurial human capital, we followed Baron and Ensley (2006) and compared samples. We did so between samples of low and high general human capital and between samples of low and high specific entrepreneurial human capital. In doing so, we specifically investigated whether differences existed in: task motivation, overconfidence, general self-efficacy, entrepreneurial self-efficacy, metacognitive knowledge, metacognitive experience, fear of failure, gender, firm age, firm size, and firm type (independent versus subsidiary). The results indicated that differences ($p < 0.05$) existed between samples for firm age (specific entrepreneurial human capital only) and firm size (general human capital and specific entrepreneurial human capital). Consequently, both firm age and firm size were included as controls in later analyses.

[4] All but four of the participants were firm CEOs (the four who were not participated at the request of the CEO once the purpose of the study was made clear).

Research design and task

As we have described, decision incongruence involves the gap between the decision-making rationale that an individual conveys to others and the decision-making rationale that informs his/her actual decisions. We next discuss each aspect of decision incongruence, beginning with how we captured the decision-making rationale that informs CEOs' actual decisions, followed by how we capture the decision-making rationale the CEOs conveyed. In the measures section, we then discuss how the two rationales are combined to calculate decision incongruence.

Actual decision-making rationale

To capture each an individual's actual decision making about strategic opportunity pursuit, we used a metric conjoint analysis decision-making task (Louviere, 1988; Priem, 1992). Metric conjoint analysis is useful because it allows for an investigation of the underlying decision structure of *each decision maker's* strategic decisions. It does so by breaking down these decisions into their component parts (Priem and Harrison, 1994; Shepherd and Zacharakis, 1997). In this approach, we created 16 hypothetical opportunity situations, which reflected variation among four theoretically relevant attributes in strategic opportunity decision making. The four attributes of the decision-making task were based on a model of entrepreneurial action that reflects the decision to commit firm resources to the exploitation of opportunities (McMullen and Shepherd, 2006): the extent to which he/she is motivated and knowledgeable to pursue the opportunity in an uncertain environment (e.g., Baron, 2006; Krueger, 1993; Krueger, Reilly, and Carsrud, 2000; McMullen and Shepherd, 2006; Mitchell and Shepherd, 2010). We link this model to the respective attributes we used in the decision-making task in the next paragraph.

We conceptualized the motivation aspect of the decision to commit resources to opportunity pursuit

DOI: 10.1002/sej

as the *potential value of an opportunity*. This attribute reflects the profit predicted to result from the decision to allocate resources to the full-scale exploitation of the opportunity (Venkataraman, 1997). We conceptualized the knowledge aspect of the decision to commit resources to opportunity pursuit as *knowledge relatedness*. This attribute reflects the extent to which the CEO believes he/she has the knowledge necessary to exploit the opportunity (Krueger and Brazeal, 1994). We conceptualized the environmental aspect of the decision to commit resources to opportunity pursuit as the *window of opportunity* and the *number of potential opportunities*. The window of opportunity attribute reflects the length of time available to profitably invest in the potential opportunity, and the number of potential opportunities reflects the number of other potential opportunities that could be pursued instead.

Prior to use of these four attributes in our field experiment, we conducted a pretest in which we asked CEOs of firms like those in our sample if the attributes were relevant to their strategic decisions about opportunity pursuit. They confirmed the appropriateness of the presented attributes. In the hypothetical opportunity profiles, we varied each of the attributes at two levels (e.g., high knowledge relatedness or low knowledge relatedness) and provided a definition of each attribute at each level. These definitions, the instruction for this task, and an example opportunity are included in Appendix A.

After viewing a hypothetical opportunity profile that had a specific combination of these attributes, decision makers indicated their likelihood of investing in that opportunity (see Appendix A for one of the hypothetical opportunities used). We measured likelihood of investment with a nine-point scale anchored by 'very likely to invest in this opportunity' (9) and 'very unlikely to invest in this opportunity' (1). To control for variance and increase the task-domain applicability, in the instructions we asked decision makers to assume that: (1) other than the information provided in the profiles, the hypothetical opportunities presented were similar to other entrepreneurial opportunities they have 'seen' in all respects; (2) they had the resources (or access to the resources) to invest in an opportunity if they chose to do so; (3) they were making decisions about these opportunities for their current firm; and (4) they were making decisions about these opportunities in their current industry and economic environment. Additionally, in the instructions we asked decision makers to use their expertise in the decision-making task. In this way, we did not presume that there was one correct way of making decisions nor did the testing of our hypotheses require it. For instance, while we might expect decision makers to invest in opportunities that were related to knowledge they already possess, this was not a requirement for our study of decision incongruence. Instead, each entrepreneur determined what was an opportunity for himself/herself.

To shorten the amount of time required in this decision-making task (Green and Srinivasan, 1990), we used an orthogonal fractional factorial design (i.e., no correlation between attributes across opportunities).This reduced the number of required hypothetical profiles (Hahn and Shapiro, 1966), which we then replicated so we could estimate *individual* subject error (bringing the final number of hypothetical opportunity profiles in the decision-making task to 16—eight profiles, each replicated one time). With this design, we were able to test for the main effects of all of the opportunity attributes on likelihood of investment, as well as three two-way interactions. For example, we were able to determine the degree to which a specific decision maker emphasized knowledge relatedness in his/her strategic decisions about opportunity pursuit (a main effect) as well the degree to which this emphasis on knowledge relatedness was contingent on window of opportunity in their strategic decisions about opportunity pursuit (an interaction effect). Although this design did not allow us to test *all* higher-order (interaction) relationships among the attributes, the ability to test four main effects and three interaction effects is sufficient for our measure of decision incongruence because 'decision policies' with more than three contingent relationships are rare (Louviere, 1988). To test for possible order effects, we created four versions of the profiles that varied the order of the attributes and the order of the profiles. There was not a significant difference between the versions ($p > 0.10$) and, therefore, order effects are unlikely to confound our findings. To familiarize decision makers with the task, we utilized a practice profile that was not used in subsequent analyses.

Using metric conjoint analysis, we were then able to calculate a *separate regression equation for each decision maker* that captured his/her actual decision making about strategic opportunity pursuit. In this regression equation, the standardized beta weights reflected the importance of and emphasis on the opportunity attributes (or combinations of attributes) in an individual's strategic decision making about opportunity pursuit. As an illustration, an individu-

DOI: 10.1002/sej

al's Time 1 actual decision making might look as follows: potential value ($\beta = 0.497$, $p < 0.01$), knowledge relatedness ($\beta = 0.417$, $p < 0.01$), window of opportunity ($\beta = 0.139$, n.s.), number of potential opportunities ($\beta = 0.218$, $p < 0.05$), knowledge relatedness × window of opportunity ($\beta = -0.139$, n.s.), knowledge relatedness × number of potential opportunities ($\beta = -0.218$, $p < 0.05$), and window of opportunity × number of potential opportunities ($\beta = 0.616$, $p < 0.001$). The regression results of the decision-making rationale that informs this individual's actual decisions at Time 1 can then be compared to what the individual says he/she did at Time 1, as we now describe.

Decision-making rationale conveyed

To capture the decision-making rationale an individual conveys about strategic opportunity pursuit, we utilized a carefully-constructed set of self-report measures. We first asked decision makers to discuss their own decision making by asking, 'When assessing the previous profiles, what things did you consider when making your investment decisions?' This open-ended self-report question about the attributes they used in their strategic decision making about opportunity pursuit (e.g., potential value, knowledge relatedness, etc.) allowed individuals to describe their decision making free from suggestive cuing. By asking decision makers whether they were more likely to invest when an attribute was at a *high* level (e.g., high knowledge relatedness) or a *low* level (e.g., low knowledge relatedness), we were able to determine the sign/direction for the factors they considered to play significant roles in their decisions (a necessary piece of information for comparison to what they actually did). A self-report interaction effect between two attributes was recorded when decision makers suggested that the importance of one attribute depended on another and was clarified by asking if they were describing the effect of Attribute A on Attribute B. When such an effect was present, we asked decision makers if having a *high* level of Attribute A was more important or less important when Attribute B was at a *high* level. Again, this allowed us to determine the sign/direction of any self-reported interaction effects. Consistent with prior research (Viswesvaran and Barrick, 1992), we then asked decision makers to assign a score (0 to 100) for each of the attributes and interactions of attributes they said they used in their decisions based on its importance to their decisions. This score permitted comparison with what an individual actually said he/she did.

Sequence of experimental protocol

In the experiment, decision makers engaged in the metric conjoint analysis decision-making task (to capture the CEOs' actual decision-making rationale), followed by the self-report measure (to capture the decision-making rationale the CEOs conveyed) both *before* and *after* the knowledge codification experimental manipulation. This means that at Time 1, decision makers evaluated the 16 opportunity profiles plus three additional profiles[5] which were to be used in the knowledge codification manipulation, followed by the self-report measures describing their decision making. At Time 2, decision makers again evaluated the 16 original opportunity profiles, followed by the self-report measures describing their decision making. While the same opportunity profiles were used at Time 1 and Time 2 so as to permit a comparison at Time 1 and Time 2, the profiles were relabeled to mask the repetition. Following the Time 2 self-report measures, we administered a questionnaire that captured additional relevant data from decision makers. Figure 1 visually depicts the temporal sequence of the field experiment protocol.

Measures

Decision incongruence

We measured decision incongruence by taking the difference between an individual decision maker's metric conjoint analysis regression results and his/her self-report measures (Viswesvaran and Barrick, 1992). To calculate this difference, both the metric conjoint analysis regression result and the self-report measure had to be expressed quantitatively and comparably. Based on each decision maker's regression equation, we first established which attributes (knowledge relatedness, value, etc.) were significant ($p < 0.05$) for each individual at both Time 1 and Time 2. Again, *each* individual had separate regression equations for both Time 1 and Time 2, meaning that there were two unique sets of regression results per person. The individual beta weights of these regression equations represented the importance of

[5] These three additional opportunity profiles were different from (and were presented after) the 16 Time 1 opportunity profiles.

