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Australian Journal of Management 2013 38: 191 originally published online 1 June 2012

DOI: 10.1177/0312896212444114

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Australian Journal of Management
38(1) 191–215

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DOI: 10.1177/0312896212444114

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Abstract

Many scholars see entrepreneurs as action-oriented individuals who use rules of thumb and other mental heuristics to make decisions, but who do little systematic planning and analysis. We argue that what distinguishes successful from unsuccessful entrepreneurs is precisely that the former vary their decision-making styles, sometimes relying on heuristics and sometimes relying on systematic analysis. In our proposed framework, successful entrepreneurs assess their level of expertise and the level of ambiguity in a particular decision context and then tailor their decision-making process to reduce risk.

Keywords

entrepreneurial decision making, entrepreneurial risk taking, new ventures, performance, theory

I. Introduction

Entrepreneurs are widely seen as ‘seat-of-the-pants’, ‘intuitive’, and ‘opportunistic’ decision makers. They are also seen as people with a high propensity to take risks (Busenitz and Barney, 1997; Lumpkin and Dess, 1996; Palich and Bagby, 1995; Schendel, 2007; Stewart and Roth, 2001). This perception arises in part because the popular press mythologizes successful entrepreneurs as having prevailed against the odds by intuitively jumping onto the right opportunity at the right time (Mitchell, 1997). The general public is led to believe that successful entrepreneurs are simply willing to take greater risks than the average person in society. Drawing on these widely disseminated heroic tales of entrepreneurs, many researchers of entrepreneurship have made the theoretical assumption that successful entrepreneurs are successful not because they adopt better decision processes but because they seize whatever opportunities come their way (Delmar and Shane, 2003). Some scholars have called into question the empirical evidence to support these views on

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entrepreneurial risk taking (Miner and Raju, 2004) and entrepreneurial decision making (Forbes, 2007; Miller, 2007).

Why is it, then, that the scholarly literature on entrepreneurs sees a strong connection between opportunistic, intuitive, ad hoc decision making and risk-taking behavior (Busenitz, 1999)? A large number of the scholars have concluded that rational and comprehensive approaches to decision making consume scarce resources that are not available in entrepreneurial contexts, and that their absence necessarily leads to more risky decisions. These scholars acknowledge that decision-making processes that devote the necessary resources to discover all the different options and that weigh the relative costs, benefits, and risks associated with each option are useful in stable environments where information is readily available. But they stress that the entrepreneurial decision makers face a fundamentally different context: the entrepreneur compared to many established firms has limited resources and has to cope with numerous ambiguities and uncertainties that even the most comprehensive decision-making process could never fully remove. An extensive literature on entrepreneurial cognition has emerged that is dedicated to exploring precisely the “knowledge structures that [entrepreneurs] use to make assessments, judgments or decisions involving opportunity evaluation and venture creation and growth” (Mitchell et al., 2002: 97; see also Mitchell et al., 2007). Based on these considerations, many scholars (e.g. Bhidé, 2000; Pascale, 1984) have arrived at the view that entrepreneurs have no choice but to engage in intuitive/ad hoc decisions that will invariably lead to more risk taking.

We enrich this view, suggesting that systematic and rational decision making can be useful in entrepreneurial contexts (Gruber, 2007; Miller, 2007). While we agree that an entrepreneur frequently faces a decision context characterized by more ambiguity and higher uncertainty (Miller, 2007), we argue that in many contexts following a systematic and rational approach to decision making makes it possible to remove some of the ambiguities and uncertainties in the context and thereby reduce the objective risk the entrepreneur is taking. Granted, thinking through different courses of actions will not remove all the possible surprises the entrepreneur will encounter (McGrath and MacMillan, 2000). But it will help to reduce them or at minimum help to prepare for them (Russo and Schoemaker, 2002: 102).

We argue, therefore, that *successful* entrepreneurs, in contrast to their unsuccessful counterparts, are not more prone to deliberate high risk-taking behaviors; they follow what Sull (2004) has called ‘disciplined entrepreneurship.’ Building on Baron (2004) who noted that successful entrepreneurs cognitively are better able to appraise the objective risk in ventures, we argue that successful entrepreneurs systematically reduce risk, using different decision-making processes in line with the requirement of the situation. We propose a framework that identifies two dimensions that lead to higher or lower risk for the decision maker. They are the *level of expertise* the decision maker has with the particular context and the *level of ambiguity* in the business context.

We then argue that successful entrepreneurs assess the amount of ambiguity inherent in the situation and their own level of expertise in regard to a particular decision situation. Based on this evaluation, successful entrepreneurs select the type of decision process best suited to reduce the level of risk inherent in pursuing a particular action. A key contribution of the paper is to spell out what specific decision-making styles lead to the best decision outcomes under the four generic conditions. We believe that this framework captures more accurately how on average successful entrepreneurs actually make decisions, and that it will open up fruitful new avenues for empirical research.

To develop our thesis we proceed as follows: we first review in more detail the literature on entrepreneurial decision making and entrepreneurial risk taking. We classify the entire literature into what we call the Intuitive View and the Rational View of entrepreneurial decision making.

By highlighting the differences between these two research streams, we identify the need for a more integrated approach. Following this, we develop a framework that identifies four different styles of entrepreneurial decision making. We propose that, depending on the level of ambiguity inherent in the context and the level of expertise a decision maker has with that context, a successful entrepreneur chooses the appropriate style for the particular context. We illustrate the four different styles of decision making with examples. We conclude the article by discussing how to operationalize and validate the framework.

2. *Entrepreneurial decision making and risk taking*

A review of the literature on entrepreneurial decision making reveals that there are two broad views of the processes that entrepreneurs use to make decisions (Gruber, 2007). Many scholars see entrepreneurs as making intuitive, ad hoc decisions, and taking greater risks than the average person. A smaller number of scholars see entrepreneurs as taking a systematic and rational approach to decision making. We will first lay out the two views and then evaluate their relative merits. From this, we conclude that a framework that explains the success of entrepreneurs based on their decision-making approach needs to integrate the existing approaches and to relate the decision-making process to the decision outcomes. We also conclude that such a framework needs to acknowledge that one universal decision-making process is not best suited for all the different contexts faced by entrepreneurs. Before we move to discuss the two major views on entrepreneurial decision making, it is useful to give a brief overview of the different meanings of the terms 'risk', 'ambiguity' and 'uncertainty' in the literature and clarify how we employ the terms in this article.

2.1 *Defining risk, uncertainty, and ambiguity*

The distinction between risk and uncertainty that economists attribute to Frank Knight (2002 [1921]) has influenced many fields. Knightian risk is a situation in which all possible outcomes are known and precise probabilities for each outcome are available to guide decision making (Runde 1998). A person playing roulette is a good example of such a situation. Uncertainty, by contrast, is a situation where all possible outcomes are known but the probabilities associated with particular outcomes cannot be determined precisely (Runde, 1998). While we follow economists in the use of the term uncertainty, we attach a different meaning to the term 'risk' and employ the term 'ambiguity' to signify a source of ignorance that is not captured in how economists typically use the term 'uncertainty.' We will now discuss why we use a different definition of risk and feel compelled to introduce the term 'ambiguity' to develop a deeper understanding of entrepreneurial decision making.

