

Section II.2

Opportunity Evaluation



8. On the relevance of decision-making in entrepreneurial decision-making

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INTRODUCTION: ENTREPRENEURSHIP AS DECISION-MAKING

The very first *Frontiers of Entrepreneurship Research*, published in 1981, included an article on venture capital decision-making. Mostly atheoretical, it just mapped out the process of decision-making.

Thereafter, Olson defined entrepreneurs as decision makers:

This paper has characterized entrepreneurs as decision makers who identify and capitalize on opportunities through approaches that emphasize innovation, profitable venture identification, effectiveness rather than efficiency, and nonprogrammed or ambiguous situations. (Olson, 1986)

The link between decision theory and entrepreneurs was noted as early as 1959, however, in *Administrative Science Quarterly*. In a paper entitled ‘Managers and entrepreneurs: a useful distinction?’, Heinz Hartmann argued for decision-making as a basic and useful differentiator between managers and entrepreneurs.

More recently, however, scholars are beginning to include affect and even biological and neurological processes in determining entrepreneurial behavior. Yet, when we examine the actual use of decision-making research in our scholarship, it is clear that only a thin slice of what is possible has been accomplished, to date. Even more importantly, hardly any efforts have been made to take results from entrepreneurship back to scholarship in decision-making – whether to cumulate overlapping findings or to challenge assumptions and claims.

Accordingly, in this chapter, we hope to highlight both the untapped possibilities from decision-making to entrepreneurship and the opportunities for dialog back from entrepreneurship to decision-making. We begin with a brief overview of the history of decision-making, which turns out to be a tapestry of arguments around the notion of ‘rationality’.

A HISTORY OF DECISION-MAKING: FROM RATIONALITY TO DEVIATIONS TO PLURAL VIEWS

Most theories used in entrepreneurship research consist as variations of classical models examining economic rationality. In recent times, the trend has been to look at research

from cognitive psychology, with a particular emphasis on deviations from classical rationality – such as heuristics and biases (Baron, 1998). Formal models of decision-making under risk (Douglas and Shepherd, 2002) and uncertainty (Fiet et al., 2005) have also been used.

The history and theory of rationality, however, has a lot more to offer than classical economic rationality and its deviations. In *The Nature of Rationality*, philosopher Robert Nozick (1993) argued for the importance of acknowledging modes of rationality that go beyond expected utility maximization. In social settings it is, for instance, important to embrace the symbolic utilities of acts themselves, and more generally it is important to recognize the rationality of producing novel outcomes and new ideas. Along the same lines, Jim March (1978) had earlier observed a range of human behaviors that are in open conflict with the canons of classical rationality: e.g. choices based on inconsistent, vague, fleeting or ostensibly unimportant preferences. While acknowledging that such behaviors are often irrational, March, like Nozick, also argued that it is quite possible that in some situations – especially situations characterized by uncertainty and ambiguity – such behaviors are highly appropriate and that they represent ‘not necessarily a fault in human choice to be corrected but often a form of intelligence to be refined by the technology of choice rather than ignored by it’ (March, 1978, p. 598).

Clearly, both philosophical and organizational understandings of rationality are open to a much broader spectrum of explanations than those traditionally included in models of rational decision-making. Moreover, because many interesting entrepreneurial activities take place in uncertain and ambiguous situations, the field probably has much to gain from embracing such broadened conceptions of rationality and decision-making.

A Historical Review of Rationality

The sheer volume of work related to rationality and the diversity of fields that build upon various conceptions of it preclude any attempt at a comprehensive review, short of a complete encyclopedia. Therefore, we limit ourselves here to a simple chronological listing of several different types of rationality and then move toward a framework relevant to entrepreneurship research.

Decision-making under certainty

While assuming a certain level of rationality, many classical economists, including Adam Smith, also speculated about the psychological make-up of the individual agents populating their theories. However, in the 1930s a group of economists started to build strictly mathematical models of the economy, based on a few simple axioms including complete and transitive preferences and rational choice (e.g. Samuelson, 1938). In these models, environmental constraints and possible outcomes are assumed to be known and stable. Decision-making is then a matter of calculating the optimal alternative. With some modifications (discussed next), this is the type of rationality that the bulk of mainstream economics is based on.

Decision-making under risk and uncertainty

Although nowadays considered fundamental to economic theorizing, risk was not formally incorporated into the discipline until fairly late. In more colloquial terms, risk and

uncertainty had been part of economic discourse for quite some time (cf. the discussion of judgmental decision-making under true uncertainty below), but it was only when precise mathematical models were extended to also include risky choices – i.e. where all outcomes and their respective probabilities are treated as objectively known – that risk truly became central to economic theory (von Neumann and Morgenstern, 1944). Even with risk present, however, choices are still a matter of rationally maximizing expected utility within a given decision framework. Consequently, although there are choices to be made, little room for the type of creativity commonly associated with entrepreneurship exists because changes in the decision environment always come from the outside. In the words of Baumol, ‘until exogenous forces lead to an autonomous change in the environment . . . the firm is taken to replicate precisely its previous decisions, day after day, year after year’ (Baumol, 1968 p.67). Many economists have therefore sought to explain entrepreneurship by focusing on certain individuals’ extraordinary capabilities (e.g. Caplan, 1999; Demsetz, 1983) or risk-propensities (e.g. Kihlstrom and Laffont, 1979) when facing a given decision-environment.