DOI: 10.1002/sej

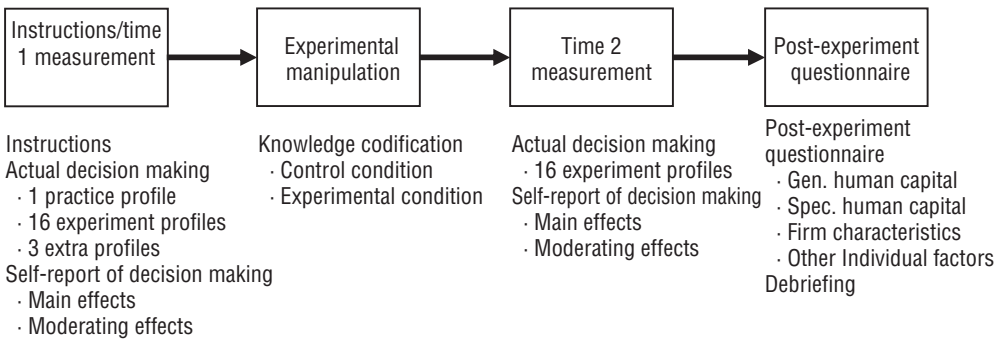


Figure 1. Temporal sequence of the field experiment
(Progression of the field experiment during the one-hour interview)

and emphasis on each attribute or combination of attributes in the decision maker's strategic decisions about opportunity pursuit at either Time 1 or Time 2. To reduce the prospect of error in our measure, we used only significant beta weights ($p < 0.05$).

To arrive at a measure of decision incongruence *for each decision maker* at Time 1 and at Time 2, we calculated the gap between decision makers' standardized regression coefficients (actual decision making) with their self-report scores (conveyed decision making) for *each* attribute or interaction of attributes (e.g., one for knowledge relatedness, one for value, etc.). This allowed us to 'compare apples to apples' in calculating the gap, as we now explain.

To arrive at a number reflecting an individual's actual decision making, we first summed the significant standardized regression coefficients for *each decision maker* to result in a decision maker-specific measure of the total actual effect for *each decision maker*. We then divided each of the decision maker's significant standardized coefficients by the measure of total actual effect to result in a decision maker-specific percentage of actual effects explained *by each attribute*. We followed a similar process to arrive at a number for the self-report measures of each attribute. We first summed the absolute values of the self-report scores that *each decision maker* gave for each attribute to result in a decision-maker-specific measure of the total conveyed effect for *each decision maker*. We then divided each of the decision maker's self-report scores by this total conveyed effect to result in a decision maker-specific percentage of conveyed effects explained *by each attribute* (or interaction of attributes).

Next, a difference score was calculated for each attribute by matching and subtracting the scores that individuals conveyed from the corresponding scores they actually used. The absolute value of each difference represented the gap *for each respective attribute*. Finally, we summed the values representing the gap between what an individual actually did and what the individual said he/she did to result in a total measure of decision incongruence for each decision maker. As we later note, decision incongruence at Time 1 was included as a covariate control, with decision incongruence at Time 2 as the dependent variable. Appendix B provides an illustration of our decision incongruence calculation for one of the CEOs in our study.

Knowledge codification

In operationalizing knowledge codification, we randomly assigned the decision makers to either an experimental condition or a control condition. In the experimental condition, we asked decision makers to visually describe their decisions using visual depictions of the four opportunity attributes (knowledge relatedness, value, etc.) and uni-/bidirectional arrows of varying thickness to indicate importance. With these visual depictions and arrows, decision makers codified knowledge that was related to the opportunity decision-making task. For instance, as the example in Appendix C depicts, this CEO codified the following effects on *likelihood of investment (A)*: *knowledge relatedness (B)* and *potential value (C)* as large main effects; *number of potential opportunities (D)* as a medium main effect; *window of opportunity (E)* as a small main effect; and *knowledge relatedness (B)* and *potential value (C)* as having a large interaction effect. After developing a visual model, we then asked decision makers in the experimental condition to use the codified model to talk through the three extra hypothetical opportunities they had evaluated during the first decision task.

DOI: 10.1002/sej

In contrast, we gave decision makers in the control condition a distracter task, wherein we asked them to visually describe how their decisions about opportunities related to their firm using visual depictions of various aspects/levels of firm structure (president/CEO, owner, operations, accounting, etc.) and uni-/bidirectional arrows of varying thickness to indicate importance. With these visual depictions and arrows, decision makers codified knowledge that was unrelated to the opportunity decision-making task. For instance, as the example in Appendix C depicts, this decision maker codified the *owner (A)*, *president/CEO (B)*, *marketing (C)*, and *finance (D)* as having a large role in decisions about opportunities; *research and development (E)* and *operations (F)* as having a medium role; and *accounting (G)* as having a negligible role. Decision makers in the control condition did not develop or record a model of opportunity pursuit and were not presented the three extra hypothetical opportunities they had evaluated during the first decision task.

General and specific entrepreneurial human capital

For our measures of both general human capital and specific entrepreneurial human capital, we followed an approach that is similar to prior research in entrepreneurship (e.g., Corbett, 2007; Dimov and Shepherd, 2005; Gimeno *et al*., 1997). For our measure of general human capital, we created an index consisting of standardized values for CEO's age, education (university degree versus none), and total work experience. For our measure of specific entrepreneurial human capital, we created an index consisting of standardized values for each CEO's industry-specific work experience, status as a founder of the firm, and the number of other start-ups in which he/she had been involved. We note that the number of other start-ups was log transformed because this item was not normally distributed.

Control variables

We also sought to control for other potential sources of variance in decision incongruence. First, we controlled for decision complexity, which reflected the number of attributes used by a decision maker in a decision (Nutt, 1998). This was measured as the maximum number of significant attributes for each CEO at Time 1 or Time 2 (ranging from 1 to 7). We expected that those who had more complex decision policies might also have a more difficult time conveying their decision, simply because there would be more to convey. Second, we controlled for individuals' erratic decisions (Mitchell, Shepherd, and Sharfman, 2011a), which reflected (and was measured as) a change in decision makers' actual decision-making rationale between Time 1 and Time 2. Our expectation was that those individuals who are more erratic in their decisions might also have a more difficult time conveying their decision-making rationale. Third, as noted previously, we followed Baron and Ensley (2006) and compared samples as a way of understanding whether differences exist beyond accumulated experience between those with low versus high general human capital and low versus high specific entrepreneurial human capital. Because the results indicated that differences ($p < 0.05$) existed between samples for firm age and firm size, both firm age and firm size are included as controls. Finally, decision makers were randomly assigned to the experimental or control condition, which controlled for other potential sources of variance (Campbell and Stanley, 1963).

In our regression analysis, we included pretest scores as covariates because they provide 'a more sensitive test of possible differences among treatments' (Huck and McLean, 1975: 516). As such, decision incongruence at Time 1 was included as a control variable, with decision incongruence at Time 2 as a dependent variable. Of the 127 decision makers in the study, two had actual decision policies with no significant effects and conjoint analysis responses that were unreliable (i.e., their responses on the replicated eight profiles were not significantly correlated with their original eight). Consequently, we excluded both cases from the analysis, resulting in a total sample of 125.

RESULTS

Table 1 shows the means, standard deviations, and correlations. To check for multicollinearity, we examined the variance inflation factors. All of the variables in the models were considerably lower than the recommended value of 10 (Neter *et al*., 1996). Table 2 summarizes the regression results. According to Hypothesis 1, decision makers who use knowledge codification to describe their strategic decisions about opportunity pursuit will have lower decision incongruence than those decision makers who do not use knowledge codification. As is

DOI: 10.1002/sej

Table 1. Means, standard deviations, and correlations[a]

Variables	Mean	s.d	1	2	3	4	5	6	7	8
1. Decision incongruence (Time 2, DV)	0.69	0.31								
2. Decision incongruence (Time 1, control)	0.75	0.31	0.37***							
3. Decision complexity (control)	3.64	1.35	–0.39***	–0.18*						
4. Erratic decisions (control)	0.63	0.37	–0.16	0.13	0.53***					
5. Firm age (control)	34.74	29.83	0.04	–0.06	–0.06	–0.06				
6. Firm size (control)	99.82	180.63	–0.02	–0.12	–0.13	–0.21*	0.37***			
7. Codification: control vs. experimental[b]	0.00	0.50	–0.14	–0.10	0.06	0.00	0.05	0.05		
8. General human capital	0.04	2.09	0.03	–0.01	0.12	–0.03	0.19*	0.14	0.02	
9. Specific human capital	0.00	1.96	0.23*	0.10	–0.07	0.04	–0.21*	–0.11	0.08	0.30**

[a]$n = 125$.
[b]Contrast coded: –0.5 = control; 0.5 = experimental.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Table 2. Results of regression analysis for decision incongruence

Variables	Model 1	Model 2	Model 3	Model 4
Decision incongruence (Time 1, control)	0.32***	0.30***	0.33***	0.31***
Decision complexity (control)	–0.31**	–0.27**	–0.21*	–0.27**
Erratic decisions (control)	–0.05	–0.07	–0.17	–0.10
Firm age (control)	0.05	0.10	0.12	0.09
Firm size (control)	–0.05	–0.04	–0.08	–0.05
Codification: control vs. experimental[a]		–0.12	–0.12	–0.17*
General human capital (GHC)		–0.01	0.00	0.01
Specific human capital (SHC)		0.21*	0.23**	0.22*
Codification * GHC			0.26**	0.20*
Codification * SHC			–0.16	–0.15
GHC * SHC			–0.08	–0.08
Codification * GHC * SHC				0.19*
ΔR^2		0.04	0.07	0.03
R^2	0.25	0.29	0.36	0.39
F	7.85***	6.07***	5.75***	5.88***
n	125	125	125	125

*$p < 0.05$ **$p < 0.01$ ***$p < 0.001$.
[a]For the low codification group, $n = 62$; for the high codification group $n = 63$.

illustrated in Model 2, knowledge codification is not significantly related to decision incongruence (β = 0.12, n.s.). Thus, Hypothesis 1 is not supported.