Following March and Shapira (1987) and Dowling (1986) in our definition of risk, we conceptualize risk not only in terms of the likelihood that an event will come about (Knightian risk) but also in terms of the impact the event can have. An example can differentiate clearly between our definition of risk and Knightian risk. Imagine a person who faces two investment alternatives: (1) Invest ten dollars with a 50 percent chance of making \$100 and 50 percent chance of losing the entire investment. (2) Invest one million dollars, with a 50 percent chance of making ten million dollars and 50 percent of losing the entire investment. While the likelihood of winning is the same in both investment options (the Knightian risk is equivalent), the investor, according to our definition, faces much greater risk in the second option because one million dollars rather than 10 dollars can be lost. Furthermore, the impact of losing one million dollars is much higher for a person whose total assets amount only to one million dollars than for a person whose net assets are one

billion dollars. The first person would lose everything whereas the second person would lose a small fraction of his/her total wealth. This is precisely why the early venture capitalists in the US were rich families such as the Rockefellers, Vanderbilts and Whitneys (Lerner, 2009) who could afford to lose non-trivial sums of money and still be phenomenally rich. For this reason, our arguments that successful entrepreneurs try to reduce risk compared to their unsuccessful counterparts should always be interpreted as holding constant the level of wealth of the entrepreneurs being compared.

Forbes (2007) uses the term 'ambiguity' to refer to what economists call Knightian uncertainty. We believe entrepreneurs frequently are not merely uncertain about the probabilities associated with the possible outcomes as emphasized by the economists' term 'uncertainty'; they frequently don't even know the range of possible outcomes. Therefore we define ambiguity as those situations in which the full range of outcome options is currently not known (not necessarily unknowable) and probabilities that particular options will occur are also not known. This means that the decision maker frequently experiences ambiguity about the consequences that might flow from taking a particular action.

To help the reader see how our definitions of the risk, uncertainty, and ambiguity relate to the use of the terms in different academic fields, we list the most prominent uses across fields and our use of the terms in Table 1. With a clear definition of how we employ the three terms in this article, we now review the literature on entrepreneurial decision making.

2.2 The Intuitive View of entrepreneurial decision making

Over the two past decades, an increasing number of scholars have focused on the cognitive processes that underpin entrepreneurial decision making (Busenitz, 1999; Keh et al., 2002; Mitchell et al., 2007). Many researchers have characterized the process as *ad hoc*, opportunistic, intuitive, oriented toward action rather than analysis (Delmar and Shane, 2003), and, consequently, as leading to more risky decisions. The story of Bill Gates and Paul Allen, who created Microsoft in 1975 to sell software they had written, is typical of the cases used to illustrate this view (see Bhidé, 1994). In 1980 the pair seized the opportunity to make the operating system for the IBM PC. Lacking time and ability to deliver the operating system from scratch, Gates and Allen shifted their development approach and bought an existing operating system from Seattle Computer Products to modify it into what became the ubiquitous MS-DOS. Bhidé reports that Gates had a track record of switching product specifications and moving developers around. Microsoft became a multibillion-dollar company not because Gates and Allen systematically thought about an innovative product, but because they grabbed opportunities that came their way and seemed appealing (Bhidé, 1994). In testimony to the prevalence of this view of decision making, Mintzberg and Lampel (1999: 22) note that the entrepreneurial school of decision making sees the process as being intuitive, opportunistic, and devoid of a systematic approach. Many scholars such as Frese et al. (2000) regard *opportunistic* strategies as being synonymous with what Mintzberg and Lampel (1999) called the *entrepreneurial* mode of strategizing. Proponents of this view have provided limited empirical and inferential support for it.

Scholars typically argue that entrepreneurs act opportunistically and intuitively rather than engage in systematic research and analysis because attempts to devise plans do not work in entrepreneurial contexts. Baker and Aldrich (cited in Baker et al., 2001), for example, found that most firms had created plans only to obtain financing and that, in most cases, these attempts failed. Similarly, Berman et al. (1997), on the basis of a survey of presidents of small business firms across different industries located in Massachusetts, found that 26 percent of the respondents

Table 1. Definitions of risk, uncertainty, and ambiguity across fields and in present article.

Field	Risk	Uncertainty	Ambiguity
Economics	Events are known and their probabilities are known as well. (Runde, 1998) [Example: Playing Roulette]	Uncertainty describes a situation when all possible events can be identified but it is impossible to assign precise probabilities to various possibilities (Runde, 1998)	
Decision making and behavioral sciences	<p>“Decision-making under risk can be viewed as a choice between prospects or gambles. A prospect $(x_1, p_1; \dots; x_n, p_n)$ [x stands for options and p stands for the associated probability] is a contract that yields outcome x_i with probability p_i, where $p_1 + p_2 + \dots + p_n = 1$.” (Kahneman and Tversky, 1979)</p>	Same as economics	<p>“Ambiguity refers to a particular type of uncertainty that often exists in decision making and judgment situations. Although all probability judgments reflect uncertainty, one can talk about the uncertainty of the probability judgment itself. . . . We define ambiguity as the subjective experience of missing information relevant to a prediction.” – Frisch and Baron (1988: 149–152)</p> <p>Ambiguity is “uncertainty about uncertainties.” + “ambiguity is an intermediate state between ignorance (no distributions are ruled out) and risk (all distributions but one are ruled out). Thus, ambiguity results from the uncertainty associated with specifying which of a set of distributions is appropriate in a given situation.” – Einhorn and Hogarth (1986: S227–S229)</p>

(Continued)

Table 1. (Continued)

Field	Risk	Uncertainty	Ambiguity
Marketing	<p>1) Perceived Risk = Uncertainty × Adverse Consequences. 2) Overall Perceived Risk = \sum Probability of Loss × Importance of Loss</p> <p>There are theoretical and practical arguments for selecting a multiplicative relationship between the uncertainty and adverse consequences components of risk, namely, that (1) the absence of either variable would eliminate risk, and (2) the influence of nonsalient adverse consequence on overall perceived risk is reduced. (Dowling, 1986: 199)</p>	Same as economics	<p>“... ambiguity is defined as uncertainty about the processes by which outcomes are determined, and has been characterized as uncertainty about the outcome probabilities themselves.” – Curley et al. (1986) in Forbes (2007: 367)</p>
Management and entrepreneurship	Same as economics	Same as economics	Same as economics
Management and Entrepreneurship	<p>March and Shapira (1987: 1407) state that majority of managers define risk as the amount they lose (or are expected to lose) rather than the probability distribution of the outcome.</p>	<p>“... under conditions of ‘uncertainty,’ decision makers are said to know the probabilities associated with a set of possible outcomes, even though they do not know exactly which outcome will occur.” – Forbes (2007: 367)</p> <p>(The term ‘uncertainty’ here is equivalent Knight’s term ‘risk.’)</p>	<p>“... ambiguity is defined as uncertainty about the processes by which outcomes are determined, and has been characterized as uncertainty about the outcome probabilities themselves.” – Curley et al. (1986) in Forbes (2007: 367)</p> <p>(The term ‘ambiguity’ is equivalent to the term ‘uncertainty’ in the economics literature.)</p>

