6-7-2008

DO EFFECTUAL APPROACHES TO ENTREPRENEURSHIP DESTROY VALUE?

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**Recommended Citation**

Ye, Qian; Fitzsimmons, Jason; and Douglas, Evan (2008) "DO EFFECTUAL APPROACHES TO ENTREPRENEURSHIP DESTROY VALUE?," *Frontiers of Entrepreneurship Research*: Vol. 28: Iss. 4, Article 2.  
Available at: [http://digitalknowledge.babson.edu/fer/vol28/iss4/2](http://digitalknowledge.babson.edu/fer/vol28/iss4/2)
DO EFFECTUAL APPROACHES TO ENTREPRENEURSHIP DESTROY VALUE?

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ABSTRACT

This paper explores the decision making processes involved in effectual logic and the relationship between behavioral biases and the effectual thinking related to entrepreneurial decision making. We consider the reasons why entrepreneurs may have a natural tendency towards effectual approaches and demonstrate under what conditions effectual processes might in some cases lead to less than desirable outcomes. We propose that entrepreneurs like other decision makers can be susceptible to behavioral biases, which can affect their effectual approaches that can either enhance or lead to less than desirable outcomes.

INTRODUCTION

A rational model of entrepreneurial decision making assumes that choices are made on the basis of the entrepreneur’s probability judgments and that choices maximize expected utility. This is consistent with the view of Alvarez and Barney (2006) which suggests that the entrepreneurial process involves the creation and appropriation of value with the overall purpose in creating firms being not just to reduce transaction costs but in order to maximize value. However, Sarasvathy (2001a) proposed a strongly contrary theory of entrepreneurial effectual reasoning that suggests that the decision processes employed by entrepreneurs can differ substantially from the rational choice model. In short, effectuation posits a strategic approach characterized by a more adaptive response rather than a planned approach in uncertain environments (Wiltbank, Dew, Read, & Sarasvathy, 2006).

Effectual logic entails three overriding principles relating uncertainty to opportunity: 1) a focus of affordable loss rather than expected returns 2) a focus on building strategic partnerships rather than depending on competitive analysis, and 3) a focus on the leveraging of contingencies rather than an exploitation of pre-existing knowledge. Overall, an effectual approach to entrepreneurship is more concerned with controlling an uncertain future than with trying to predict how that uncertainty will unfold (Dew & Sarasvathy, 2002).

Sarasvathy (2001a) has not overlooked why entrepreneurs may have the natural tendency towards effectual approaches even though effectual processes may not might be the optimal approach in all situations. Although effectual reasoning is not considered an irrational response to the entrepreneurial task, it does however involve a set deviations from rational choices as a “non-overlapping alternative paradigm” to choice of rationality (Dew et al., 2002). Consequently, entrepreneurs may be susceptible to the same biases that hinder decision making in other contexts. Thus, better understanding the potential impact of behavioral biases and entrepreneurs’ responding behaviors, and investigating the conditions under which effectual approaches can either enhance or lead to less than desirable outcomes can help us better understand the decision making processes in entrepreneurship.
In this paper we argue that certain behavioral biases can have a potential impact on entrepreneurs' effectual decision making, resulting in less than optimal choices which may lead to less than optimal outcomes. We consider the decision making processes involved in effectual logic and the relationship between behavioral biases and effectual thinking related to entrepreneurial decision making. We explore the cognitive reasoning associated with effectuation and whether effectual approaches to entrepreneurship may destroy value. In order to understand this point, it is important to recognize that entrepreneurs like other decision makers have a tendency towards risk aversion (Bellu, Davidsson, & Goldfarb, 1990; Miner, 1990). In this situation, decision makers demonstrate a preference for sure bets rather than a gamble of equal value, and they prefer gambles of lower variance rather than riskier prospects (Kahneman & Lovallo, 1993). Consequently, we expect that entrepreneurs in highly uncertain environments characterized by early stage ventures will have a tendency to reduce risk rather than maximizing value.