According to Hypothesis 2, the impact of knowledge codification on lowering decision incongruence in strategic opportunity pursuit will be less for decision makers with high general human capital than for those with low general human capital. As Model 3 demonstrates, knowledge codification and general human capital significantly interact in their effect on

DOI: 10.1002/sej

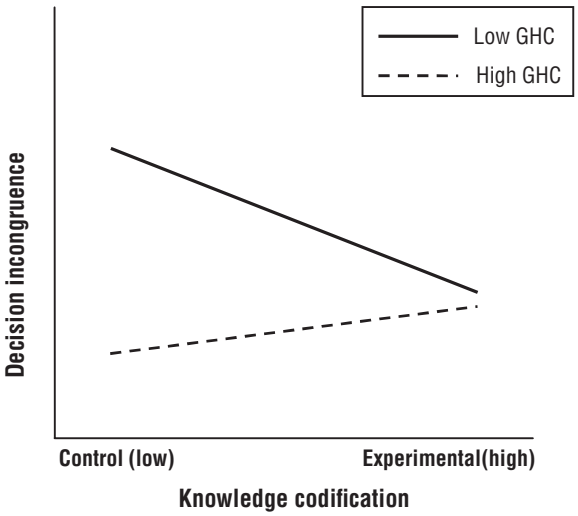


Figure 2. Knowledge codification × general human capital

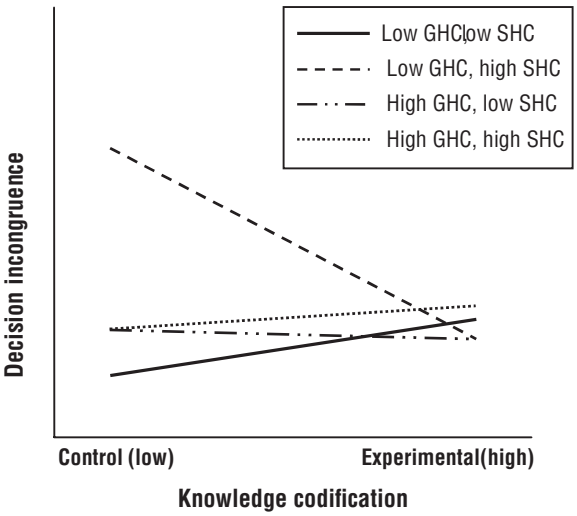


Figure 3. Knowledge codification × general human capital × specific human capital

decision incongruence (β = –0.31, p < 0.01).[6] Figure 2 displays the form of this interaction effect. As was hypothesized, decision incongruence decreases with knowledge codification more for decision makers with low general human capital than for decision makers with high general human capital. Interestingly, in the case of decision makers with high general human capital, decision incongruence appears to increase with knowledge codification. However, a regression with the same controls, but only those with high general human capital, indicates that knowledge codification does not significantly increase decision incongruence for those with high general human capital (β = 0.04, n.s.). The findings provide support for Hypothesis 2.

According to Hypothesis 3, the impact of knowledge codification on lowering decision incongruence in strategic opportunity pursuit will be greater for decision makers with high specific entrepreneurial human capital than for those with low specific entrepreneurial human capital, but more so when general human capital is low than when it is high. As Model 4 demonstrates, the configuration of knowledge codification, general human capital, and specific entrepreneurial human capital significantly interact in their effect on decision incongruence (β = 0.19, p < 0.05). Figure 3 displays the form of this interaction effect. As was hypothesized, when general human capital is low, knowledge codification decreases decision incongruence more for decision makers with high specific entrepreneurial human capital than for those with low specific entrepreneurial human capital. The same does not hold true when general human capital is high. This finding provides support for Hypothesis 3.

To comprehend the lack of findings for Hypothesis 1 relative to Hypotheses 2 and 3, we draw upon Kerlinger's (1986: 242) discussion of interaction effect interpretation: 'a general rule is that when an interaction is significant, it may not be appropriate to try to interpret main effects because the main effects are not constant but vary according to the variables that interact with them.' This is consistent with our configurational model, the findings of which contribute to understanding when knowledge codification is helpful in enabling decision makers to articulate knowledge of their decision making about opportunities to important others. Those entrepreneurs who lack general experience and education are especially likely to benefit. These might be the individuals who are in most need of assistance. They do not have the credibility that comes with age, education, and experience, but they possess expertise in entrepreneurship.

DISCUSSION

In our focus on the role of capabilities in strategic decisions about opportunity pursuit, we have

[6] Note that the pattern of results in Model 3 is similar when the nonhypothesized interactions—codification × specific entrepreneurial human capital (codification * SHC) and general human capital × specific entrepreneurial human capital (GHC * SHC)—are omitted.

DOI: 10.1002/sej

indirectly adopted a resource-based view of decision making (cf. Amit and Schoemaker, 1993; Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). Our findings related to decision incongruence contribute to this ever growing and deepening area of inquiry by giving additional attention to the role of knowledge codification as a capability that certain individuals can develop to assist them in their strategic opportunity pursuit. We see these findings as particularly salient considering the importance of entrepreneurial action to organizational renewal (Barringer and Bluedorn, 1999; Hitt *et al*., 2001; Zahra and Covin, 1995). Thus, in the following subsections, we link our findings to extant entrepreneurship *and* resource-based research, underscore the implications of our findings for practice, and acknowledge the limitations of this study, while highlighting future research possibilities.

Implications for theory

We see three primary contributions of this research. First, the extreme conditions that occur in the pursuit of opportunities lead us to view entrepreneurship as an ideal context in which to explore cognition (Baron, 1998). Specifically, in our investigation of decision incongruence, we clarify the boundary conditions of when individuals may face difficulties in conveying the simple rules they use in their decision making about opportunities (cf. Bingham *et al*., 2007; Smith and Miller, 1978), while also suggesting some potential remedies of such difficulties. We find that the impact of knowledge codification on lowering decision incongruence in strategic opportunity pursuit is greater for decision makers with high specific entrepreneurial human capital than for those with low specific entrepreneurial human capital, but more so when general human capital is low than when it is high. In this sense, not only does our research contribute to an understanding of the importance of certain learning mechanisms in the pursuit of opportunity (Zander and Kogut, 1995; Zollo and Winter, 2002), but it also speaks to the larger question of 'when (not whether) people are able to report accurately on their mental processes' (Smith and Miller, 1978: 361).

Our research also captures three of the four key elements called for in a socially situated view of entrepreneurial cognition (see, e.g., Mitchell *et al*., 2011b; Smith and Semin, 2004). That is, we adopt an *action-oriented* perspective with our focus on strategic decision making in opportunity pursuit, which plays an important role in entrepreneurial action (cf. Busenitz and Barney, 1997; McMullen and Shepherd, 2006). Knowledge codification itself likewise represents a kind of *embodied* action, in that it requires more than just saying, but rather physically recording knowledge that has been converted into identifiable rules and relationships (Cowan and Foray, 1997; Kogut and Zander, 1992). Similarly, our approach is implicitly *situated* in our positioning of decreased decision incongruence as a way to increase an individual's ability get 'buy-in' from key stakeholders (cf. Brush *et al*., 2001; Kor, 2003; Miller and Ireland, 2005), thereby enabling coordination, higher-quality group decision making and better firm performance (cf. Bingham *et al*., 2007; Bonner and Baumann, 2012; Hirokawa *et al*., 1996; van Dijk *et al*., 2009). However, as we note in a later section, future research is needed to understand how cognition might be *distributed* across social agents.

These broader contributions notwithstanding, the primary focus of our article is entrepreneurial decision making. Given the importance of strategic opportunity pursuit to organizational renewal (Barringer and Bluedorn, 1999; Hitt *et al*., 2001; Zahra and Covin, 1995), our findings would seem to be especially salient. Indeed, the ability to reduce decision incongruence can be viewed as a resource for certain entrepreneurial ventures (Alvarez and Busenitz, 2001) because those entrepreneurs who can accurately convey to others the rationale that underlies their decisions should be more likely to succeed in strategic opportunity pursuit (cf. Bingham *et al*., 2007; Brush *et al*., 2001; Miller and Ireland, 2005). Although opportunity pursuit does represent an important strategic context (Dess and Lumpkin, 2005), it is only one of many important strategic decision-making contexts in entrepreneurship. Therefore, we wonder what our results may suggest for other decision-making contexts, especially whether the configuration of general human capital and specific entrepreneurial human capital shape the effectiveness of a knowledge codification capability in reducing decision incongruence for other decisions, such as those related to sources of funding, modes of opportunity exploitation (including alliance formation), and exit.