(Continued)

Table 1. (Continued)

Field	Risk	Uncertainty	Ambiguity
The present article	Same as March and Shapira (1987) and Dowling (1986)	Same as economics	Our definition of ambiguity includes situations described by the term 'uncertainty' in the economics literature as well as those situations in which the full range outcome options are currently not known (not necessarily unknowable) and probabilities that particular options will obtain are also not known. This frequently leads options to possess multiple possible meanings for the decision maker.

engaged in planning, while 74 percent said they did not plan in a systematic manner. Dencker et al. (2009) conclude that planning does not lead to any benefit in entrepreneurial situations. Pascale (1984) reanalyzed the Boston Consulting Group (BCG) study of Honda Motors' successful move into the American motorcycle market. (The BCG study became the source material for many business school case studies, including some done at Harvard.) He argues that the decisions that made Honda a success in the USA were not made in a systematic manner but were of an ad hoc and opportunistic nature. The initial decision was made to deal with an overcapacity issue in the Japanese factory by selling Honda's standard motorbikes in the large US market. This decision led to failure because the standard Japanese bikes were not suited for long-distance travel on American roads. Later the firm accidentally discovered that small (50 cc) motorbikes were in demand in America and, once these small motorbikes were made available widely, they became a big success. In both cases the decisions came about opportunistically.

When entrepreneurs make decisions, according to the Intuitive View, they use their 'gut feeling' and take deliberative short cuts to get quickly into action. Allinson et al. (2000) find that successful entrepreneurs are more intuitive in their cognitive styles. Busenitz and Barney (1997) argue that entrepreneurs resort to heuristics and are driven by biases more often than managers because they have to deal more often with complex and uncertain environments where heuristics and biases are 'effective' approaches to decision making.

The Intuitive View of entrepreneurial decision making sees the lack of planning by entrepreneurs as directly related to their higher level of risk taking (Palich and Bagby, 1995). According to Bhide (1994), a 1990 study of 2,994 start-ups by the National Federation of Independent Business (USA) revealed that founders who spent a long time in study, reflection, and writing up business plans were no more likely to survive their first three years than people who seized opportunities without researching and analyzing them systematically. To support his argument that a comprehensive analytical approach to decision making does not suit most start-ups, Bhide gives many examples from interviews with successful entrepreneurs (1994, 2000). The interviews suggest that entrepreneurs are risk takers. Support for this observation also comes from a meta-analytic review by Stewart and Roth (2001) that shows that entrepreneurs have a higher propensity to take risks than managers.

Some scholars have argued that entrepreneurs unknowingly take greater risk simply because they perceive the risk associated with an action to be lower than it objectively is. Drawing on the cognitive psychology and decision-making literature, Busenitz (1999) and Palich and Bagby (1995) propose that entrepreneurs are predisposed to assessing a situation more favorably than managers or any other persons. Entrepreneurs are believed to arrive at their judgments using *biases* and *heuristics* (Simon et al., 1999). Simon et al. speculate that these biases could be one of the main reasons for the high failures of new ventures because they blind decision makers to the actual risks.

2.3 The Rational View of entrepreneurial decision making

There is also another body of literature that reaches a very different conclusion about effective entrepreneurial decision making, arguing that systematic research and analysis of alternative options lead to a higher likelihood of success. Some researchers (Delmar and Shane, 2003; Kickul et al., 2009; Langley, 1988; Lyles et al., 1993; Patel and Fiet, 2009; Robinson and Pearce, 1984; Zinger and LeBrasseur, 2003) contend that engaging in systematic research and analysis gives entrepreneurs an in-depth knowledge of the business and helps them to better understand the options available for action. This means that, rather than being driven by intuition and guided by heuristics to select an option that appears promising, entrepreneurs can discover better options by engaging in systematic

research and analysis (Smith et al., 1988). Books for would-be entrepreneurs on the best way to start and manage a new venture, such as Nesheim (2000) and Timmons (1999), also advocate that it is important to follow such a systematic and deliberate approach to decision making.

A few empirical studies have provided support for the idea that systematic decision making leads to better results. Haber and Reichel (2007), who conducted interviews with 305 small tourism ventures, conclude that careful planning of a venture does contribute to higher customer satisfaction and venture success. Based on a mail survey of 500 CEOs, Olson and Bokor (1995) conclude that the performance of small, rapidly growing firms is positively influenced by a formal strategy process that weighs different options and then crafts a business plan.

2.4 Evaluating the intuitive and rational views

The empirical evidence marshaled in support of the two views of entrepreneurial decision making is not strong enough to conclude with confidence which view is more compelling. Researchers do not conceptualize the decision situation and the entrepreneur in the same way, and many do not connect the decision under investigation to the performance consequences of that decision. First we discuss how researchers have frequently not connected decision processes to performance outcomes of the decision. This leads us to suggest that a framework of entrepreneurial decision making needs to consider different levels of ambiguity in a decision context and different levels of expertise that decision makers bring to a context. Our framework integrates aspects of the Intuitive and Rational Views.

2.4.1 Neglect of performance. Many researchers subscribing to the Intuitive View (e.g. Busenitz and Barney, 1997) advocate that heuristics and biases are 'effective' approaches to entrepreneurial decision making in what they consider complex environments. However, typically they do not establish a link from the decision-making style to better performance. When researchers have focused on the performance outcome of a decision, they have often drawn conclusions about the decision based on the performance of the firm rather than the area of the firm that is directly connected to the decision (Eisenhardt, 1989; Forbes, 2005). Therefore, the empirical literature does not show whether an ad hoc/intuitive style of decision making and risk taking on average actually benefits an entrepreneur. To provide a more solid foundation for normative claims about which decision-making styles entrepreneurs should adopt, we would benefit from heeding Pettigrew's (1992) suggestion that strategy process research needs to build a consideration of performance outcomes into the design of the analytic framework.

2.4.2 Neglect of context. It is useful to distinguish two aspects within a decision context: the characteristics of the decision situation and the characteristics of the person making the decision. Our reading of the literature suggests that only laboratory studies considered clear differences in decision context (e.g. Palich and Bagby, 1995; Simon et al., 1999; Sitkin and Weingart, 1995). But researchers outside the experimental methodologies typically do not draw these distinctions at all. For this reason, it is difficult to identify the contexts in which different decision-making styles in the real world might lead to more or less risk taking and, hence, to better performance.