In the entrepreneurship field, studies of how entrepreneurs make risky decisions abound. In line with the economists just cited, the assumption in many of these studies is that risks can be accurately evaluated and that entrepreneurs tend to either underestimate these risks or overestimate their own ability to avoid or overcome them (Camerer and Lovo, 1999; Forbes, 2005; Koellinger et al., 2007). Empirically, however, the issue of whether entrepreneurs are indeed risk takers is mixed. In two meta-reviews of this rather vast and robust literature, one found that entrepreneurs were risk averse (with a small effect size; Miner and Raju, 2004) and the other found the opposite (also with small effect size; Stewart and Roth, 2001). Other studies have focused on the decision to enter into self employment, which is modeled as a matter of individuals maximizing their expected utility given a known decision framework that includes individual ability and potential incomes, combined with constraints such as attitudes toward risk, independence and work effort (cf. Douglas and Shepherd, 2000; 2002; Lévesque et al., 2002). When the expected utility from self employment outweighs that of employment, the rational individual decides to become an entrepreneur.

When decisions are made under conditions of uncertainty – where outcomes are known but their probabilities are not – it is impossible to rationally calculate expected utilities, something which is possible when probability sets are known objectively (i.e. decision-making under risk) or subjectively (see Bayesian rationality below). This lack of information makes the definition of rationality problematic because it forces the decision-maker to rely on more or less arbitrary decision-making strategies such as: choose the alternative where the worst possible outcome is as good as possible (maximin), or choose the alternative where the best possible expected utility is as good as possible (maximax) (Pearman, 1977). Adoption of strategies such as these reflects either a pessimistic or an optimistic outlook. Thus it appears that accounts of entrepreneurial decision-making under uncertain conditions – much as decision-making under risk – boil down to individual risk-propensities or attitudes.

Bayesian rationality

Bayesian, or subjective expected utility, models of decision-making are quite similar to models of decision-making under risk. Instead of assuming that the probabilities of

outcomes refer to likelihoods in the physical world, however, Bayesian models assume that such probability sets are subjective, i.e., that they are based on the limited information about the world that the agent currently has available (Savage, 1954). Agents are still assumed to maximize their expected utility, but based on both a subjective utility function and a subjective probability set. A key feature of Bayesian rationality is that decision makers update their subjective probability sets with experience (Oaksford and Chater, 2009). As a result, the Bayesian decision maker will gradually make more qualified decisions based on more and more information about the world.

Fiet and colleagues have developed a normative Bayesian model of entrepreneurial decision-making, in which individuals plan and search systematically for pre-existing opportunities. This is achieved as individuals restrict their search to a limited domain of inquiry – in which the subjective probabilities of all alternative outcomes are known – and within this domain make optimal decisions, e.g. investments in new information signals (Fiet, 2002; Fiet et al., 2005).

Bounded and procedural rationality

The notion of judgment has also been the focus of attention of a large body of research in behavioral decision theory that was originally motivated by Herbert Simon's work on bounded rationality. Models of bounded rationality embrace much of the classical model of rational decision-making (Simon, 1955; 1977). Individuals still seek to maximize their expected utility in a known decision environment, but with some added constraints on information processing capacity, problem solving skills, and memory usage. Because these limitations make the task of maximizing expected utility overwhelming, the decision-making process is brought into sharper focus as people are forced to rely on 'satisficing' decision-making procedures.

Much of the work on entrepreneurial cognition can be seen as explorations of bounded rationality in the context of entrepreneurial decision-making. Often these studies focus on how certain cognitive heuristics and biases produce decisions that deviate from the precepts of classical rationality. Drawing on these insights, entrepreneurship scholars have found evidence that entrepreneurs are more prone than others to certain biases such as overconfidence, belief in the law of small numbers and illusion of control (Busenitz and Barney, 1997; Camerer and Lovo, 1999; Simon et al., 2000), and less prone than bankers to certain biases such as status quo bias (Burmeister and Schade, 2007). Although such biases can clearly be both harmful and beneficial to entrepreneurship, the goal is often to help entrepreneurs identify their flawed modes of reasoning and help them behave more in accord with classical rationality (e.g. Baron, 1998).

Other proponents of process rationality downplay outcomes and expected utilities even more – partly because the uncertainty of future preferences make expected utility calculations problematic (March, 1978) – and instead highlight salient attributes of the decision-making process as such. The argument is that outcomes can often be seen as ancillary end-results of processes that are halted, redirected and driven forward by the pleasures and pains of the process itself, including wishes to avoid discomfort or embarrassment (March, 1978), or ambitions to signal legitimacy or creativity (Nozick, 1993). In an example from the entrepreneurship field, Honig and Karlsson (2004) found that the decision to write a business plan could be better explained as the result of coercive and mimetic forces than as a consequence of rational considerations.

Prospect theory and regret theory

Clearly acknowledging the bounds on human rationality, prospect theory is an empirically grounded model of decision-making that accounts for a number of empirically identified violations of the axioms of rational decision-making (i.e. axioms that are common to decision-making under risk and Bayesian decision-making; Kahneman and Tversky, 1979). Prospect theory divides decision-making procedure into two phases: editing and evaluation. During the editing phase, the agent analyzes the problem's 'prospects' (i.e. its outcomes and probabilities) in a way that yields a simpler representation of the problem, for example by reducing, combining or simplifying prospects. The most important editing, however, consists in determining a reference point that marks the border between what is considered a loss or a gain. During the evaluation phase, the agent chooses the prospect with the highest utility. When doing so, however, people tend to: (1) value similar sized losses higher than gains, (2) overvalue small probability events and undervalue medium and high probability events, and, (3) most importantly, be risk-averse in gain situations and risk-prone when facing losses.