A second theoretical contribution of this study involves our finding that the capability-building experience of those with specific entrepreneurial human capital, but limited general human capital, has a differential effect on decision incongruence in strategic opportunity pursuit. For us, understanding

DOI: 10.1002/sej

the differences in approaches to strategic opportunity pursuit between those with entrepreneurial experience and those without adds to research that has investigated differences between entrepreneurs and nonentrepreneurs (e.g., Baron, 1999; McGrath, MacMillan, and Scheinberg, 1992; Mitchell *et al*., 2002) by furthering understanding of differences in categories of entrepreneurs (Sarasvathy, 2004). Indeed, our results relating to general human capital would seem to support the contingent effects of categories of entrepreneurs, especially in terms of dimensions that may not seem at first glance to be expressly entrepreneurial in nature.

Along these lines, our results support the idea that the capability-building activities in strategic decisions about opportunity pursuit are not equal and, thus, should differ in their application by different types of entrepreneurs. While knowledge codification may be less critical for those with high general human capital, it appears to be highly important for those with low general human capital and high specific entrepreneurial human capital. In this way, our findings contribute to prior research that has addressed how differences in entrepreneurial experience can result in behavioral differences (e.g., Begley and Boyd, 1987; Busenitz and Barney, 1997; Forbes, 2005). In our study, this difference is seen in the differential ability to articulate knowledge of decision making about opportunities.

Third, our configurational findings, that the impact of knowledge codification on decision incongruence will be greater for those with low general human capital and high specific entrepreneurial human capital than others, also contributes to capabilities research (e.g., Barney, 1986; Hall, 1993; Zahra, Sapienza, and Davidsson, 2006) by further illustrating the benefits and boundaries of knowledge codification as a learning mechanism (Zander and Kogut, 1995; Zollo and Winter, 2002). In this sense, we illustrate how and when knowledge codification represents a potential dynamic capability (cf. Teece *et al*., 1997; Winter, 2003). By investigating this question in terms of decision incongruence, we begin to bridge the organizational knowledge, organizational routines, and heuristics literatures (cf. Bingham and Eisenhardt, 2011). We do so by demonstrating how knowledge codification and experience, as learning mechanisms that underlie the evolution of routines (Zander and Kogut, 1995; Zollo and Winter, 2002), can be useful in the articulation and application of the heuristics (simple rules) that underlie the pursuit of opportunities (cf. Bingham and Eisenhardt, 2011; Bingham *et al*., 2007).

To this latter point, individuals' understanding of how the combination of experience and knowledge codification can reduce decision incongruence is a skill that can then be used as a mechanism to develop and adapt other organizational capabilities and routines (Zollo and Winter, 2002). Moreover, our findings support the idea that knowledge codification and experience are mechanisms that can facilitate the creation of dynamic capabilities insofar as they can facilitate diffusion of knowledge related to a specific capability (Nonaka, 1994; Zollo and Winter, 2002)—in this case, the heuristics underlying strategic opportunity pursuit. Thus, a dynamic capability is created insofar as an understanding of the configuration of knowledge codification and experience can be used to increase the usefulness of similar knowledge in other situations and circumstances.

In speaking of dynamic capabilities, Collis (1994: 151) noted that because dynamic capabilities can always be superseded by higher-order capabilities, researchers should not simply extol the virtues of capabilities devoid of context, but should instead seek to 'generate lists of the enormous variety of capabilities and develop normative prescriptions for actually building those capabilities' in a particular temporal context. Our finding about the boundaries in usefulness of knowledge codification represents a step in this direction. That is, our results illustrate a particular temporal context (i.e., strategic opportunity pursuit) wherein there exists a capability differential (i.e., knowledge codification that is more beneficial to certain individuals than others). Thus, future research is warranted to investigate the potential performance effects of such knowledge codification differences. It may be, for instance, that in context of a start-up, any potential negative effects of communicating tacit knowledge can be countered while still preserving the positive effects (cf. Berman, Down, and Hill, 2002; Coff *et al*., 2006).

Implications for practice

The findings reported herein can directly assist entrepreneurs. It is often the case that decisions about opportunities are taken on faith alone (Miller and Ireland, 2005: 25). Through knowledge codification, however, those with low general human capital, but high specific entrepreneurial human capital, can decrease decision incongruence about strategic opportunity pursuit and, in so doing, may

DOI: 10.1002/sej

be in a better position to gain access to critical resources from others who might otherwise withhold resources due to knowledge asymmetries (Hayek, 1945; Miller and Ireland, 2005). Of course, decision makers who rely on 'bootstrap financing' in the pursuit of opportunity can be less concerned about decision incongruence. However, from a practical perspective, the individual seeking external financing who possesses high specific entrepreneurial human capital, but low general human capital, may specifically benefit from decreased decision incongruence. Indeed, as a result of low general human capital, such an individual might lack some credibility with potential stakeholders (cf. Spence, 1973, 2002) but at the same time be well positioned to pursue opportunity as a result of high specific entrepreneurial capital. For him/her, decreasing decision incongruence may be especially useful.

Knowledge codification may also provide a channel for understanding other difficult-to-communicate knowledge in entrepreneurial organizations (Hedlund, 1994; Osterloh and Frey, 2000; Stenmark, 2001). Knowledge codification may, for instance, provide a novel mechanism for individuals to reduce the 'glitches' in strategic opportunity pursuit that can arise as a result of insufficient knowledge sharing (Hoopes and Postrel, 1999). Once understood, knowledge codification can also lead to the creation of the organizational and structuring documents and systems that are the foundation of replicable routines surrounding the use of tacit knowledge (Nelson and Winter, 1982). Practically speaking, individuals who understand how to benefit from knowledge codification in one decision-making area (i.e., strategic opportunity pursuit) may then replicate these new routines for articulation in the management of other areas of strategic decision making.

Limitations and future research

Within this section, we discuss the limitations of our study and (when applicable) link them to the yet unanswered questions that are implied. First, our investigation has been limited to decision incongruence in strategic opportunity pursuit. We have adopted this approach because strategic opportunity pursuit represents decision making that is important to the creation, renewal, and survival of organizations (Barringer and Bluedorn, 1999; Hitt *et al*., 2001; Zahra and Covin, 1995). However, we also expect that problems of decision incongruence will extend beyond strategic opportunity pursuit. Indeed, generalizability considerations require that other types of strategic decision making be explored as well. Thus, future research must ask whether decision incongruence occurs in multiple settings and whether knowledge codification has a similar impact in other strategic decision-making contexts.

Second, we tested our theory in an experimental field setting (cf. Harrison and List, 2004). In conducting a field experiment, we were able to control for 'noise' that exists in strategic opportunity pursuit, while at the same time provide a realistic context for the decision maker (making decisions about these opportunities for their current firm and in the current industry and economic environment). Of course, we acknowledge that the CEOs in our study made decisions about 'hypothetical' versus 'actual' opportunities. However, our decision to use an experimental approach was guided by our desire to understand the conditions that would enable individuals to better articulate knowledge of their decision making about opportunities. Our use of hypothetical opportunities in a metric conjoint analysis specifically allowed us to obtain such real-time information about decisions that could then be compared with the information the CEOs conveyed through self-reports. In future research, however, these findings could be generalized to more 'natural' field settings (Harrison and List, 2004).

Third, and related to the previous point, conjoint analysis is limited in the number of profiles individuals can manage. As the number of attributes increases, the number of profiles that individuals are required to evaluate also typically increases (Hahn and Shapiro, 1966), resulting in potentially biased responses on the part of decision makers (Green and Srinivasan, 1990). To mitigate this concern by making the conjoint task more manageable, we included only four attributes in the hypothetical opportunities that decision makers evaluated. However, one drawback of this approach is that it requires individuals to simplify aspects of a complex process. For instance, we asked decision makers to make a series of assumptions regarding the opportunity profiles—they had access to the resources, the opportunities were similar to other opportunities they see, etc. In essence, these variables were controlled by being 'set' at a specific level. But this meant that interesting questions went untested due to the limitations of the metric conjoint technique. Future research is needed to understand whether other elements of strategic opportunity pursuit that were controlled for in this study (e.g.,

DOI: 10.1002/sej

resource trade-offs [Haynie, Shepherd, and McMullen, 2009]) might also affect entrepreneurs' decision incongruence.

Fourth, although our findings relating to decision incongruence as an individual-level construct have implications for collective action (i.e., high decision incongruence may impede a decision maker's ability to undertake collective action as a result of an inability to share knowledge with important others [cf. Bingham and Eisenhardt, 2011; Bingham *et al*., 2007; Cooper and Daily, 1997; Gartner *et al*., 1994]), we nonetheless do not capture any aggregate performance effects. Nor do we capture team decision making. Thus, beyond the experimental manipulations (in which CEOs codified their decision making for explanation to us, as researchers), we do not capture the processes whereby individuals 'shop' their ideas to other key individuals. This social interaction that occurs in the process of conveying the logic underlying the simple rules about opportunities to important others is admittedly beyond the scope of our article. Thus, future research should investigate both how social interaction among multiple individuals might affect decision incongruence and how decision incongruence might, in turn, affect the development of a *shared* understanding. Moreover, because we do not account for team decision-making processes in our measure of decision incongruence, future research should address whether individual decision incongruence is manifest in team decision making and, if so, how it is distributed and with what performance effects (Mitchell *et al*., 2011b).

Fifth, we do not address all potential mechanisms whereby an individual can convince others to support him/her in the pursuit of opportunity. As noted previously, we recognize that charisma, expertise, trustworthiness, social skills, signaling, etc. (cf. Alvarez and Barney, 2005; Baron and Markman, 2003; Spence, 1973) can help individuals get buy-in from key stakeholders. For instance, while we find that individuals with low general human capital and high specific entrepreneurial human capital are most likely to benefit from knowledge codification in reducing decision incongruence, so too might they *partially* benefit from signals that can stem from their high specific entrepreneurial human capital—partially because at the same time they lack general human capital, which would send an opposite signal (cf. Spence, 1973, 2002). Along similar lines, finance theory suggests that a CEO's financing decisions can signal the value of the information possessed to potential stakeholders (e.g., Flannery, 1986) and thereby relieve the CEO of a need to explicitly communicate anything at all (e.g., Myers and Majluf, 1984). More research is needed to understand the boundaries of when decision incongruence matters (e.g., Bingham *et al*., 2007) and when it does not (e.g., Myers and Majluf, 1984).