The literature that focuses only on answering the question of whether entrepreneurs are risk takers or not typically uses controlled laboratory style research methodologies (see Brockhaus, 1980; Palich and Bagby, 1995). They draw distinctions between contexts by giving subjects different decision scenarios. However, it is not clear how well the scenarios represent the range of different decision contexts that entrepreneurs face in the real world (Einhorn and Hogarth, 1986).

Laboratory studies are very useful because they can isolate causes. (We ourselves propose a laboratory study at the end of this paper.) But to establish that *successful* entrepreneurs are more prone to take risks, we also need studies that examine actual entrepreneurs making decisions.

When non-experimental researchers do distinguish between different contexts, they typically do not explain adequately their classification scheme for different contexts, making it difficult to interpret whether the findings are consistent or inconsistent with each other. For example, Armstrong (1982) does not clearly define and operationalize the term 'uncertainty' when he distinguishes between uncertain and certain contexts. Similarly, Miller and Cardinal (1994) do not define the term 'turbulence' when they distinguish between stable and turbulent contexts.

Taking business context into consideration is not sufficient to understand what style of entrepreneurial decision making leads to better performance. We also need to consider the expertise of the decision makers. Bourgeois and Eisenhardt (1987), Priem et al. (1995), as well as Slevin and Covin (1997) come to the conclusion that systematic decision analysis is related to a firm's good performance in rapidly changing environments. On the other hand, Frederickson (1984) and Frederickson and Mitchell (1984) suggest that comprehensiveness in the decision-making process is positively related to performance in stable environments but negatively related in unstable environments. Likewise, Brinckmann et al. (2010) conclude that while business planning can lead to firm success, its effect is significantly weaker in new firms due to high uncertainty. We surmise that the inconsistencies in these finding may be driven by the fact the researchers did not measure the expertise of the decision makers within a decision context and/or their consideration of planning as static written plan. Take a decision situation characterized by low levels of ambiguity. Someone with a lot of expertise with a particular situation already has a sense which options are good or bad, making it unnecessary to consider all options. The person can simply focus on the good ones. The expert will still be aware of the need to adapt, if need be.

Based on this literature review, we conclude that the evidence in support of the Intuitive View as the correct decision style in all contexts needs to be improved. In the next section we will integrate the Intuitive View and Rational View and develop a framework of entrepreneurial decision making in which entrepreneurs become successful by systematically reducing risk.

3. A framework for successful entrepreneurial decision making

Personality psychologists in the past have theorized that behavior is largely driven by stable dispositions (Mischel, 1968). The Intuitive View of entrepreneurial decision making operates according to this principle. A higher propensity to take risks on the part of entrepreneurs leads them to launch risky ventures. When personality psychologists tested how predictive dispositions are of behavior across different contexts, they found typically very low correlations (Mischel, 2004). For example, a study of the extroversion-introversion disposition of 51 boys across 21 situations in a summer camp found only a 0.14 correlation between disposition and behavior (Mischel, 2004). This type of finding led to a crisis in the field of personality psychology. Over the past three decades a consensus has emerged that the behavior of a person is driven by characteristics of both the situation and the person (Mischel and Shoda, 1995). While there is disagreement about the relative importance of the situation and the person in driving behavior, psychologists agree that to predict behavior one needs to take both into consideration. Some situations are considered strong, driving behavior almost entirely; other situations are considered weak, allowing individual dispositions to drive behavior.

Entrepreneurs face a wide variety of different decision environments. Some new ventures are inherently more complex and risky than others (Courtney et al., 1997). There is less ambiguity about what factors are important when deciding whether to become a taxi operator in New York

City or to provide a taxi service into space (Virgin Galactic). Furthermore, decision contexts within a particular venture also differ—every entrepreneurial venture requires the entrepreneur to make many different decisions to turn an idea into a commercial reality: What entrepreneurial ideas should I pay attention to? How much time should I devote to studying how the underlying technology for my product or service works? How much market research should I do? How should I finance the project? Whom should I hire to help me commercialize the idea? How should I get the product or service made? How should I market it? This list of questions goes on. In his theoretical contribution, Forbes (2007) has suggested that a key feature driving entrepreneurial decision making is the level of ambiguity inherent in a situation. We agree with Forbes that the level of ambiguity in a situation will lead to different decision-making styles on the part of successful entrepreneurs. We go beyond Forbes in two ways. First, whereas Forbes (2007) suggests that a systematic and planned approach to decision making will improve performance under conditions of uncertainty but not ambiguity, we contend that this is also the case under conditions of ambiguity. Second, we propose that another key determinant of effective entrepreneurial decision making is the level of expertise the entrepreneur possesses with the decision situation.

Theorists of human problem solving have also found that novices and experts follow very different processes (Newell and Simon, 1972; Simon, 1979). Using the game of chess as a laboratory for their most famous studies, Simon and colleagues discovered that novices need to evaluate every option available at each step of the problem (the game) to come up with the best action for the step. Experts, by contrast, have accumulated over long periods of study a large number of problem constellation patterns and recognize the most appropriate response (solution) to a particular pattern.

Psychologists have continued these early studies and investigated how people who become experts in an area build up their superior skills. Reviewing what by now has become a very large literature, Ericsson and Lehman found that “(1) measures of basic mental capacities are not valid predictors of expert performance in a domain, (2) the superior performance of experts is often very domain specific and transfer outside their narrow area of expertise is surprisingly limited, and (3) systematic differences between experts and less proficient individuals nearly always reflect attributes acquired by the experts during their lengthy training” (as quoted in Ericsson, 2006a). This implies that the widely cited 10,000 hours of practice are a necessary but not sufficient condition to perform at very high levels. Ericsson (2006b) notes that some individuals turn into experts while others become good performers only because they acquire ideas about how to overcome their performance shortcomings with specific learning plans. They also learn how to self-monitor their performance and take necessary corrective actions.

For these reasons, we use in this paper the term ‘expertise’ rather than the frequently used term ‘experience’ to highlight that experience does not necessarily lead to expertise. A six-year-old child will become a competent user of a foreign language simply by experiencing the foreign language environment; an adult will not learn simply by hearing the language being spoken and requires time-consuming instructions. For a detailed account of how expertise is created see Ericsson (2006b).

Building on Simon and colleagues as well as the philosopher Michael Polanyi (1967), Nelson and Winter (1982, Chapter 2) have elaborated how experts differ from novices regarding business decisions. Contrary to neo-classical economic theory that saw the economic agent as scoping out all different options and calculating the optimal options before making a decision, Nelson and Winter (1982) conceptualized skilled business behavior as the capability for a smooth sequence of coordinated behavior that involves very little deliberation and choice. The situation triggers in the person a particular sequence of behavior that has been learned to be effective in that context. These considerations suggest that a theory of entrepreneurial decision making must take into consideration the level of expertise a person has with a particular situation.

Ambiguity	High	Delegation to Expertise	Critical-point Comprehensive Analysis
	Low	Consultative Deliberation	Expertise-based Evaluation
		Relevant Expertise	
		Low	High

Figure 1. Effective decision-making styles under different conditions.