A number of authors have suggested prospect theory as a useful framework for understanding how entrepreneurs decide to take, what appear to be, extraordinary risks when developing their companies (Busenitz et al., 2003). Prospect theory has also been used to explain the decision to become an entrepreneur. Baron thus suggests that: 'persons who choose to become entrepreneurs tend to frame many situations in terms of losses; that is, they focus on the possibilities for economic gains they will forfeit if they ignore or overlook an opportunity and continue to work for an existing organization' (Baron, 2004, p. 225).

Similarly, regret theory seeks to improve on the classical model of rationality by incorporating behavioral evidence. This is done by including the feelings of regret (or rejoicing) that subjects anticipate, should a better (worse) outcome than the one chosen materialize. The result is a two dimensional utility function $U(X, Y)$, where X represents the traditional expected utility and Y denotes the difference in utility between actual outcomes and best (worst) alternatives (Sugden, 1986). Although regret theory has, to the best of our knowledge, not been used by entrepreneurship researchers, it is a parsimonious theory that can explain decision paradoxes such as how the same person can be both risk-prone and risk-averse (see Markham et al. (2002) for related literature on regretful thinking). For example, if you consider betting on a particular horse for the next race and then decide not to, it would be awful to see it win at long odds, making you more likely to actually bet. In the same way, seeing your house burn down after you have decided not to insure it would be an occasion for strongly felt regret, making you more likely to buy insurance.

Judgmental decision-making under true uncertainty

Many economists of entrepreneurship highlight the need to clearly separate the notion of probabilistic risk from true uncertainty. True uncertainty here refers to situations where both potential outcomes and their probabilities are unknown, in part because the situations in question are unique and unrepeatable (Cantillon, 1755, p. 54; Knight, 1921, p. 227; Mises, 1949, p. 110). Consequently, decision-making under uncertainty has to rely on some form of qualitative judgment or intuition rather than on quantitative calculations. In his well known discussion on judgmental decision-making under true

uncertainty, Frank Knight did not specify the content of ‘judgment’ but simply assumed that this capacity existed in humans; that evolution has brought about something in our relationship with the world that allows us to make sound decisions even in the face of a radically uncertain future:

The ultimate logic, or psychology, of these deliberations is obscure, a part of the scientifically unfathomable mystery of life and mind. We must simply fall back upon a ‘capacity’ in the intelligent animal to form more or less correct judgments about things, an intuitive sense of values. We are so built that what seems to us reasonable is likely to be confirmed by experience, or we could not live in the world at all. (Knight, 1921, p.228)

The issue of what constitutes judgment is an intriguing one. As discussed above, behavioral decision theorists have identified a variety of heuristics and biases to which human beings in general are prone. Proponents of ecological rationality, however, argue that seeing heuristics as imperfect versions of optimal statistical procedures may tell the wrong story (Bullock and Todd, 1999; Gigerenzer and Todd, 1999). These authors argue that human beings have evolved to use fast and frugal heuristics that help them adapt to and survive in changing environments. Consequently, environmental fit and functionality, not the internal properties of the problem solving process, provides the key to understanding human cognition. Also, in certain cases, with some interesting corrective procedures such as alternative presentations of the same data – frequencies versus point estimates in probability problems, for example – the so-called ‘biases’ disappear (Gigerenzer et al., 1988).

Like Knight, many recent entrepreneurship researchers continue to simply assume that there exists such a thing as good judgment and that some people have it and others do not. Casson (2005, p. 329) makes the case for entrepreneurial judgment as follows:

Judgemental decision-making involves an element of improvisation rather than exclusive reliance on routines. It makes use not only of publicly available information but also of private information available only to a few. The exercise of judgment involves a synthesis of all this information, for it is rarely the case that a single item of information is sufficient for taking an important business decision. Although everyone makes judgmental decisions from time to time, only the entrepreneur specializes in this activity.

Langlois (2007, p. 1112) uses a definition much closer to Knight:

Judgment is the (largely tacit) ability to make, under conditions of structural uncertainty, decisions that turn out to be reasonable or successful *ex post*.

By black-boxing the specifics of the entrepreneurial decision-making process, these authors seek to draw out the implications of true uncertainty for aspects of entrepreneurial organization and behavior. One way this is done is to make judgmental decision-making the basis of a theory of the firm (Langlois, 2007). Because qualitative judgments about uncertain outcomes cannot be bought and sold on a market – for reasons that also include moral hazard and the general problem of buying and selling information (Arrow, 1962) – the argument is that entrepreneurs must capitalize their judgments themselves (Foss et al., 2007; Langlois, 2007). Others relate judgmental decision-making under true uncertainty to charismatic leadership. Because judgments are highly subjective and hence difficult to communicate, it is difficult for entrepreneurs to use rational arguments

when persuading employees or partners as to why the formers' visions of the future are plausible and worthy of allegiance. Therefore, entrepreneurs must rely on other ways of ensuring that goals and efforts are aligned. In this context, Witt (1998) speaks of the need for cognitive leadership and Langlois (1998), drawing on Weber, sees the entrepreneur as displaying charismatic authority.