Sixth, the research participants in this study were CEOs at technology companies (both high tech and low tech) in one geographical area, thereby limiting the generalizability of the results to these types of companies in the Midwestern United States. Therefore, future research is needed to understand whether decision incongruence and the mechanisms to reduce it also apply to other types of businesses (e.g., service companies) in other geographical areas. Additionally, because the majority of decision makers in our study were men (representative of the larger population of decision makers from which we sampled), there are added limits to the generalizability of our findings. Future research should, consequently, seek to better understand how gender may influence decision incongruence in strategic opportunity pursuit.

CONCLUSION

In this article, we set out to understand why some decision makers might have greater decision incongruence in strategic opportunity pursuit than others. Using theory from research on capabilities and decision making, we examined how the configuration of knowledge codification, general human capital, and specific entrepreneurial human capital affects CEOs' decision incongruence in strategic opportunity pursuit. We found that, indeed, knowledge codification decreases decision incongruence more for those CEOs who lack general human capital, but have specific entrepreneurial human capital, thus lending support to our configurational model.

ACKNOWLEDGEMENTS

We thank Jay Barney and three anonymous reviewers for their insightful and helpful feedback on earlier versions of our manuscript. Likewise, we thank Lowell Busenitz and James Oldroyd for their similarly helpful feedback. We also acknowledge and thank the Johnson Center for Entrepreneurship and Innovation at Indiana University for its generous support of this research. An earlier

DOI: 10.1002/sej

version of this article was presented at the Babson Entrepreneurship Research Conference.

REFERENCES

Alavi M, Leidner DE. 2001. Knowledge management and knowledge management systems: conceptual foundations and research issues. *MIS Quarterly* **25**(1): 107–136.

Alvarez SA, Barney JB. 2005. How do entrepreneurs organize firms under conditions of uncertainty? *Journal of Management* **31**(5): 776–793.

Alvarez SA, Barney JB. 2008. Opportunities, organizations, and entrepreneurship. *Strategic Entrepreneurship Journal* **2**(3): 171–173.

Alvarez SA, Busenitz LW. 2001. The entrepreneurship of resource-based theory. *Journal of Management* **27**: 755–775.

Amit R, Schoemaker PJH. 1993. Strategic assets and organizational rent. *Strategic Management Journal* **14**(1): 33–46.

Argyris C. 1976. Single-loop and double-loop models in research on decision making. *Administrative Science Quarterly* **21**(3): 363–375.

Argyris C. 1977. Double loop learning in organizations. *Harvard Business Review* **55**(5): 115–125.

Argyris C, Schön DA. 1974. *Theory in Practice: Increasing Professional Effectiveness*. Jossey-Bass Publishers: San Francisco, CA.

Barney JB. 1986. Strategic factor markets: expectations, luck, and business strategy. *Management Science* **32**(10): 1231–1241.

Barney JB. 1991. Firm resources and sustained competitive advantage. *Journal of Management* **17**(1): 99–120.

Baron RA. 1998. Cognitive mechanisms in entrepreneurship: why and when entrepreneurs think differently than other people. *Journal of Business Venturing* **13**(4): 275–294.

Baron RA. 1999. Counterfactual thinking and venture formation: the potential effects of thinking about 'what might have been.' *Journal of Business Venturing* **15**: 79–91.

Baron RA. 2006. Opportunity recognition as pattern recognition: how entrepreneurs 'connect the dots' to identify new business opportunities. *Academy of Management Perspectives* **20**(1): 104–119.

Baron RA. 2007. Behavioral and cognitive factors in entrepreneurship: entrepreneurs as the active element in new venture creation. *Strategic Entrepreneurship Journal* **1**(1): 167–182.

Baron RA. 2009. Effectual versus predictive logics in entrepreneurial decision making: differences between experts and novices: does experience in starting new ventures change the way entrepreneurs think? Perhaps, but for now, 'caution' is essential. *Journal of Business Venturing* **24**(4): 310–315.

Baron RA, Ensley MD. 2006. Opportunity recognition as the detection of meaningful patterns: evidence from comparisons of novice and experienced entrepreneurs. *Management Science* **52**(9): 1331–1344.

Baron RA, Markman GD. 2003. Beyond social capital: the role of entrepreneurs' social competence in their financial success. *Journal of Business Venturing* **18**: 41–60.

Barringer BR, Bluedorn AC. 1999. The relationship between corporate entrepreneurship and strategic management. *Strategic Management Journal* **20**(5): 421–444.

Becker GS. 1964. *Human Capital*. National Bureau of Economic Research: New York.

Begley TM, Boyd DP. 1987. A comparison of entrepreneurs and managers of small business firms. *Journal of Management* **13**(1): 99–108.

Berman SL, Down J, Hill CWL. 2002. Tacit knowledge as a source of competitive advantage in the National Basketball Association. *Academy of Management Journal* **45**(1): 13–31.

Bingham CB, Eisenhardt KM. 2011. Rational heuristics: the 'simple rules' that strategists learn from process experience. *Strategic Management Journal* **32**(13): 1437–1464.

Bingham CB, Eisenhardt KM, Furr NR. 2007. What makes a process a capability? Heuristics, strategy, and effective capture of opportunities. *Strategic Entrepreneurship Journal* **1**(1/2): 27–47.

Bonner BL, Baumann MR. 2012. Leveraging member expertise to improve knowledge transfer and demonstrability in groups. *Journal of Personality and Social Psychology* **102**(2): 337–350.

Bourgeois LJ III, Eisenhardt KM. 1988. Strategic decision processes in high velocity environments: four cases in the microcomputer industry. *Management Science* **34**(7): 816–835.

Branch MC. 1961. Logical analysis and executive performance. *Academy of Management Journal* **4**(1): 27–31.

Brush CG, Greene PG, Hart MM. 2001. From initial idea to unique advantage: the entrepreneurial challenge of constructing a resource base. *Academy of Management Executive* **15**(1): 64–78.

Busenitz LW, Barney JB. 1997. Differences between entrepreneurs and managers in large organizations: biases and heuristics in strategic decision making. *Journal of Business Venturing* **12**: 9–30.

Campbell DT, Fiske DW. 1959. Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin* **56**: 81–105.

Campbell DT, Stanley JC. 1963. *Experimental and Quasi-Experimental Designs for Research*. Rand McNally: Chicago, IL.

Coff RW, Coff DC, Eastvold R. 2006. The knowledge-leveraging paradox: how to achieve scale without making knowledge imitable. *Academy of Management Review* **31**(2): 452–465.

Cohendet P, Meyer-Krahmer F. 2001. The theoretical and policy implications of knowledge codification. *Research Policy* **30**(9): 1563–1591.

DOI: 10.1002/sej

Collis DJ. 1994. How valuable are organizational capabilities? *Strategic Management Journal* **15**(8): 143–152.

Colombo MG, Grilli L. 2005. Founders' human capital and the growth of new technology-based firms: a competence-based view. *Research Policy* **34**(6): 795–816.

Cook TD, Campbell DT. 1979. *Quasi-Experimentation: Design and Analysis Issues for Field Settings*. Houghton Mifflin Company: Boston, MA.

Cooper AC, Daily CM. 1997. Entrepreneurial teams. In *Entrepreneurship 2000*, Sexton DL, Smilor RW (eds). Upstart Publishing: Chicago, IL; 127–150.

Cooper AC, Gimeno-Gascon J, Woo CY. 1994. Initial human and financial capital as predictors of new venture performance. *Journal of Business Venturing* **9**(5): 371–395.

Corbett AC. 2007. Learning asymmetries and the discovery of entrepreneurial opportunities. *Journal of Business Venturing* **22**(1): 97–118.

Cornelissen JP, Clarke JS. 2010. Imagining and rationalizing opportunities: inductive reasoning and the creation and justification of new ventures. *Academy of Management Review* **35**(4): 539–557.

Cowan R. 2001. Expert systems: aspects of and limitations to the codifiability of knowledge. *Research Policy* **30**(9): 1355–1372.

Cowan R, David PA, Foray D. 2000. The explicit economics of knowledge codification and tacitness. *Industrial and Corporate Change* **9**(2): 211–253.

Cowan R, Foray D. 1997. The economics of codification and the diffusion of knowledge. *Industrial and Corporate Change* **6**(3): 595–622.

Davidsson P, Honig B. 2003. The role of social and human capital among nascent entrepreneurs. *Journal of Business Venturing* **18**: 301–331.

Dess GG, Lumpkin GT. 2005. The role of entrepreneurial orientation in stimulating effective corporate entrepreneurship. *Academy of Management Executive* **19**(1): 147–156.

Dew N, Read S, Sarasvathy SD, Wiltbank R. 2009. Effectual versus predictive logics in entrepreneurial decision-making: differences between experts and novices. *Journal of Business Venturing* **24**(4): 287–309.

Dierickx I, Cool K. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science* **35**(12): 1504–1511.

Dimov DP, Shepherd DA. 2005. Human capital theory and venture capital firms: exploring 'home runs' and 'strike outs.' *Journal of Business Venturing* **20**(1): 1–21.

Eisenhardt KM. 1989. Making fast strategic decisions in high-velocity environments. *Academy of Management Journal* **32**(3): 543–576.

Ericsson KA, Simon HA. 1980. Verbal reports as data. *Psychological Review* **87**: 215–251.