In contrast to many large organizations with established and stable businesses, entrepreneurs clearly have limited time and resources to make a decision. They cannot engage in what neo-classical economists have called a complete rational decision-making process in which an agent looks at all possible options, evaluates all the consequences from each action, and then computes the optimal decision. The challenge for the entrepreneur is to economize on the decision-making process without jeopardizing decision quality. This means that an entrepreneur has a strong incentive to devote as little time and resources as possible to making a decision, yet to devote as much time and resources as necessary to come up with a decision that will lead to a good outcome.

Given our previous discussion that both the level of ambiguity in a decision situation and the level of expertise needed in the decision-making process need to be considered in a framework of entrepreneurial decision making, we distinguish between four different ambiguity–expertise conditions. The central idea in our theory is that successful entrepreneurial decision makers – in contrast to their unsuccessful counterparts – vary their decision-making process appropriately depending on the level of ambiguity within the decision context and level of expertise the decision maker brings to the context. We call the four distinct processes Expertise-based Evaluation, Critical Point Comprehensive Analysis, Consultative Deliberation, and Delegation to Expertise. We will now describe the different styles of coming to a decision and provide an example to illustrate each style.

3.1 Expertise-based evaluation

The value of expertise in new venture decisions has been emphasized by many scholars (Fiske et al., 1983; Hambrick and Mason, 1984; Hitt and Ireland, 1985; Mitchell, 1997; Mowen, 1993; Politis, 2005; Reuber and Fischer, 1994; Reuber, 1997). Expertise is particularly helpful in reducing the need for a systematic rational evaluation in low ambiguity contexts. When ambiguity is low and the entrepreneur possesses expertise relevant to the specific situation, the entrepreneur does not need to engage in a costly formal research and analysis process but can make a quick decision based on his or her expertise. We call this mode of deliberation, ‘Expertise-based Evaluation’. This is precisely the context in which the Intuitive View of decision making identifies correctly how effective decision making proceeds through expert-based heuristics and rules of thumb that have developed over time. (Gaglio (2004) among others has tried to differentiate between expertise-based heuristics, such as mental simulations and counterfactual thinking, and heuristics that are not

well suited, such as biases.) The example of an individual who sold customized software to accountants [adapted from Vesper (1993: 13)] is a case in point. He realized that instead of writing custom-made accounting programs for clients, he could develop a standardized accounting program and sell it for much less money. When his employer was not receptive to the idea, he and two fellow employees started their own venture to develop the standardized product. The entrepreneur did not have to engage in a lot of systematic research and analysis for two reasons. First, the situation was low in ambiguity: the standard functional requirements for accounting software were known and the product features were, therefore, well defined. Furthermore, to estimate the range of profits that could be made from this new product, one only needed to obtain information on how much accounting firms were already spending on customized software and how much it would cost to develop the standardized software. Second, the entrepreneur had acquired expertise in this context. He already knew how much accounting firms were willing to pay and could estimate the development costs based on what custom software costs, making it unnecessary to engage in any elaborate effort to figure out whether the investment was profitable and how much risk he would run with his investment.

Proposition 1: Expertise-based evaluation is the most effective way of making decisions when ambiguity is low and the entrepreneur has high relevant expertise.

3.2 Consultative deliberation

Without relevant expertise, it is best for an entrepreneur in a low or moderate ambiguity context to find someone who is more knowledgeable about the specific situation and obtain advice in a way that reduces the risk of making the wrong decision. We call this mode of deliberation 'Consultative Deliberation'. Consider the example [adapted from Vesper (1990: 45)] of a chef who is bored with his job and who is offered the chance to buy a restaurant equipment business from one of the suppliers to his restaurant. Like the previous example, the business opportunity in this example is relatively low in ambiguity because market size information can be estimated with ease and the business is up for sale and has a cash flow. The difference with the earlier example is that the decision maker lacks expertise with the business. The chef is attracted to the idea because it would keep him associated with people from his own profession. However, his cooking skills do not provide him with enough relevant expertise for making an informed judgment as to how lucrative an investment in the equipment business would be, given that the present owner did not make much money. The chef consults with a knowledgeable salesperson in the area who explains that large competitor firms had substantial competitive advantages over the small firm up for sale because they could offer a much wider range of products and substantial rebates by spreading their fixed costs over a larger volume of sales. Armed with these insights, he declined the offer to buy the business and avoided losing his money.

Proposition 2: Consultative deliberation is the most effective way of making decisions when ambiguity is low and the entrepreneur has low relevant expertise.

3.3 Delegation to Expertise

Shane (2008: 122) notes that "doing what most entrepreneurs do is a mistake; the majority of entrepreneurs are wrong about how to run a new company." An entrepreneur with low relevant expertise finding himself or herself in a high ambiguity situation should never make a decision about the

business alone. For this reason we call this approach 'Delegation to Expertise'. Making a decision alone in this context is worse than gambling because the person has no way of knowing whether the venture has a good chance of success. (*De facto* this means that entrepreneurs who do not want to consult with people with relevant expertise will simply stay away from businesses in the high ambiguity context where they have no expertise.) It is important to acknowledge that some entrepreneurs make a decision on their own in this context, get lucky and become successful. But this does not imply that one should advocate this approach or that on average it will lead to success [see, Miller (2007) for a forceful articulation of the distinction between descriptive and normative statements about entrepreneurial decision making]. Consider the case of an American business school professor who was approached in 2008 at the Academy of Management by an Iraqi government official who wanted to find American scholars who were willing to set up a private MBA program in Baghdad. The business school professor had never gained any management expertise, had never seen the accounting numbers of his own business school, and had never been to Iraq. The situation was highly ambiguous because it was not clear whether Iraq would be sufficiently stable and peaceful to launch a successful business school and because the students who can afford private tuition might simply leave the country to get their MBAs at internationally recognized schools. Since the professor also had no expertise in running a business school (he had not even been a department chair) he did not know how to identify the crucial analyses one would need to do to ascertain the level of risk inherent in this proposed venture. For this reason he should delegate the evaluation to experts who can better appraise the riskiness of the decision. This can lead to a recommendation not to do the venture if the risk is too high or a decision to proceed if the experts appraise the risk to be low.

Proposition 3: Delegation to Expertise is the most effective way of making decisions when ambiguity is high and the entrepreneur has low relevant expertise.

3.4 Critical-point comprehensive analysis

When the ambiguity of a situation is high but the entrepreneur has accumulated substantial expertise, then the entrepreneur can reduce the risk associated with a decision by engaging in a systematic process to gather as much information as possible and come to an informed decision (Frederickson and Mitchell, 1984). Time and resource constraints mean that the entrepreneur cannot evaluate all possible options in fine detail and consider all the factors associated with a venture decision. The entrepreneur identifies from the set of all decision elements those that are critical for success. Next the entrepreneur organizes these critical decision points into a sequence of logical priority so that it is possible to engage in sequential problem solving to turn the idea into a commercial venture. For example, one does not have to buy land for a manufacturing site before proving that a product works in principle. If it turns out that the first critical point cannot be achieved, the entrepreneur should not invest additional time and resources to evaluate later stages of the commercialization effort. If the evaluation of the first critical point reveals that this step will in all likelihood work, the entrepreneur then moves on to the next critical point. We call this process 'Critical-point Comprehensive Analysis' (a label derived from a term used by Frese et al., 2000).