The goal of this paper is to extend the important contributions from recent research in effectual reasoning and decision making process in entrepreneurship. Our investigation highlights the effect of behavioral biases on entrepreneurial action. We consider each of principles embodying effectual approaches and demonstrate the relationship between well known behavioral biases and each of the principles of effectual thinking. The next section provides the theoretic background of this paper including the principles associated of the effectuation theory, which serves as a useful lens in understanding the entrepreneurial process. We then discuss the literature related to behavioral biases that can impact on effective decision making. Based on the assumption that entrepreneurs naturally apply effectual logic, we develop propositions associating behavioral biases and effectual reasoning resulting in entrepreneurs making less optimal decisions resulting in less than desirable outcomes. We conclude with directions for future research extending the behavioral aspects of effectual reasoning and the impact on entrepreneurial decision making processes.

THEORETIC BACKGROUND

Effectuation Theory

Effectual reasoning is an alternative to causal reasoning in entrepreneurial decision making (Sarasvathy, 2001b). Unlike causal processes where a decision maker takes a pre-determined goal and focuses on a given set of means to achieve the fastest, cheapest and the most efficient result, effectuation on the other hand follows the process of effectual logic that begins with a set of means and focuses on selecting possible effects that can be achieved by these means (Davidsson, 2005; Sarasvathy, 2001a). Sarasvathy (2001b) proposed that the causal model does not adequately describe how entrepreneurs actually behave, suggesting instead that entrepreneurs have a tendency toward effectual reasoning to guide their decision making. According to Sarasvathy, although the same person can use both causation and effectuation reasoning at different times depending on the requirement of contextual circumstances, entrepreneurs naturally prefer effectual logic over causal reasoning especially in the very early stage of new ventures where risks and uncertainty is higher.

Entrepreneurs usually begin with three categories of means: 1) their traits, tastes and abilities—who am I? 2) their skills and resources such as their education, expertise, and experiences—what I know?, and 3) their contacts and social networks—whom I know?. Without a specific goal, effectuation process is inherently creative and interactive. It can take off in any direction in line with the given means in which varied imagination, early feedback from customers, and diverse aspirations of the founders and their contacts are involved, which allows goals to emerge contingently over time (Dew et al., 2002; Sarasvathy, 2001a, b).
There are three general principles related to effectual thought:

1. A focus on affordable loss rather than expected returns. Entrepreneurs tend to spend minimum expenditure of resources such as time, effort, and money. Therefore, limiting the downside if they fail is more important than maximizing returns.

2. A focus on strategic alliances rather than competitive analysis. Entrepreneurs prefer to build partnerships rather than competitive behavior. Following this principle, entrepreneurs can bring their ideas to market with the least capital, and they obtain pre-commitments from stakeholders who can help them reduce uncertainty. In addition, expanding network of strategic partnerships may help entrepreneurs identify the market the entrepreneurial firm will “end in”.

3. A focus on the leveraging of contingencies rather than pre-existing information. Entrepreneurs are sensitive to contingencies, and prefer to leverage uncertainty by treating the unexpected as opportunity and turning it into profitable business strengths. The core of this principle is that entrepreneurial expertise leads to the ability to leverage contingencies and utilize contingent information to reconfigure their goals. According to this principle, not all unexpected events are considered bad but instead can be sources of opportunity.