Felin T, Hesterly WS. 2007. The knowledge-based view, nested heterogeneity, and new value creation: philosophical considerations on the locus of knowledge. *Academy of Management Review* **32**(1): 195–218.

Flannery MJ. 1986. Asymmetric information and risky debt maturity choice. *Journal of Finance* **41**(1): 19–37.

Floyd SW, Wooldridge B. 1999. Knowledge creation and social networks in corporate entrepreneurship: the renewal of organizational capability. *Entrepreneurship Theory and Practice* **23**(3): 123–143.

Forbes DP. 2005. Are some entrepreneurs more overconfident than others? *Journal of Business Venturing* **20**(5): 623–640.

Gartner WB, Shaver KG, Gatewood E, Katz JA. 1994. Finding the entrepreneur in entrepreneurship. *Entrepreneurship Theory and Practice* **18**(3): 5–9.

Gibbons R, Waldman M. 2004. Task-specific human capital. *American Economic Review* **94**(2): 203–207.

Gimeno J, Folta TB, Cooper AC, Woo CY. 1997. Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative Science Quarterly* **42**(4): 750–783.

Gordon SE. 1992. Implications of cognitive theory for knowledge acquisition. In *The Psychology of Expertise: Cognitive Research and Empirical AI*, Hoffman RR (ed). Springer-Verlag: New York; 99–120.

Green PE, Srinivasan V. 1990. Conjoint analysis in marketing: new developments with implications for research and practice. *Journal of Marketing* **54**(4): 3–19.

Grimaldi R, Torrisi A. 2001. Codified-tacit and general-specific knowledge in the division of labour among firms: a study of the software industry. *Research Policy* **30**(9): 1425–1442.

Hackner E, Hisrich RD. 2001. A golden era for entrepreneurship and entrepreneurial finance research. *Venture Capital* **3**(2): 85–89.

Hahn G, Shapiro S. 1966. *A Catalogue and Computer Program for the Design and Analysis of Orthogonal Symmetric and Asymmetric Fractional Factorial Designs*. General Electric Corporation: Schenectady, NY.

Hall R. 1993. A framework linking intangible resources and capabilities to sustainable competitive advantage. *Strategic Management Journal* **14**(8): 607–618.

Harrison GW, List JA. 2004. Field experiments. *Journal of Economic Literature* **42**(4): 1009–1055.

Hayek FA. 1945. The use of knowledge in society. *American Economic Review* **35**(4): 519–530.

Haynie JM, Shepherd DA, McMullen JS. 2009. An opportunity for me? The role of resources in opportunity evaluation decisions. *Journal of Management Studies* **46**(3): 337–361.

Hedlund G. 1994. A model of knowledge management and the N-form corporation. *Strategic Management Journal*, Summer Special Issue **15**: 73–90.

Hill RC, Levenhagen M. 1995. Metaphors and mental models: sensemaking and sensegiving in innovative and entrepreneurial activities. *Journal of Management* **21**(6): 1057–1074.

DOI: 10.1002/sej

Hirokawa RY, Erbert L, Hurst A. 1996. Communication and group decision-making effectiveness. In *Communication and Group Decision Making*, Hirokawa RY, Poole MS (eds). SAGE Publications: Thousand Oaks, CA; 269–300.

Hitt MA, Ireland RD, Camp SM, Sexton DL. 2001. Strategic entrepreneurship: entrepreneurial strategies for wealth creation. *Strategic Management Journal* **22**(6/7): 479–491.

Hoopes DG, Postrel S. 1999. Shared knowledge, 'glitches,' and product development performance. *Strategic Management Journal* **20**(9): 837–865.

Huck SW, McLean RA. 1975. Using a repeated measures ANOVA to analyze the data from a pretest-posttest design: a potentially confusing task. *Psychological Bulletin* **82**(4): 511–518.

Hughes GD. 1990. Managing high-tech product cycles. *Academy of Management Executive* **4**(2): 44–55.

Jelinek M, Litterer JA. 1995. Toward entrepreneurial organizations: meeting ambiguity with engagement. *Entrepreneurship Theory and Practice* **19**(3): 137–168.

Kerlinger FN. 1986. *Foundations of Behavioral Research*. Holt, Rinehart and Winston, Inc.: Fort Worth, TX.

Kogut B, Zander U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science* **3**(3): 383–397.

Kor YY. 2003. Experience-based top management team competence and sustained growth. *Organization Science* **14**(6): 707–719.

Krueger NF. 1993. The impact of prior entrepreneurial exposure on perceptions of new venture feasibility and desirability. *Entrepreneurship Theory and Practice* **18**(1): 5–21.

Krueger NF, Brazeal DV. 1994. Entrepreneurial potential and potential entrepreneurs. *Entrepreneurship Theory and Practice* **18**(3): 91–104.

Krueger NF, Reilly MD, Carsrud AL. 2000. Competing models of entrepreneurial intentions. *Journal of Business Venturing* **15**(5/6): 411–432.

Lazaric N, Mangolte PA, Massue ML. 2003. Articulation and codification of collective know-how in the steel industry: evidence from blast furnace control in France. *Research Policy* **32**(10): 1829–1847.

Leiblein MJ. 2011. What do resource- and capability-based theories propose? *Journal of Management* **37**(4): 909–932.

Lichtenstein BB, Carter NM, Dooley KJ, Gartner WB. 2007. Complexity dynamics of nascent entrepreneurship. *Journal of Business Venturing* **22**(2): 236–261.

Louviere JJ. 1988. *Analyzing Decision Making: Metric Conjoint Analysis*. SAGE Publications: Newbury Park, CA.

Marvel MR, Lumpkin GT. 2007. Technology entrepreneurs' human capital and its effects on innovation radicalness. *Entrepreneurship Theory and Practice* **31**(6): 807–828.

McGrath RG, MacMillan IC, Scheinberg S. 1992. Elitists, risk-takers, and rugged individualists? An exploratory analysis of cultural differences between entrepreneurs and non-entrepreneurs. *Journal of Business Venturing* **7**(2): 115–135.

McGrath RG, Nerkar A. 2004. Real options reasoning and a new look at the R&D investment strategies of pharmaceutical firms. *Strategic Management Journal* **25**(1): 1–21.

McMullen JS, Shepherd DA. 2006. Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Academy of Management Review* **31**(1): 132–152.

McNatt DB, Judge TA. 2004. Boundary conditions of the Galatea Effect: a field experiment and constructive replication. *Academy of Management Journal* **47**(4): 550–565.

Mieg HA. 2001. *The Social Psychology of Expertise*. Lawrence Erlbaum Associates: Mahwah, NJ.

Miller CC, Ireland RD. 2005. Intuition in strategic decision making: friend or foe in the fast-paced 21st century? *Academy of Management Executive* **19**(1): 19–30.

Mintzberg H, Raisinghani D, Théorêt A. 1976. The structure of 'unstructured' decision processes. *Administrative Science Quarterly* **21**(2): 246–275.

Mitchell JR, Friga PN, Mitchell RK. 2005. Untangling the intuition mess: intuition as a construct in entrepreneurship research. *Entrepreneurship Theory and Practice* **29**(6): 653–679.

Mitchell JR, Shepherd DA. 2010. To thine own self be true: images of self, images of opportunity, and entrepreneurial action. *Journal of Business Venturing* **25**(1): 138–154.

Mitchell JR, Shepherd DA, Sharfman MP. 2011a. Erratic strategic decisions: when and why managers are inconsistent in strategic decision making. *Strategic Management Journal* **32**(7): 683–704.

Mitchell RK, Randolph-Seng B, Mitchell JR. 2011b. Socially situated cognition: imagining new opportunities for entrepreneurship research (dialogue). *Academy of Management Review* **36**(4): 774–776.

Mitchell RK, Smith JB, Morse EA, Seawright KW, Peredo AM, McKenzie B. 2002. Are entrepreneurial cognitions universal? Assessing entrepreneurial cognitions across cultures. *Entrepreneurship Theory and Practice* **26**(4): 9–32.

Myers SC, Majluf NS. 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics* **13**(2): 187–221.

Nelson RR, Winter SG. 1982. *An Evolutionary Theory of Economic Change*. Belknap Press: Cambridge, MA.

Neter J, Kutner MH, Nachtsheim CJ, Wasserman W. 1996. *Applied Linear Statistical Models*. WCB/McGraw-Hill: Boston, MA.

Nisbett RE, Wilson TD. 1977. Telling more than we can know: verbal reports on mental processes. *Psychological Review* **84**(3): 231–259.

Nonaka I. 1994. A dynamic theory of organizational knowledge creation. *Organization Science* **5**(1): 14–37.

Nutt PC. 1998. How decision makers evaluate alternatives and the influence of complexity. *Management Science* **44**(8): 1148–1166.

Osterloh M, Frey BS. 2000. Motivation, knowledge transfer, and organizational forms. *Organization Science* **11**(5): 538–550.

Patzelt H. 2010. CEO human capital, top management teams, and the acquisition of venture capital in new technology ventures: an empirical analysis. *Journal of Engineering and Technology Management* **27**(3/4): 131–147.

Pennings JM, Lee K, van Witteloostuijn A. 1998. Human capital, social capital, and firm dissolution. *Academy of Management Journal* **41**(4): 425–440.

Peteraf MA. 1993. The cornerstones of competitive advantage: a resource-based view. *Strategic Management Journal* **14**(3): 179–191.

Poole MS, Seibold DR, McPhee RD. 1996. The structuration of group decisions. In *Communication and Group Decision Making*, Hirokawa RY, Poole MS (eds). SAGE Publications: Thousand Oaks, CA; 114–146.