Consider the example of a professor of biochemistry at a medical school whom we have studied. He believes that his university lab has developed a new skin-based drug delivery technology that is more effective for many medicines than oral delivery. (Unlike a patch that remains visible, this technology sprays the drug onto the skin once a day.) His expertise with the context is high:

he has consulted widely in the pharmaceutical industry about drug delivery technology and he also served as the president of the national pharmacy board. To fully commercialize his laboratory findings, he needs to take these fundamental steps: (1) He has to prove the technical superiority of the new delivery method with an existing pharmaceutical product. (2) He has to get FDA approval for the technology. (3) He has to find at least one pharmaceutical company that will use the technology.

In deciding whether he should invest his time and money into commercializing this technology, he can stage his decisions and decide which ones are critical, and then focus on those critical decisions that logically come first and delay the others. The first most critical decision he faces is whether or not it makes sense to invest any money. This means he needs to get an estimate of the potential market for this skin-based, non-oral drug delivery mechanism. Concretely this implies estimating how many existing pharmaceuticals would be better administered in a skin-based way and how many pharmaceutical companies would be willing to buy or license the technology.

Given his expertise in the drug delivery field, it is not difficult for him to conclude that a sizable number of different pharmaceuticals in principle can be delivered with the new technology and it could capture a non-trivial share of the \$8 billion skin-based delivery market. Spending \$2 million on proving the technology with one pharmaceutical, therefore, is a lucrative investment. We want to focus here on the second major decision that the professor needs to make, namely which pharmaceutical product should be selected to prove the efficacy of the drug delivery technology. Decisions about how to seek and manage the FDA approval process, how to obtain funds for a full commercialization of the idea, what other products to develop, where and how to manufacture each product, etc., can be left for a later stage.

Because the professor has high relevant expertise with the context, he can identify the critical factors that need to be considered in deciding what pharmaceutical should be selected to prove the efficacy of the drug delivery technology. They are the market size of the medicine (a larger market should mean that potential investors would commit more funds); the ease of getting the delivery technology to work and to be approved by the FDA (less development cost and time); the receptiveness of a patient group to the skin-based delivery technology (higher marketability); and the share of costs represented by the delivery technology in the overall cost of the medicine (consumers do not mind paying a small additional cost for increased convenience).

But the decision situation is marked by high ambiguity because there are many trade-offs to consider in the choice of test medicine: One candidate medicine to prove the delivery technology may have a big market but it has a complex molecular structure. This means it would require substantial adaptation of the delivery technology and hence take a longer time and more money to develop. Another medicine may have a smaller market but be attractive to a patient group enthusiastic about the new delivery method. A third medicine may have a simpler molecular structure, making it easier to get the delivery technology to work and be approved, but the cost of the delivery technology relative to the cost of the medicine is high, making it less attractive vis-à-vis other delivery technologies. Unlike in the low ambiguity situation of buying an existing restaurant supply business, there are, in short, many implications of choosing a particular molecule that are unknown in this particular decision situation, creating a high level of ambiguity. Because of the inherent trade-offs among performance factors, the probability distribution of successful outcomes across the alternative molecular options are not known, introducing even more ambiguity into the situation.

The professor now has to do systematic research and analysis to help him navigate the trade-offs in such way that he maximizes the likelihood of finding the most promising medicine and reduce

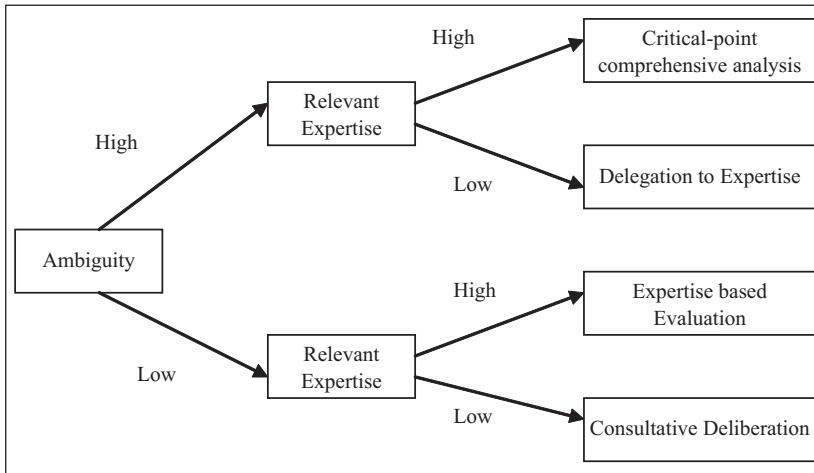


Figure 2. How entrepreneurs can select the appropriate decision-making style.

his overall risk of choosing an inappropriate medicine. For this reason, he consults biotech venture capitalists, he commissions studies on delivery method preferences on various patient groups, and investigates the molecular complexity of different medicines and their costs. From this research, he realizes that the speed and cost of demonstrating the new technology's efficacy are more important than achieving the largest market possible for the first product. Even a moderate-sized market would lead to high returns for venture capitalists. His patient research indicates that many women are already using skin patches as contraceptives and they will be very responsive to the new skin-based delivery technology. Equipped with these insights he selects a medicine to alleviate menopausal symptoms for these reasons: (1) its relatively simple molecular structure would reduce development time and costs, (2) the market is large enough to convince investors to be impressed with the profit opportunities, and (3) women suffering from the symptoms would likely be receptive to the new delivery technology.

Proposition 4: Critical-point Comprehensive Analysis is the most effective way of making decisions when ambiguity is high and the entrepreneur has high relevant expertise.

3.5 Selection of the appropriate decision-making style

Rather than use either the Intuitive or Rational View of entrepreneurial decision making, our reading of the literature suggests that successful entrepreneurs change how they make decisions by considering the level of ambiguity in the situation and the level of expertise they possess with the context. If entrepreneurs want to increase the likelihood that a particular decision will lead to a successful outcome, they should first consider how much ambiguity is inherent in a particular decision context (see Figure 3). If they determine that the ambiguity is high, they should ask themselves how much expertise they possess within the particular decision context. If their expertise is high, they should engage in critical-point comprehensive analysis; if their expertise is low, they should delegate to an expert. On the other hand, if entrepreneurs determine that the ambiguity in the situation is low but their relevant expertise is high, they can engage in expertise-based evaluation, which is analogous to the intuitive decision-making style advocated previously by many

		Yes	No
Success of Decision	Yes	More cases in this box suggest that our propositions are correct.	More cases in this box suggest that either our propositions are incorrect or we should look for other influential variables.
	No	More cases in this box suggest that either our propositions are incorrect or we should look for other influential variables.	More cases in this box means that our framework is correct, and people need to be educated to make better decisions.