Vickers (1965) takes a more normative view and urges humans to develop good judgment almost as an imperative for the future. His focus is thus on the particularities of important human situations and the impossibility of simply extrapolating from the past or following so-called 'general laws' in making decisions involving complex policy matters. At the end of his seminal compilation of detailed case studies that illustrate the particularities that necessitate judgment as opposed to mere rationality, Vickers (1965, p.261) concludes:

For if my analysis is remotely right, the future of our society depends on the speed with which it can *learn* – learn not primarily new ways of responding, though these are needed, but primarily new ways of appreciating a situation that is new and new through our own making . . .

A recent stream of research in entrepreneurship has begun looking into the black-box of entrepreneurial judgment under true uncertainty, codifying an internally consistent set of heuristics used by expert entrepreneurs called 'effectual logic'. (See our outline of effectual rationality below.)

Post-hoc rationality

Most temporally oriented decision-making models assert that actions follow from and conform to given preferences (e.g. a utility function). People are assumed to start with a given set of preferences and, based on this, arrive at some form of decision regarding how to behave in given situations (e.g. maximize expected utility). Models of post-hoc rationality reverse this sequence. Actions are still seen as consistent with preferences, but this consistency is brought about by individuals acting first and only later, when the outcomes can be observed, forming preferences (Weick, 1995).

Hill and Levenhagen (1995) argue that successful entrepreneurs must be able to deal with substantial uncertainty and ambiguity. This is in part accomplished through the retrospective development of plausible visions of the venture's future. Besides being critical as a way to reflexively establish order in the face of uncertainty and ambiguity, vivid post-hoc rationalizations also enable entrepreneurs to more effectively communicate broad and abstract concepts.

Creative and phenomenological rationality

In a major assault on the limitations of the notion of rationality, Hans Joas (1996) painstakingly pointed out that most models of rationality ignore at least three important aspects of decision-making, namely: 'corporeality', the fact that decision makers only have imperfect control over their bodies; 'situatedness', the fact that decision makers are situated in particular circumstances and those circumstances often are inextricable from the decision parameters; and 'sociality', the fact that decision makers are social beings who operate within the context of and interact with other human beings in important ways that make a difference to the way they make decisions.

In effect, Joas's argument boils down to the conclusion that most familiar models of rationality are actually special cases where corporeality, situatedness and sociality do not matter or are deemed not to matter. The moment we become more realistic about these three 'assumed away' aspects of real decision-making, everything changes. In particular, when we open up the decision space to these three dimensions of reality, the creativity of *all* action becomes inescapable and obvious. For the most part, creative action is not the exception but the norm in the human realm. In particular, the usual utilitarian calculus of rational decision-making ought to be relegated to those few specialized instances when we can assume away corporeality, situation and sociality. For most real world decisions and actions, it is better and more useful to use a Pragmatist philosophical basis than a Utilitarian one.

Similarly, Spinoza et al. (1997) draw on the phenomenological tradition to argue that the root source of innovative, or 'history-making', entrepreneurship cannot be explained in terms of abstract rational analyses. Grounded in an ontology that sees individuals as inseparable from the world, i.e. as 'being-in-the-world' (Dreyfus, 1991), such entrepreneurship must instead be understood in terms of individuals who sense, hold on to and engage with anomalies that they perceive in their everyday social and cultural practices. The results of such 'disclosive' activities are inconceivable in advance. Moreover, echoing March's admonition to treat future preferences as unknown, such activities are also seen to fundamentally change the worldview of the entrepreneur. This is elegantly illustrated with the example of falling in love:

When a man falls in love, he loves a particular woman, but it is not that particular woman he needed *before* he fell in love. However, after he is in love, that is after he has found that this particular relationship is gratifying, the need becomes specific as the need for that particular woman, and the man has made a creative discovery about himself. He has become the sort of person that needs that specific relationship and must view himself as having lacked and needed this relationship all along. In such a creative discovery the world reveals a new order of signification that is neither simply discovered nor arbitrarily chosen. (Dreyfus, 1979, p. 277)

Both Joas's exposition of creative rationality and Dreyfus's phenomenological account argue for a 'made' rather than a 'found' worldview. This is very much in line with both effectual rationality, described below, and the notion of moving from decision-making to design that we urge at the end of this chapter.

Recent developments directly related to entrepreneurship

More recently, researchers more directly involved in entrepreneurial decision-making have begun to realize that new conceptions of rationality may be required to describe what entrepreneurs do in building new ventures and creating innovations in the marketplace. Some noteworthy developments include:

Practical intelligence In the preface to his seminal book on the topic, Sternberg (2000, p. xi) describes practical intelligence as follows:

Practical intelligence is what most people call common sense. It is the ability to adapt to, shape and select everyday environments. Intelligence as conventionally defined may be useful in everyday life, but practical intelligence is indispensable. Without some measure of it, one cannot survive in a cultural milieu or even in the natural environment. In our work, we have studied

many aspects of practical intelligence, although we have concentrated on one particularly important aspect of it, *tacit knowledge*, namely the procedural knowledge one learns in everyday life that usually is not taught and often is not even verbalized.

Sternberg and colleagues have developed metrics, designed experiments and carried out fieldwork on the use of practical intelligence in a variety of different domains including entrepreneurship. In a recent article in the *Journal of Business Venturing*, Sternberg (2004) explains how practical intelligence may be combined with creative intelligence to generate and implement valuable new ideas in entrepreneurship:

The most important kind of intelligence for an entrepreneur, or really anyone else, is successful intelligence, which involves a balance of analytical (IQ-based), creative, and practical intelligence. (Sternberg, 2004, p. 196)

Although research on practical intelligence is at the level of the individual, tacit knowledge in the form of successful routines and capabilities is important in the case of firms, especially the type of high-technology, high-growth firms that policy makers everywhere want to foster. Eisenhardt (1989) studied decision-making in high-velocity environments and has since connected her findings with the literature on dynamic capabilities in the strategic management literature (Eisenhardt and Martin, 2000).