Preisendörfer P, Voss T. 1990. Organizational mortality of small firms: the effects of entrepreneurial age and human capital. *Organization Studies* **11**(1): 107–129.

Priem RL. 1992. An application of metric conjoint analysis for the evaluation of top managers' individual strategic decision making processes: a research note. *Strategic Management Journal,* Summer Special Issue **13**: 143–151.

Priem RL, Harrison DA. 1994. Exploring strategic judgment: methods for testing the assumptions of prescriptive contingency theories. *Strategic Management Journal* **15**(4): 311–324.

Sabini J, Silver M. 1981. Introspection and causal accounts. *Journal of Personality and Social Psychology* **40**(1): 171–179.

Sarasvathy SD. 2004. The questions we ask and the questions we care about: reformulating some problems in entrepreneurship research. *Journal of Business Venturing* **19**(5): 707–717.

Shane S. 2000. Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science* **11**: 448–469.

Shane S, Venkataraman S. 2000. The promise of entrepreneurship as a field of research. *Academy of Management Review* **25**(1): 217–226.

Shepherd DA. 1999. Venture capitalists' introspection: a comparison of 'in use' and 'espoused' decision policies. *Journal of Small Business Management* **37**(2): 76–87.

Shepherd DA, Zacharakis AL. 1997. Conjoint analysis: a window of opportunity for entrepreneurship research. In *Advances in Entrepreneurship, Firm Emergence and Growth*, Katz JA (ed). JAI Press: Greenwich, CT; 203–248.

Simon HA. 1987. Making management decisions: the role of intuition and emotion. *Academy of Management Executive* **1**: 57–64.

Smith ER, Miller FD. 1978. Limits on perception of cognitive processes: a reply to Nisbett and Wilson. *Psychological Review* **85**(4): 355–362.

Smith ER, Semin GR. 2004. Socially situated cognition: cognition in its social context. In *Advances in Experimental Social Psychology*, Zanna MP (ed). Academic Press: San Diego, CA; 53–117.

Spence M. 1973. Job market signaling. *The Quarterly Journal of Economics* **87**(3): 355–374.

Spence M. 2002. Signaling in retrospect and the informational structure of markets. *American Economic Review* **92**(3): 434–459.

Stahl MJ, Zimmerer TW. 1984. Modeling strategic acquisition policies: a simulation of executives' acquisition decisions. *Academy of Management Journal* **27**(2): 369–383.

Stenmark D. 2001. Leveraging tacit organization knowledge. *Journal of Management Information Systems* **17**(3): 9–24.

Stone MM, Brush CG. 1996. Planning in ambiguous contexts: the dilemma of meeting needs for commitment and demands for legitimacy. *Strategic Management Journal* **17**(8): 633–652.

Szulanski G. 1996. Exploring internal stickiness: impediments to the transfer of best practice within the firm. *Strategic Management Journal*, Winter Special Issue **17**: 27–43.

Teece DJ. 2007. Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal* **28**(13): 1319–1350.

Teece DJ, Pisano G, Shuen A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* **18**(7): 509–533.

van Dijk E, de Kwaadsteniet EW, De Cremer D. 2009. Tacit coordination in social dilemmas: the importance of having a common understanding. *Journal of Personality and Social Psychology* **96**(3): 665–678.

Venkataraman S. 1997. The distinctive domain of entrepreneurship research. In *Advances in Entrepreneurship, Firm Emergence and Growth*, Katz JA (ed). JAI Press: Greenwich, CT; 119–138.

Viswesvaran C, Barrick MR. 1992. Decision-making effects on compensation surveys: implications for market wages. *Journal of Applied Psychology* **77**(5): 588–597.

Von Hippel E. 1994. 'Sticky information' and the locus of problem solving: implications for innovation. *Management Science* **40**(4): 429–439.

Weick KE, Sutcliffe KM, Obstfeld D. 2005. Organizing and the process of sensemaking. *Organization Science* **16**(4): 409–421.

Wernerfelt B. 1984. A resource-based view of the firm. *Strategic Management Journal* **5**(2): 171–180.

West GP III. 2007. Collective cognition: when entrepreneurial teams, not individuals, make decisions. *Entrepreneurship Theory and Practice* **31**(1): 77–102.

DOI: 10.1002/sej

White P. 1980. Limitations on verbal reports of internal events: a refutation of Nisbett and Wilson and of Bem. *Psychological Review* **87**(1): 105–112.

White PA. 1988. Knowing more about what we can tell: 'introspective access' and causal report accuracy 10 years later. *British Journal of Psychology* **79**(1): 13–45.

Wilson TD, Kraft D. 1990. The disruptive effects of self-reflection: implications for survey research. *Advances in Consumer Research* **17**(1): 212–216.

Winter SG. 1987. Knowledge and competence as strategic assets. In *The Competitive Challenge: Strategies for Industrial innovation and Renewal*, Teece DJ (ed). Ballinger: Cambridge, MA; 137–158.

Winter SG. 2003. Understanding dynamic capabilities. *Strategic Management Journal* **24**(10): 991–995.

Wright M, Hmieleski KM, Siegel DS, Ensley MD. 2007. The role of human capital in technological entrepreneurship. *Entrepreneurship Theory and Practice* **31**(6): 791–806.

Wright P, Rip PD. 1981. Retrospective reports on the causes of decisions. *Journal of Personality and Social Psychology* **40**(4): 601–614.

Zacharakis A, Meyer GD. 1998. A lack of insight: do venture capitalists really understand their own decision process? *Journal of Business Venturing* **13**(1): 57–76.

Zahra SA, Covin JG. 1995. Contextual influences on the corporate entrepreneurship-performance relationship: a longitudinal analysis. *Journal of Business Venturing* **10**(1): 43–58.

Zahra SA, Sapienza HJ, Davidsson P. 2006. Entrepreneurship and dynamic capabilities: a review, model, and research agenda. *Journal of Management Studies* **43**(4): 917–955.

Zander U, Kogut B. 1995. Knowledge and the speed of the transfer and imitation of organizational capabilities: an empirical test. *Organization Science* **6**(1): 76–92.

Zarutskie R. 2010. The role of top management team human capital in venture capital markets: evidence from first-time funds. *Journal of Business Venturing* **25**(1): 155–172.

Zollo M, Winter SG. 2002. Deliberate learning and the evolution of dynamic capabilities. *Organization Science* **13**(3): 339–351.

APPENDIX A

Decision task instructions, definition of terms, example opportunity

Instructions

As the head of a company in a technology-related industry, you are ideally qualified to make decisions about whether or not to invest in potential opportunities. In this part of the study, you will be asked to evaluate a series of hypothetical opportunities. Your task is to decide whether or not to invest in the full-scale exploitation of each opportunity. When making these decisions assume that:

- O*ther than the information provided in the profiles*, the hypothetical opportunities presented are assumed to be similar to other entrepreneurial opportunities you have 'seen' in all respects;
- You have the resources (or access to the resources) to invest in an opportunity, if you choose to do so;
- You are making decisions about these opportunities for your current firm; and
- You are making decisions about these opportunities in the current industry and economic environment.

I also ask that you consider each profile as a separate decision, independent of all the others—please do not refer back to profiles already completed.

For each and every profile, refer to the definitions on the following page and use your expertise to make the requested decision.

Important notes

It is important that you respond to all questions, as incomplete surveys cannot be included in the statistical analyses.

Again, please be assured that your individual responses will remain anonymous and completely confidential. No reference will be made, in any report or publication, to individual responses in a way that would enable the identification of any respondent.

DOI: 10.1002/sej

DESCRIPTION OF TERMS

Higher potential value of an opportunity: The predicted profit from investment in the full-scale exploitation of this potential opportunity is higher than other opportunities you have successfully pursued after the predicted expenses (i.e., time, money, and effort) have been taken into account.

Lower potential value of an opportunity: The predicted profit from investment in the full-scale exploitation of this potential opportunity is lower than other opportunities you have successfully pursued after the predicted expenses (i.e., time, money, and effort) have been taken into account.

High knowledge relatedness of an opportunity: The knowledge that is necessary to exploit this potential opportunity is very similar to the knowledge that you already possess.

Low knowledge relatedness of an opportunity: The knowledge that is necessary to exploit this potential opportunity is very different from the knowledge that you already possess.

Wide window of opportunity availability: The next six months are free from changing conditions in the environment that will considerably shorten the length of time available to profitably invest in this potential opportunity.

Narrow window of opportunity availability: The next six months will bring about changes in the environment that will considerably shorten the length of time available to profitably invest in this potential opportunity.

Many potential opportunities: There are several potential opportunities with unknown potential value, knowledge relatedness, and opportunity windows that you could choose to invest in and exploit.

Few potential opportunities: There is one potential opportunity that you could choose to invest in and exploit, the potential value, knowledge relatedness, and opportunity windows of which are given in the opportunity profile.

EXAMPLE OPPORTUNITY*

1. **Potential value of an opportunity** - **higher**
2. **Knowledge relatedness of an opportunity** - **high**
3. **Window of opportunity availability** - **narrow**
4. **Number of potential opportunities** - **many**

Likelihood of commitment

Based on the above opportunity attributes, how would you rate the likelihood that you would invest in fully exploiting this potential opportunity?

Very unlikely to invest in this potential opportunity	1	2	3	4	5	6	7	8	9	Very likely to invest in this potential opportunity

*Note: While the same four attributes were included for all hypothetical opportunities, the levels of these attributes varied (e.g., low knowledge relatedness versus high knowledge relatedness). These high/low levels were then quantified (–0.5/0.5) and used as independent variables in the individual regressions to capture actual decision making about strategic opportunity pursuit.