Decision Approach Aligned to the Framework

Figure 3. Assessing the validity of the framework.

scholars. If the ambiguity is low and their expertise is low, they should engage in consultative deliberation.

4. Discussion

Entrepreneurship is a central driver of economic growth and higher standards of living. Evolutionary theorists argue that high failure rates of ventures are to be expected (Nelson and Winter, 1982). The central claim of this paper is that some of those failures are avoidable. We argue that successful entrepreneurs are systematic in their decision-making processes, reducing risk.

We begin the paper by reviewing the literature on entrepreneurial decision making, identifying two major views, the Intuitive View and the Rational View. The Intuitive View characterizes the entrepreneurial decision-making process as *ad hoc*, opportunistic, intuitive, and oriented toward action rather than analysis. The Rational View, by contrast, argues a systematic process with research and analysis of alternative options leading to a higher likelihood of success.

We accept the argument that entrepreneurs often have time and resource constraints that require them to reduce the amount of time they spend on evaluating decision options. However, analyzing the arguments and empirical support for the Intuitive View and the Rational View led us to the conclusion that there is not one universal entrepreneurial decision-making process that is best suited under all conditions.

The paper makes two contributions. One is to integrate the Intuitive View and the Rational View into a framework that recognizes that entrepreneurial decision-making processes are contingent on both the decision situation and the entrepreneur's relevant level of expertise. Following prior work on entrepreneurial decision making (e.g., Forbes, 2007), we identify the level of ambiguity in the decision situation as a key factor requiring different decision-making styles to ensure the effectiveness of a decision. Given that these two key factors (ambiguity inherent in the situation and the level of expertise of the decision maker), the entrepreneur faces four generic decision situations that require the decision maker to vary his or her decision style.

The second key contribution of the paper is to spell out how specific decision-making styles lead to the best decision outcomes under each of the four generic conditions. To do this, we build on scholars, including, for example, Elbanna and Child (2007) and Papadakis et al. (1998) who

emphasize the need to establish relationships between decision-specific characteristics and decision process dimension. When the ambiguity in the situation is low but the entrepreneur's relevant expertise is high, he or she should follow the process outlined in the Intuitive View and make a decision without undue formal process. We called this style Expertise-based Evaluation.

On the other hand, an entrepreneur who has little expertise with a low ambiguity situation should consult with people who have expertise with the situation and have them lay out the merits of the different options and propose how to proceed. We call this style Consultative Deliberation.

When the ambiguity is high and the entrepreneur has high expertise contingent on the decision situation, we argue that it is important for the entrepreneur to work carefully through different options rather than making a decision based on heuristics and intuition. Given the time and resource constraints on the entrepreneur, we argue that the entrepreneur should identify from the set of all decision elements those that are critical for success and then organize these critical decision points into a sequence of logical priority so that it is possible to engage in sequential problem solving to turn the idea into a commercial venture. We call this formal decision-making style Critical-Point Comprehensive Analysis.

Finally, if the ambiguity in the decision situation is high but the entrepreneur has little expertise with respect to the situation, he or she should delegate the decision to an expert to make that decision on their behalf. Making that decision him- or herself would amount to a mere gamble. We called this style Delegation to Expertise.

Closely aligned with the Intuitive View is the notion that entrepreneurs are inherently more willing to take risk. We argue in this paper that what distinguishes successful entrepreneurs at the same level of wealth as their less successful counterparts is that they systematically reduce the risk associated with a new venture. This is not to say that entrepreneurs who make intuitive, ad hoc decisions in all contexts cannot sometimes outperform their more systematic counterparts. There is a considerable amount of luck in business outcomes. The successful entrepreneur Ralph Landau (who followed a systematic decision-making style) captured this in his slightly exaggerated observation, "Luck beats brains every single time" (Landau, 1994: xiv). Rather, our claim is that on average, entrepreneurs who follow a systematic decision-making process, adapting their decision style to the requirements of the situation and their level of expertise, perform better than entrepreneurs who always use an ad hoc decision-making style, solely relying on intuition and gut feel.

We are not the first to argue against the assumption that successful entrepreneurs are high risk takers. Based on his life-long observations of business life, Drucker (1985) emphasized that successful entrepreneurs work hard to reduce the risk they take. He observes that there is an element of risk in all the activities, commercial or non-commercial. The key is to identify and then manage those risks. Driving a car, for example, involves many potential risks but learning to drive safely substantially reduces the risk of an accident. The same holds true for starting new ventures. Following a systematic decision-making process reduces the risk of failure. Our framework, therefore, has important practical implications for both entrepreneurs and those who teach entrepreneurship. Entrepreneurial decision making is a skill that can be improved upon. Entrepreneurs can evaluate how they make decisions by comparing their decision-making styles to our framework, helping them improve their decision-making styles.

A potential criticism of our proposed decision-making framework is that the two dimensions in the framework are not independent. The level of expertise that an entrepreneur has within a particular decision context influences the level of ambiguity inherent in the decision context. We have pondered this issue carefully and have concluded that, while expertise can have a small influence on the level of ambiguity in the decision situation, this effect is swamped by the characteristics of

the decision situation itself. This means that, for all practical purposes, the two dimensions are independent.

A highly ambiguous situation is not turned into a low ambiguity situation just because an entrepreneur has a high level of relevant expertise. Recall the example of the biochemistry professor who possessed a high level of expertise with drug delivery technologies but nonetheless faced a high ambiguity situation in selecting the first medicine to use. There were many trade-offs to consider. Similarly, quite independent of the level of expertise of the decision maker, a decision about whether or not to launch a private MBA program in present-day Baghdad is fraught with much higher levels of ambiguity than the decision to launch a kindergarten next to an American university campus with a shortage of child care, a university willing to subsidize the operation, and academic parents who are eager to get their young children out of the house for a few hours a day.

5. Future research

Systematic empirical studies are needed to demonstrate the validity and generalizability of our proposed framework. In this final section, we begin to explore how researchers can design studies to test the assumptions underpinning the framework. To begin this process, we describe one laboratory research methodology and a second methodology to achieve external validity based on case studies.

The former approach has the significant advantage that once the initial setup costs are borne, collecting data is low cost. Moreover, researchers can monitor the decision processes employed by individuals and one can structure the task to measure the performance outcome of different decision processes. The advantage of the latter approach is that it examines real entrepreneurial behavior rather than simulated behavior.

In both cases, the critical issue is to generate observations in all four conditions of the framework and to develop measures of the levels of ambiguity and expertise contingent on each decision situation. Recall that the central premise of the framework is that there are four different decision approaches, each of which is best suited to a particular situation, depending on the level of ambiguity inherent in that situation and the level of expertise the decision maker has with the context. The framework predicts that employing the optimal decision-making style (or at least a superior one) in each of the four ambiguity–expertise conditions leads to higher performance. The relevant data are the frequency with which decision makers use the normatively specified decision-making approaches and how often those choices generate good and poor outcomes. This would provide the data for the cross tabulation in Figure 3.