Ad-hoc rationality Winter (2003) examined the notion of ‘dynamic capabilities’ to argue that there are more ways for an organization to change than through the use of dynamic capabilities. Broadly speaking, dynamic capabilities involve the ability of organizations to change their capabilities in response to changing environments. As Teece et al. (1997, p. 526) define the term, dynamic capabilities are the capabilities by which firm managers ‘integrate, build, and reconfigure internal and external competencies to address rapidly changing environments’ (Teece et al., 1997, p. 516) in order to achieve sustained competitive advantage.

Winter cites Collis (1994) to observe that one could define an infinite regression of such capabilities – with normal operational capabilities at the zero-order, dynamic capabilities as first-order capabilities, and the ability to know when to change those being second-order and so on *ad infinitum*. In an important sense then, Winter argues, such higher order capabilities are unlikely to exist, simply because higher order changes in the environment most probably are highly unpredictable and simply cannot be ‘prepared for’ in any meaningful sense. Instead, Winter (2003, pp. 992–93) proposes the notion of ad-hoc problem solving:

Whether it is because such an external challenge arrives or because an autonomous decision to change is made at a high level, organizations often have to cope with problems they are not well prepared for. They may be pushed into ‘firefighting’ mode, a high-paced, contingent, opportunistic and perhaps creative search for satisfactory alternative behaviors. It is useful to have a name for the category of such change behaviors that do not depend on dynamic capabilities – behaviors that are largely non-repetitive and at least ‘intendedly rational’ and not merely reactive or passive. I propose ‘ad hoc problem solving’. Ad hoc problem solving is not routine; in particular, not highly patterned and not repetitious. As suggested above, it typically appears as a response to novel challenges from the environment or other relatively unpredictable events. Thus, ad hoc problem solving and the exercise of dynamic capabilities are two different ways to change – or two categories comprising numerous different ways to change.

But then Winter goes on to admit that there may be patterns and learnable heuristics within ad-hoc problem solving, especially with long practice and experience such as in the case of jazz musicians:

Of course, close study of a series of ‘fires’ may well reveal that there is pattern even in ‘firefighting.’ Some of the pattern may be learned and contribute positively to effectiveness, and in that sense be akin to a skill or routine. (Winter, 2003, p.993)

At least one such discernible pattern of internally consistent heuristics is what constitutes effectual logic, the decision–action framework by which expert entrepreneurs transform extant realities into new ventures and new markets.

Effectual rationality Through a series of studies that compared expert entrepreneurs with novices and expert corporate executives, elements of effectual rationality have been identified and related to new market creation (Sarasvathy and Dew, 2005), marketing (Read et al., 2009), private equity investing (Wiltbank et al., 2009), as well as Austrian (Sarasvathy and Dew, 2010) and behavioral (Dew et al., 2008) and evolutionary economics (Sarasvathy et al., 2010a). Effectual logic is means-driven, driven by affordable loss rather than expected return as the criterion for investment, and focused on co-creating new ventures and markets through stakeholder self-selection processes aimed at both shaping the environment and making the future rather than predicting and adapting to them. Effectual logic is pragmatist at its core and takes a creative rather than a search-and-select stance toward decision-making. It is also action-oriented and explicitly incorporates ad-hoc or serendipitous problem solving by leveraging rather than avoiding unexpected contingencies.

Several of these recent developments in decision-making approaches listed above have not yet been fully developed in entrepreneurship research. We believe that the work to date has barely scratched the surface of what is possible, simply because entrepreneurship is a particularly rich domain for a pluralistic view of rationality and also a rather unique domain that encompasses a multi-dimensional decision space – a Galapagos island of human problem solving, as it were. In the next section, we provide an outline of the space through practical examples attached to key theoretical concepts, some of which have not yet been introduced to entrepreneurship research or even to the scholarship in decision-making in general.

THE PROBLEM SPACE FOR DECISION-MAKING IN ENTREPRENEURSHIP: FROM UNCERTAINTY TO OPENNESS

An interesting trend that emerges through a historical analysis of conceptions of rationality is the increasing entanglement of the decision maker with other decision makers as well as with the environment in which decisions occur and decision makers operate. Indeed, it is this entanglement that is of particular interest to entrepreneurship research.

In order to understand the role of decision-making in entrepreneurship research, per se, it is good to begin with Knight’s typology of risk and uncertainty. This typology classifies temporal uncertainties exogenous to the decision maker’s actions and unhooked from issues of interaction – between decision makers, between decision makers and their

Table 8.1 *Elements of the entrepreneurial decision space and relevant tools to tackle them*