DOI: 10.1002/sej

APPENDIX B

Decision incongruence illustration

We illustrate how decision incongruence is calculated using one of our cases (at Time 1 [T1] only) for reference. As noted in the text, we begin with the CEO's actual T1 decision making (regression equation) and the CEOs T1 conveyed decision making (self-report scores).

Starting point: For each CEO, determine usable T1 β's ($p < 0.05$) and T1 self-report weights

T1 Regression weights and significance

T1 β		**T1 Significant β**
$\beta_1 = 0.873^*$	→	$\beta_1 = 0.873$
$\beta_2 = 0.404^*$	→	$\beta_2 = 0.404$
$\beta_3 = 0.106^*$	→	$\beta_3 = 0.106$
$\beta_4 = -0.192^*$	→	$\beta_4 = -0.192$
$\beta_5 = 0.106^*$	→	$\beta_5 = 0.106$
$\beta_6 = -0.021$		n.s.
$\beta_7 = -0.064$		n.s.

*$p < 0.05$

Matching T1 self-report scores

Actual decision making total variance:	1.681
T1 Self-report (paired w/ β)	**Score**
1 (Conveyed score for β_1)	100
2 (Conveyed score for β_2)	65
3 (Conveyed score for β_3)	20
4 (Conveyed score for β_4)	–40
5 (Conveyed score for β_5)	none
6 (Conveyed score for β_6)	none
7 (Conveyed score for β_7)	none

Step 1: Sum the *absolute values* of the T1 β's; sum the *absolute values* of the T1 self-report scores

Actual decision making total effect:	1.681

Conveyed total effect:	225

Step 2: Divide each significant T1 actual score (T1 β's) by the total actual decision-making effect; divide each T1 conveyed score (T1 self-report score) by the total conveyed effect

β_1	0.873/1.681=	0.519
β_2	0.404/1.681=	0.240
β_3	0.106/1.681=	0.063
β_4	–0.192/1.681=	–0.114
β_5	0.106/1.681=	0.063

1	100/225=	0.444
2	65/225=	0.289
3	20/225=	0.089
4	–40/225=	–0.178

Step 3: Subtract the conveyed number for each attribute from the corresponding actual decision number and sum the absolute values of each difference, resulting in a measure of T1 decision incongruence

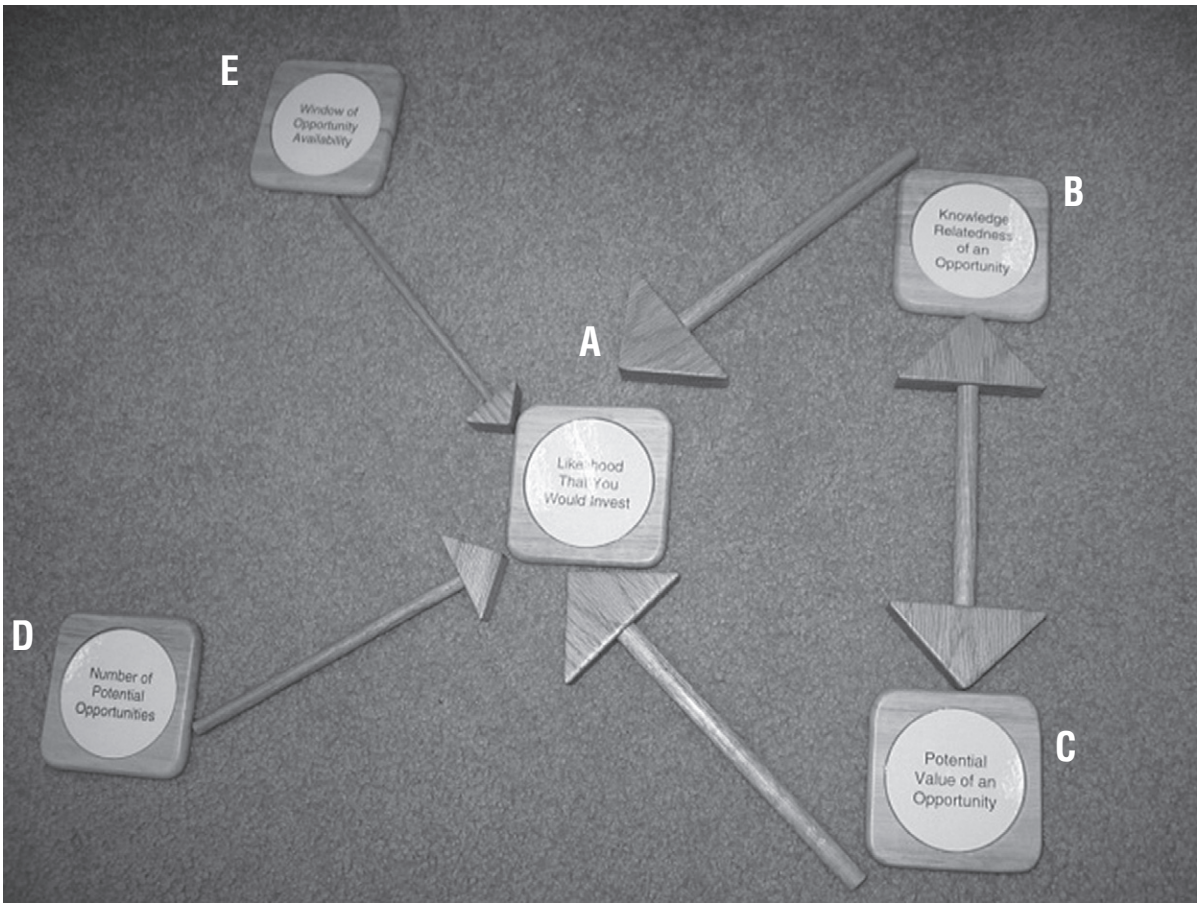
Actual	0.519	0.240	0.063	–0.114	0.063		**T1 decision incongruence**
-Conveyed	0.444	0.289	0.089	–0.178	-		
Total	**|0.075|**	**|–0.049|**	**|–0.026|**	**|0.064|**	**|0.063|**	**=**	***0.276***

DOI: 10.1002/sej

APPENDIX C

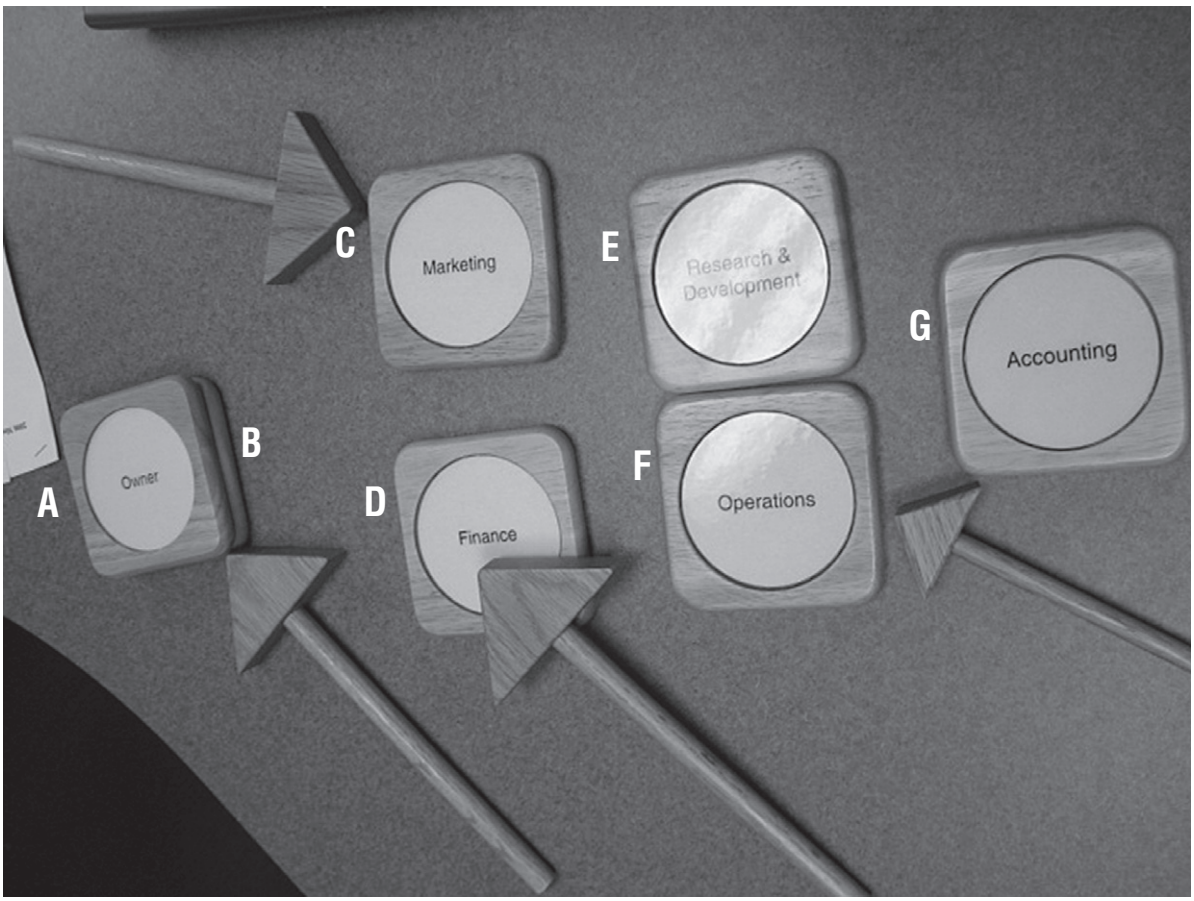
Experimental and control condition illustrations

Experimental condition illustration



DOI: 10.1002/sej

Control condition illustration



DOI: 10.1002/sej