Our framework is validated if a significant proportion of observations lie in the off-diagonal cells. A chi-square analysis would confirm or disconfirm our framework. The null hypothesis for the chi-square test would be that there is no difference in the success rate between those decision approaches that are aligned with our framework and those that are not. If the statistical analysis reveals a significant difference, our framework would be supported.

First, consider a laboratory methodology to generate data to test our framework. This approach mimics, as much as possible, entrepreneurial decisions. Many computer-based business simulations (e.g. Capstone and GoVenture) have been developed to train students to become more effective strategists and entrepreneurs. These existing simulations could be used to investigate our framework.

Here, we limit ourselves here to outlining the core requirements for such an experimental design: The simulation needs to have decisions varying in their degree of ambiguity. An expert

panel could be used to rate the level of ambiguity of the different decision. Entrepreneurs should be recruited to participate in the study (possibly by offering them free sessions with leading professors on campus). Subjects would be selected to ensure that some of them have expertise with the decision context and others do not. Their level of wealth would be treated as a control variable. Again an expert panel could be used to rate the expertise of the participants. (One would use a domain where experts can easily rate the expertise of subjects based on their previous experience.) The subjects would make decisions, participating in a time-bound computer simulation in which the performance consequences of their decisions can be measured. Subjects would be encouraged to pre-arrange availability for any experts that they might wish to contact during the simulation – call an expert. The speed and content of subjects' decision making would be monitored and collected.

In the experimental design, consultation with experts would cost resources and reduce overall profitability of the decision (i.e. the balance in the fictitious budget that tracks performance in the simulation would be reduced). Coders, unaware of the framework, would be given the definition of the four different styles of decision making and code the processes by which each subject made the various decisions. Implementing this study design would generate the necessary data to test the validity of our framework.

In the second methodology, showing that our framework accounts for effective entrepreneurial decisions in real settings, we propose a critical case approach. There is an extensive literature on case-based research (see, for example, Eisenhardt, 1989; Krippendorff, 1980; Langley et al., 1995; Mintzberg, 1979). Here, we articulate the critical features of the case study design to study entrepreneurial decision making.

Unlike a laboratory setting, where one can design the causal connection between the decision and its performance, in case analysis the causal relationship between the decision taken and performance is part of the data collection. Two specific problems in the real world need to be addressed: (1) There is a delay between the decision and its performance outcome, which makes it difficult to measure those outcomes. The consequences of decisions are spread out over time and may not be detectable at the specific point in time. Furthermore, such a delay means that other causal factors can intervene and shape the performance outcome, potentially contaminating the causal effect of the decision. (2) An entrepreneur makes many large and small decisions in the course of setting up a particular venture, making it difficult to isolate the impact of particular decisions. One needs to establish that a particular performance outcome is caused by the specific decision under investigation and not by the many other decisions that the entrepreneur makes.

We suggest a case study design to address these two challenges. We do not claim that it is the only or even the best design to test our framework with real world data. Rather, our goal is to demonstrate that our framework is testable and, by lowering the barriers to doing such research, to encourage other researchers to work on such tests.

Our proposed design examines a decision that every entrepreneur has to make. This is the decision about how to finance the venture. In the low-ambiguity condition, we propose to study the decision process used by entrepreneurs who are seeking bank loan financing, and for the high-ambiguity condition, entrepreneurs who want to undertake an initial public offering (IPO) to obtain funds. Clearly, there are more critical decisions that an entrepreneur may have to make but the outcomes of these decisions can be observed and measured. In terms of a bank loan, the entrepreneur has to decide which bank out of many possible banks to approach to obtain the best loan terms possible (low-interest rate, and little or no collateral). The dimensions of the decision problem are not ambiguous and the task is quite straightforward.

By contrast, deciding on the lead investment bank to raise capital through an IPO is a high-ambiguity decision because there are complex trade-offs to consider. The entrepreneur ideally wants to raise a desired amount of capital (and not less), maximize the value of his or her remaining stake in the company, keep control over the company, and pay as little commission to the lead investment bank as possible. An investment bank with a stronger reputation will be more likely to place the desired number of shares at the desired price, but it will ask for a higher commission. By contrast, a less prestigious investment bank may take less commission but also not raise the desired amount of capital. There is a complex set of trade-offs that lead to much higher ambiguity in this decision vis-à-vis selecting the appropriate bank for a loan.

To test our framework, it is necessary to choose a set of cases where the entrepreneurs differ in their level of relevant expertise. This should not be difficult because in terms of both decision situations, particular entrepreneurs will have had more (already undertaken bank financing /IPOs before) or less relevant expertise.

To measure the performance outcomes of choosing one of the four decision-making processes in our framework, we propose to measure the difference between the ex-ante goals of the entrepreneurs and the ex-post outcomes of their decisions. The closer the outcome is to the desired goal of the entrepreneur, the higher is the quality of the decision. In the case of selecting a bank to obtain a loan, the relevant measures could be the following: (a) The difference between the interest rate of the obtained loan and the average interest paid by firms for loans in the region. (b) The difference between the entrepreneur's expected time to obtain the loan and the actual time it takes to obtain the loan. (c) The difference between the entrepreneur's desired level of collateral and the actual collateral pledged. In the case of selecting an investment bank for an IPO, the relevant decision performance measures could be (a) Did the selected bank do the IPO in the end? (b) The difference between the entrepreneur's expected time to do the IPO and the actual time it takes to do the IPO. (c) The difference between the entrepreneur's desired amount of capital to be raised and the actual amount of capital raised. (d) The difference between the entrepreneur's desired value of his or her stake in the company and the actual value of the stake.

Just as in the case of the experimental design, expert panels should rate the level of expertise of the entrepreneurs in the case studies to generate objective data. A group of coders will be given the definition of the four different styles of decision making and asked to evaluate the processes by which each entrepreneur in the case study made the decision, generating the data for the chi-square test. Karl Popper (1976) has taught us that scientific knowledge grows through 'Conjectures' and 'Refutations'. We have offered in this paper a clearly articulated theoretical conjecture and outlined two empirical research strategies that can support the conjecture by trying to refute it. We are confident that the community of scholars can develop even more sophisticated study designs to test our ideas.

Acknowledgments

We would like to thank the editors, Phil Yetton and Baljit Sidhu, as well as the anonymous reviewers for helpful guidance in developing this paper. We are also grateful to Daniel Forbes, Saras Sarasvathy and our colleagues Grahame Dowling, Ben Oviatt, Salih Ozdemir, Jeremy Davis and School of Strategy & Entrepreneurship Seminar attendants for feedback on earlier versions of this paper.

Funding

This research was supported under Australian Research Council's *Discovery Projects* funding scheme (DP0987788) and by the R. Graham Whaling Visiting Professorship at the Wharton School, University of Pennsylvania.

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Date of acceptance of final transcript: 13 March 2012.

Accepted by Associate Editor, Philip Yetton (Strategy).