Element of decision space		Relevant rationality/ tools	Key scholarly work
Uncertainty	Risk: known distribution, unknown draw	Classical rationality	Arrow (1962), von Neumann and Morgenstern (1944)
	Uncertainty: unknown distribution, unknown draw	Bayesian rationality	Oaksford and Chater (2009)
	True uncertainty/ ignorance: unknowable distribution	Judgment Ad-hoc rationality Effectual logic	Vickers (1965), Boettke (2002), Winter (2003), Sarasvathy (2008)
Openness	Ambiguity: preferences and goals unknown and/or conflicting	Behavioral decision theory Ecological rationality Creative rationality	Simon (1977), March (1978), Kahneman and Tversky (1979), Gigerenzer and Todd (1999), Joas (1996)
	Isotropy: what counts as data is unknown	Relevance logic	Fodor (1983)
	Causality: distribution depends on human action	Causal surgery diagrams	Pearl (2000)

environments and of course, between and within the same decision maker's preferences, tastes and values. If we bring these exogenous issues into the decision-making process, we begin to work with a space that is more characteristic of entrepreneurial decisions. In other words, entrepreneurship highlights problems not only of uncertainty, but also of ambiguity, isotropy and causality – all indicative of openness or too much information rather than too little as in the case of Knight's typology. Briefly, ambiguity refers to unpredictable changes and conflicts in entrepreneurs' own preferences and goals; isotropy refers to the problem of knowing what information is relevant to the decision under consideration and what needs to be ignored as irrelevant; and causality refers to possible changes in the environment caused by human action. See Table 8.1 for a summary of these and how each relates (approximately) to different types of rationality discussed in the previous section as well as certain new tools emerging in literatures both within and outside of entrepreneurship.

In the rest of this section we elaborate on each of these using practical examples. The point here is not to suggest solutions to these problems but to clarify the decision space so we can get a feel for new possibilities for research at the interface of decision-making and entrepreneurship.

In the previous section, we have already examined issues connected with uncertainty. It might be useful, however, to exemplify them in at least one particular context of entrepreneurship, namely, new venture creation. The canonical example of entrepreneurial opportunity in the neo-classical mold is arbitrage – or the \$500 bill left on the sidewalk. In

this world of perfect information, all that the entrepreneur has to do is pick up the \$500. When we move from this skeletal example to a more realistic one, we can see the role of risk (namely, known distribution, unknown draw) in the case of franchise opportunities. When an entrepreneur seeks to open a new McDonald's franchise, for example, he or she faces risk that is mostly calculable and predictable. Yet, unlike the arbitrage example, the skills, experience and other resources of the entrepreneur do matter in terms of the eventual shape and performance of the particular franchise any given entrepreneur ends up developing.

We can contrast that type of risk with uncertainty, which requires a certain amount of trial and error with systematic updating of beliefs through experimental learning. Take the case of Ecotricity:

Committed to a low-impact lifestyle, Vince began his journey into business by building small-scale windmills to serve his personal energy needs and limit his dependency on commercial power. One of the most complex pieces of the puzzle was finding out how to assess environments in order to identify a location providing the kind of consistent wind needed to drive turbines. Not finding adequate solutions on the market, Vince started crafting wind-monitoring towers in 1991 and in 1992 he founded Western Windpower. Western attracted large orders from clients such as Scottish Power, and is now Nexgen Wind, the UK's market leader in wind monitoring equipment.

... Armed with more knowledge of wind measurement and power generation, Vince gained permission to establish a wind farm in the UK in 1992. Just three years later, he founded Ecotricity (originally the Renewable Energy Company), offering the radical alternative of 'green' electricity to both household and business customers. The firm operates 12 wind farms today, representing 10 per cent of England's wind energy, 46GWh/year of renewable electricity (at the end of 2007), and a saving of around 46000 tonnes of CO₂ emissions a year as compared with the same amount of 'brown' energy. (Read and Sarasvathy, 2008, p. 16)

Contrast this with the development of something like the commercialization of the internet, where at any given point in time, it was never clear what would be the next application that would show up and work well – or not. Similar uncertainties and consequently a plethora of possible, but highly uncertain, opportunities abound in the case of iPhone, Facebook and Twitter applications. Here it is not only a matter of experimentation of what might work that contributes to the uncertainty, but the thrill of a whole new industry-changing application that might develop overnight that adds to the overall volatility. In fact, in a profound philosophical sense, one could argue that Knightian true uncertainty characterizes the problem space for *all* entrepreneurship, especially at the earliest stages of firm founding – simply because a potential infinity of factors may impact decisions such as whether to start a venture at all, which venture to start, which ventures *not* to start and whether and with whom to co-found, and so on and on.

As mentioned above, however, the frayed edges of the decision space for entrepreneurship does not stop at Knightian uncertainty. There is the added issue of openness, starting with the preferences of the entrepreneur himself or herself. Here the case of Kaarma is illustrative:

What do you do when you wake up in a lather one day in San Francisco and realise you actually want to be living on a sparsely populated Estonian island in the middle of the Baltic Sea? You make sure that you will be able to support yourself by starting a company there, of course. That

is what Stephen and Ea Greenwood did when they moved to the island of Saaremaa in 2004. But then come the details – what kind of company, where to start, and how to make it work? (Read and Wiltbank, 2009)

Sometimes, even if the entrepreneur clearly knows what he or she wants to accomplish and several parameters of the potential market are known, the decision space for particular implementations might remain open-ended due to a number of equally attractive options or alternatives that contradict each other in ways that make it impossible to choose using traditional decision criteria. Starbucks is a famous case in point. In the early days when Howard Schultz was still trying to perfect the coffee shop of his dreams through *Il Giornale*, he was flooded with input from customers on the ambiance of the place – be it the color on the walls and furniture, the background music, menu format, or the notion of the barista. Schultz's problem is not unique in this regard. Every entrepreneur faces a plethora of implementation decisions – such as name, logo, whether or not to create a Twitter account, office space, whether, when, how and how many meetings, and so on – several of which might turn out to be more or less important in hindsight. Add to this list, conflicting advice from well-wishers and mentors, exciting ideas from almost everyone the entrepreneur talks to, and information pouring from every communication medium encountered during each day – and very soon the environment gets so isotropic that the entrepreneur sometimes simply gives up.