Together these three basic principles embody an effectual approach to entrepreneurship based on the premise that as long as individuals have some control over the future there is less need to predict it. According to Sarasvathy (2001a), effectuation describes what entrepreneurs actually do. She proposed that effectual logic makes entrepreneurs entrepreneurial and differentiates entrepreneurs from managers who use managerial or strategic decision making that reflects classical causal reasoning. Dew and Sarasvathy (2002) further indicated that effectual reasoning should incorporate heuristics and principles observed in other research on entrepreneurship. This view is consistent with the prediction of Baron (2000) which proposes that entrepreneurs more likely rely on heuristics than other people to guide their thinking and decision making because they often work in situations that are new, unpredictable, complex, and subject to high time pressures. Accordingly, entrepreneurs can exhibit enhanced susceptibility to various forms of cognitive bias or error. Evidence consistent with these propositions has been reported continuously. For instance, Smith et al. (1988) reported that entrepreneurs were less comprehensive in their decision behavior than managers in large organizations. They found that entrepreneurs gathered significantly less information and utilized less formal techniques when they analyzed problems. Other studies reported that entrepreneurs use heuristics in decision making more extensively than managers (Busenitz, 1999; Busenitz & Barney, 1997). Consequently, entrepreneurs are reported to be more susceptible to cognitive biases than other individuals. For example, Palich and Bagby (1995) documented that entrepreneurs’ perceptions of risk showed greater bias than those of other persons. Busenitz and Barney (1997) also found that entrepreneurs were significantly more likely to show overconfidence and to use representativeness in their own judgment than other individuals.

Although evidence of substantial deviations from the rational model of entrepreneurship decision making continue to mount, recent studies that specifically examined entrepreneurial decision making have concentrated on investigating the differences in decision making between entrepreneurs and other individuals such as managers. Few studies however (Goel & Karri, 2006; Simon, Houghton, & Aquino, 2000) have examined the effects of heuristics and biases on entrepreneurial decision making process and effectual decision making behavior. In addition, the literature has not addressed the reasons why entrepreneurs have a tendency towards effectual
approaches. If entrepreneurial decision making is susceptible to behavioral biases in decision making then it is likely that they may be prone to decision making that can hinder the achievement of successful outcomes.

Sarasvathy (2001a) carefully described the effectuation process, and provides evidence supporting the descriptive validity of effectual processes (Davidsson, 2005, p14) reflecting what entrepreneurs do although she does point out that effectuation may not lead to the most efficient outcomes. As Davidsson (2005, p14) points out, “the effectuation model may sometimes describe better what entrepreneurs do, but this does not prove that they are right in doing so. They might have been more successful with a different approach.”

**EFFECTUAL DECISION MAKING**

Heuristics and Biases

Historically, the rational model dominated strategic decision making literature. It follows the assumption that individuals make rational decisions and behave on purpose (Eisenhardt & Zbaracki, 1992). This assumption has been extensively challenged (Allison, 1971; Simon, 1959). Scholars have realized that the purely rational model cannot describe the realities of strategic decision making. In many cases, goals are unclear and shift over time. Decision makers follow by generating alternative and choice rather than the rational proves of goal definition (Anderson, 1983). Consequently other research argued that decision makers are boundedly rational (Simon, XX). This view acknowledges the bounded rationality of the decision making processes; therefore they seek to figure out how to improve the rationality in decision making.

The behavioral perspective breaks from the rational decision-making stream of thought and argues that decision makers are simultaneously rational and intuitive. Decision makers adjust their rationality in complex ways which cannot be simply describes as being more or less rational (Eisenhardt et al., 1992). Heuristics refer to a set of decision rules, cognitive mechanisms, and subjective opinions people use to assist in making decisions (Busenitz et al., 1997), which are rational in some ways, but not others (Eisenhardt et al., 1992). Heuristic decision making reflects a process of “cognitive simplification” (Schwenk, 1988), in which decision makers adopt simplifying strategies and apply a set of rule of thumb to make choices (Busenitz et al., 1997; Simon & Houghton, 2002). Heuristics can help decision makers cope with high level of uncertainty characterized by turbulence and chaos, especially under conditions lacking rational patterns where comprehensively rational decisions can be made (Busenitz et al., 1997; Schwenk, 1988; Simon et al., 2002). However, heuristics may also inevitably lead to behavioral biases which may result in decisional errors. As Tversky and Kahneman (1974, p.1125) pointed out, “in general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors.”