Isotropy refers to the inability to clearly distinguish *ex ante* what information may or may not turn out to be relevant *ex post*. The word *isotropy* is made up from Greek *iso* (equal) and *tropos* (direction) and literally signifies uniformity in all directions. The conceptual notion of isotropy has been identified by philosophers and roboticists under different rubrics such as the frame problem and the relevance problem. Fodor (1983) studied it in some depth in the context of scientific discovery, for example, and used it in constructing a taxonomy of cognitive systems. For our purposes, it is important to note only that the problem of isotropy exists regardless of the truth (or probability of truth) of the facts, i.e. regardless of actors' ability to predict. In fact isotropy is not limited to the unknown aspects of a given problem, but arises from what is known and the relative relevance of different aspects of the known. Thus isotropy is different from Knightian uncertainty where the problem is one of classification and prediction; it is also different from Bayesian updating where the issue concerns how one interprets additional data; in isotropy the problem is one of what counts as data in the first place – before it can be classified or used to update one's expectations.

The final aspect of openness in the entrepreneurial decision space that we need to come to grips with consists in the fact that not only do entrepreneurs actively change, transform and reshape the environments in which they operate, the more experienced ones actively believe that the environment is not exogenous to their actions. This means that even *ex ante* the choice set they perceive as available is different from the choice set others might see if they believed the environment to be mostly exogenous. An actual classroom example might help us see the intuition here. Conventional wisdom takes the position that the future comes from the past. Entrepreneurs invert this paradigm to argue that the past is a reliable predictor of the future *only to the extent* the entrepreneur is *not* taken into account. Eminent probability theorists have also begun taking human agency seriously in studies of causality. Pearl (2000), for example, has invented a 'do' operator in a new kind of probability calculus where human agency is modeled through causal diagrams.

It is tempting to argue that every company that exists would have come into existence in one form or another – and hence the role of any particular entrepreneur is irrelevant to our understanding of the phenomenon. This Panglossian attitude does not help the entrepreneur in the trenches who is striving to make good decisions nor is it of any use to the development of normative approaches to point out better and worse ways to make those decisions. Moreover, Panglossian explanations fail to address the issue of time lags in the development of key ventures such as those that helped commercialize the internet. Take, for example, a successful restaurant called ‘Unsicht’ in Germany. It is a restaurant where dinner is served in pitch darkness by blind waiters. It is interesting to ask whether the market for such a restaurant arose exogenously and an alert entrepreneur responded to the demand, or whether demand for such a restaurant was created through the fact of an entrepreneur creating the concept. If the latter, in what way can we argue that such a restaurant would have come to be, one way or another? And if so, why did it not happen sooner than the twenty-first century? Would it not have been more likely in an age without electricity or in a place without electricity today? Counterfactuals aside, one can find hundreds of examples of ventures that created their own markets and came to be simply because someone decided to make it happen. Faddoctor.com provides a long and lively list of ventures that created fads ranging from Rubik’s cube to the wackywallwalker rubber octopus.

In sum, when we move from the history of decision-making theories to the reality of practical entrepreneuring, it is clear that an almost unlimited scope exists for profitable research in the future. An enumeration of these possibilities would be too far outside the scope of this essay. Instead we point out just two jumping off points – one involving the future of a key issue in current entrepreneurship research (namely the individual–opportunity nexus), and the other having to do with the very role of decision-making in future entrepreneurship research.

IMPLICATIONS FOR THE INDIVIDUAL–OPPORTUNITY NEXUS: QUESTIONING THE QUESTION

Few would dispute that both (a) modes of decision-making rationality and (b) aspects of decision environments are necessary to fully understand entrepreneurial decision-making. Indeed, the widespread idea that entrepreneurship, generally, comprises a ‘nexus of individuals and opportunities’ (Venkataraman, 1997; Shane, 2003) is based on this very premise. The nexus view constitutes a considerable improvement over older, individual-centered, theories of entrepreneurship. Nevertheless, the preceding reviews make clear some of its limitations by showing how it fails to incorporate two very important aspects of entrepreneurship.

First, it focuses exclusively on the ‘lower’ levels of decision-maker rationality and decision environments, i.e. those where individuals make decisions by performing rational (or biased) calculations or somehow forming intuitive judgments regarding the state of an independent (albeit sometimes poorly known) decision environment. Focus is squarely on individuals who discover (or believe that they discover) objectively existing opportunities and act to exploit these (Shane and Venkataraman, 2000). The ‘higher’ level modes of rationality and decision environment discussed above do not enter into the nexus theory.

Of course, this does not mean that the nexus idea is wrong, just that it is slanted in its focus, because it appears to focus on the most common but perhaps not the most interesting modes of entrepreneurship.

In response to such charges, it is sometimes pointed out that these lower-level nexuses (e.g. rational choice or alert discovery of existing opportunities) describe the majority of start-ups, which are neither innovative nor growth-oriented (Shane, 2008, p. 64) but quite mundane (Aldrich, 2009, p. 30). However, as Per Davidsson has repeatedly pointed out, entrepreneurship theories should not be built by democratic vote: 'it is not a given that every empirical case should be deemed equally important for our theory building and theory testing' (Davidsson, 2004, p. 68, cf. Davidsson, 2005, p. 46; 2008, p. 137). Quite to the contrary, because neither the impact nor the workings of all 'entrepreneurial' activities are equal, it is critical to pay special attention to the theoretically more interesting modes of entrepreneurship. Thus, while the nexus theory may be representative in some quantitative sense, it fails to describe what are arguably the most important and theoretically interesting forms of entrepreneurship.