Behavioral biases are subjective or predisposed opinions that derive from specific heuristics (Busenitz & Lau, 1996). Because of behavioral biases, individuals may fail to notice information, overestimate the reliability and validity of the information, incorrectly weight information, and draw erroneous conclusions (Simon et al., 2002; Simon et al., 2000). Entrepreneurs may also be more likely to apply heuristics in decision making than other individuals (Baron, 2000; Busenitz, 1999; Wright, Hoskisson, Busenitz, & Dial, 2000), thereby they are susceptible to biases because they behave under the situation of high stress and ambiguity, which requires them to make fast decisions without enough rational decision making patterns (Simon et al., 2000). Thus, certain behavioral biases may cause entrepreneurs who inherently apply effectuation approach to discount the negative outcomes and uncertainty (Barnes Jr, 1984), overestimate their skills and resources.
(Busenitz et al., 1997), and over-trust their contacts and partners (Goel et al., 2006), thereby hindering entrepreneurs’ decision making.

**Heuristics and Biases and Effectuation**

Researchers have identified a number of heuristics and biases that may impact strategic decision making. Hogarth (1980) provided a list of 29 separate biases uncovered by research. On the basis of Hogarth’s list, Schwenk (1988) selected 10 biases which seem most likely to affect strategic decision making (see Appendix A). However, this list does not include all biases likely to be related to entrepreneurial decision making.

The purpose of this paper is to explore the decision making processes involved in effectual logic and the relationship between behavioral biases and effectual thinking. This paper utilizes the three overriding principles of effectual thought to identify those biases that are most likely to impact effectual thinking. A bias was included if previous literature indicated it 1) occurred when entrepreneur focuses on affordable loss rather than expected returns, 2) influenced the effect of building strategic partnerships, and 3) arose during leveraging of contingencies. On the basis of this research, we identified several behavioral biases including threats bias, loss aversion, over-trust, and illusion of control.

**Threats Bias, Loss Aversion, and the Effectuation Principle of Focus on Affordable Loss**

“Threat” is one of the two “schemas” (the other one is opportunity) that are commonly used by organizational decision makers to scan their environment and make response (Jackson & Dutton, 1988). Decision makers engage in environment scanning and identity threats and opportunities by comparing the characteristics of the specific issues to their perceptions of what a threat and opportunity represent. Dutton and Jackson (1987), who based on researchers’ concepts of crises, threats, and stress, developed the issue characteristics associated with threat or opportunity. The issue characteristics of negative, uncontrollable, and potential loss would be “threat-consistent”. On the contrary, the issue characteristics of positive, controllable, and potential gain would be “threat-discrepant”. Thus, threats have a clear negative connotation, and are avoided where possible. Perceived threats may cause people to restrict the amount of information they access to and constrain the solutions they choose (Billings, Milburn, & Schaalman, 1980; Staw, Sandelands, & Dutton, 1981).

Threats bias refers to decision maker being more sensitive to issue characteristics associated with threats than to those of same issue associated with opportunities (Jackson et al., 1988). Threats bias may occur under the situation characterized of urgent, stressful, problematic and conflict, in which individuals face likelihood of loss without gain, less control, and feeling being less qualified. Basing on the data of 78 male general managers and strategic planners contacted through questionnaires, Jackson and Dutton (1988) found threat bias to be extensively exhibited amongst managers. Managers tend to view strategic issues as threat unless they are strongly convinced otherwise. Threat bias causes individuals to ignore, under-recognize, or over-interpret threats, sometimes resulting in disastrous consequences (Starbuck & Hedberg, 1977).