This leads to the second, and related, limitation of the nexus view. It assumes that individuals and opportunities exist independently of each other; an assumption that implies that they can also be treated in isolation. For instance, it is assumed that the characteristics of individuals and opportunities can be gauged separately and thereafter 'added up' to establish their total impact as causes of entrepreneurial behavior. Shane et al. (2003, p. 269) thus write that: 'Researchers need to know the magnitude of the force exerted by the opportunities themselves to accurately estimate the effect of the individual motivations.' However, as we move up the two taxonomies and embrace more and more innovative modes of entrepreneurship, we see that it becomes more and more difficult to keep decision maker and decision environment analytically, indeed ontologically, separate. In sum, the nexus idea constitutes an improvement over individual-centered theories by regarding entrepreneurship as comprising both individuals and opportunities. However, as shown by Joas (1996) and Spinoza et al. (1997), in order to grasp the nature of truly creative modes of entrepreneurship, the relation between individual and opportunity (or agent and structure, if you will) can probably no longer be thought of as a detached *dualism* but needs to be treated as an integrated *duality* where the development of each is inseparable from the development of the other (cf. Giddens, 1984). This brings us to the most important issue for research into entrepreneurial decision-making: how relevant is the notion of 'decision-making' per se?

CONCLUSION: FROM DECISION TO DESIGN

Perhaps it is time we moved from modeling entrepreneurial activity as 'decisions' occurring within the individual-opportunity nexus to expanding the domain of our questions to include the 'design' of opportunities. In this view, opportunities are not exogenous to the entrepreneurial process, but can also be its outcome or residual. Opportunities, as well as ventures and markets and even institutions, may at times be initiated and propelled by individual and collective action while simultaneously being structured by those constraining elements of the decision space that are harder to transform or at least are deemed stable during the design process.

Decision theories mostly ignore design. In modeling the choice between A and B, they take A and B as outside the scope of decision analysis. In contrast, design is interested in how A and B come to be in the first place. A brief examination of the etymology of the two words might be useful here:

c. 1380, from O.Fr. *decider*, from L. *decidere* ‘to decide’, lit. ‘to cut off’, from *de-* ‘off’ + *cædere* ‘to cut’

c. 1548, from L. *designare* ‘mark out, devise’, from *de-* ‘out’ + *signare* ‘to mark’, from *signum* ‘a mark, sign’.¹

The quintessential symbol of decision is the decision tree with forking branches and nodes at which reality is cut into paths taken and paths forgone. The potter’s wheel serves as the symbol for design, evoking images of clay being molded into an infinite variety of shapes and sizes. Both are part of the entrepreneurial process. But focusing exclusively on one without the other cuts us off from coming to grips with the phenomenon in more useful ways.

Of course, some models of the decision-making process, such as the one illustrated in Mintzberg et al. (1976), do incorporate design as a key element. Design, however, in the sense in which Herbert Simon (1996) used it in *The Sciences of the Artificial*, is a domain worthy of study in itself. Entrepreneurship, in our opinion, ought to be as much, if not more, a phenomenon of design as of decision. Moreover, the study of design is bound to have much to offer the study of decisions. For example, consider the well-studied decision between working for a wage versus starting a venture. If looked at as a decision problem, the choice is modeled as an either-or – evoking the etymology of ‘cutting’ the world into two separate pathways. If looked at as a design problem, it is possible to think through a combination (continuing to work while building the venture on the weekends or through a spouse) or a third or fourth path such as getting one’s company to fund a spin off or taking a sabbatical and so on. Although decisions often force a choice between alternatives, design includes the creation of new alternatives, and the latter is particularly important not only for scholarship, but for the practice, pedagogy and policy of entrepreneurship.

Scholars in entrepreneurship have begun to take notice of this importance. Take for example recent work arguing for a more ‘creative’ view of opportunities (Alvarez and Barney, 2007; Berglund, 2007; Sarasvathy et al., 2003) in addition to calls for the study of the creation of new networks (Aldrich and Kim, 2007) and new institutions (Battilana, 2009). In a series of five essays under the rubric, ‘Made as well as found’, Sarasvathy et al. (2010b) have outlined several key ideas from disciplines such as economics, sociology, psychology and philosophy that can be used to begin the study of entrepreneurship as a science of the artificial. The essays suggest methods and theoretical lenses for studying individual entrepreneurs and their stakeholders as makers of opportunities, ventures, markets and institutions as well as seekers of the same. They also urge ways to focus on fabrication processes in addition to discovery processes and examine the outcomes of entrepreneurship as artifacts and not only as unexplored landscapes mapped out through the pursuit of pre-existing opportunities. In all of these, and in new methods and tools that we can bring to bear on these, the key unit of analysis is *interaction* – interaction

between entrepreneurs and their stakeholders, entrepreneurs and their external environment, and between entrepreneurs' own preferences, tastes and values.

Armed with a view of entrepreneurship as a domain of design, we believe that in the near future when our students come asking us about the fork in the road ahead in their lives, we can, like Yogi Berra, advise them to take it.

NOTE

1. <http://www.etymouline.com>, accessed 1 June 2009.

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