In entrepreneurial context, characterized by highly uncertain, unpredictable and stressful environments, threat bias may occur and causing entrepreneurs to have preference of loss aversion. That is, under high uncertain conditions, entrepreneurs focus on minimizing downside rather than expected returns. This view has been supported by empirical work which reported that environmental uncertainty moderated entrepreneurs’ desire to avoid risk (Bellu et al., 1990), and
entrepreneurs like other decision makers have a tendency towards risk aversion (Miner, 1990). This is consistent with the view of Tversky and Kahneman (1979) that people generally value loss prevention over gain. In this situation, decision makers demonstrate a preference for sure bets rather than a gamble of equal value, and they prefer gambles of lower variance rather than riskier prospects (Kahneman et al., 1993). Following this logic, I would expect that entrepreneurs at early stage ventures characterized by highly uncertain environments will have a preference for reducing risk rather than maximizing value, given that threat bias induces them to be more sensitive to the risks resulting in loss aversion. In short, limiting the damage when they fail is more crucial for them than gaining the highest return when they succeed. Consequently, entrepreneurs try to limit risk through smaller more frequent entrepreneurial commitments to action, and tend to spend minimum expenditure of resources such as time, effort, and money. Therefore, entrepreneurs’ effectual thinking focusing on affordable loss rather than expected return may result in less optimal decisional choice which is followed by less desirable outcome.

Proposition 1: Effectual reasoning may lead to under-investment in otherwise good investment opportunities.

Over-trust, and Effectuation Principle of Focus on Building Strategic Partnerships

Applying effectual reasoning, entrepreneurs emphasize strategic alliances rather than competitive analysis. Following this principle, entrepreneurs attempt to bring their ideas to market with the least capital and obtain pre-commitments from stakeholders who can help them reduce uncertainty. In addition, expanding a network of strategic partnerships may help entrepreneurs identify the market the entrepreneurial firm will finally “end in”. Therefore, with this approach, entrepreneurs prefer to build partnerships rather than focusing on competitive behavior at the startup phase (Sarasvathy, 2001a). A very important factor involved into this process is the concept of trust. As Coleman (1990) noted, entrepreneurship is somehow a trust function in which trustors place resources in the hands of other actors who are expected to realize gains. Entrepreneurs need to trust and being trusted in order to get pre-commitment from their partners or stakeholders. There are informative literature theoretically or empirically addressing that trust plays a mainly positively role in reducing the complexity of business operations, in lowing transaction costs, in accessing accurate and valuable information, and in making things happen quickly and efficiently (Howorth & Moro, 2006; Welter & Smallbone, 2006). However, several scholars have recently noticed the dysfunctional effects of trust on entrepreneurship (Goel et al., 2006; Zahra, Yavuz, & Ucbasaran, 2006). They proposed that reliance on trust can be excessive and lead to over-trust causing serious errors of judgment.

Over-trust is a bias with which one chooses, either consciously or habitually, to trust another more than is warranted by an objective assessment of the situation (Goel, Bell, & Pierce, 2005). Basing on this definition, Goel and Karri (2006 , p479) further refine over-trust in the context of the entrepreneur’s trusting behavior as “instrumental in making deals under the assumption that the other parties will keep their end of the bargain.”. They proposed that in the absence of perfect information and systematical evaluation of objective criteria, entrepreneurs effectuate through alliances and cooperative strategies, rely more heavily on their partners and networks, and make bets on relational outcome. Therefore, entrepreneurs driven by effectuation processes are more susceptible to over-trust than other individuals. In many cases, entrepreneurs are unlikely to exercise the necessary due diligence and engage in monitoring behavior (Goel et al., 2005; Zahra et al., 2006). As a consequent, entrepreneurs trust in situation where others may urge caution and seek cautionary safeguards, which may lead to a less than ideal partnership. Furthermore, entrepreneurs who over-trust may ignore evidence that would indicate the previous assumption of
trustworthiness false. Instead, they are likely to favor ideas from sources that they value and trust, which make it less likely to conceive and develop radical changes (Zahra et al., 2006). Besides, over-trust could also lead to less feedback and immediate acceptance of proposed ideas (Zahra et al., 2006). As a trustor or served as a trustee, entrepreneur may favor their ideas in a ways that they believe their partner will like and make those ideas more politically acceptable, thereby hinder creativity and innovation (Nooteboom, 2002)

**Proposition 2: Effectuation reasoning may cause entrepreneurs to escalate commitment to less than ideal partnerships.**

**Illusion of Control, and Effectuation Principle of Focus on the Leveraging of Contingencies**

Another principle associated with effectual reasoning is the focus on the exploitation of contingencies rather than exploitation of pre-existing knowledge. Entrepreneurs are sensitive to the arrival of contingencies, and exploit those unexpected that arose over time. The core of this principle is entrepreneurial expertise that has the ability to leverage the contingencies and utilize contingent information to reconfigure their goals, a situation where biases of illusion of control would dominant.

Illusion of control is a common cognitive bias exhibited by entrepreneurs (Langer & Abelson, 1983; Schwenk, 1988; Simon et al., 2000). It refers to a bias in which a decision maker overemphasizes the extent to which his/her skills can increase performance in situations where chances plays a large part and skill is not necessarily the deciding factor (Langer & Roth, 1975). Langer (1983) notes that illusion of control may occur under the condition that people tend to seek out information that supports their hypothesis and ignore disconfirming evidence. Illusion of control may affect individuals’ assessments of their chance of success (Schwenk, 1988). Individuals exhibiting this bias tend to overestimate their abilities to cope with and predict future events.

With effectuation reasoning, entrepreneurs believe they can control the future rather than predict it, and exploit the contingency over time. Their perception of control, however, may be an illusion, because illusion of control bias may cause them underestimate the potential risk of the encountered unexpected, over-evaluate their skills that can prevent negative occurrences, and overestimate the future outcome. This observation has been supported by empirical studies that reported that an illusion of control decreases one’s perception of the level of risk associated with forming a venture (Keh, Foo, & Lim, 2002; Simon et al., 2000). Therefore, under the situation of high uncertainty, the process that effectual entrepreneurs rely on expertise to leverage the contingencies and utilize contingent information to reconfigure their goals can be impacted by the heuristic bias of illusion of control, resulting in less effective decision making.

**Proposition 3: Effectuation reasoning may cause entrepreneurs to pursue less than ideal opportunities related to their venture**

**DISCUSSION AND IMPLICATION**

This paper adopts the theoretical lens of effectuation to understand decision making processes in entrepreneurship. In examining the effectuation process, we examine behavioral biases associated with the principles of effectuation logic, and explore the potential impact of effectuation reasoning entrepreneurial outcomes.
Entrepreneurs need to make judgments under complex or uncertain conditions. In these situations, entrepreneurs may adopt effectual approaches where they pursue a more adaptive response rather than a planned approach. With the effectuation reasoning, entrepreneurs have a tendency towards three principles being a focus on affordable loss rather than expected returns, a focus on building on strategic partnerships rather than depending on competitive analysis and lastly, a focus on the exploitation of contingencies rather than an exploitation of pre-existing knowledge. These principles are derived from standard rationality. Because entrepreneurs generally have fewer resources and lack information to make objective decisions, they must draw fast conclusions since the window of opportunity may be temporary and consequently they apply simplified strategies to cope with the high levels of uncertainty. Entrepreneurial heuristics, however, inevitably raise cognitive or behavioral biases. Recent articles (Busenitz et al., 1997; Simon et al., 2000) have extended our knowledge by suggesting that cognitive biases affect entrepreneurs’ perception and their responding act. Therefore, a given bias may present in the process of effectual reasoning, and specific biases may be associated with each of effectuation principles embodying effectual approaches. As a consequent, entrepreneurs may be susceptible to the same biases that hinder decision making in other contexts. Under these conditions, effectuation may lead to less than desirable outcome rather than otherwise.

The present article, therefore, explores the effects of heuristics and cognitive biases on the effectuation decision making. Our approach is to consider the relationship between each of effectuation principles and well known behavioral biases. We propose that threats bias and loss aversion, over-trust, and illusion of control can lead entrepreneurs to make limited commitment, make less optimal investments rather than maximum value, build up less ideal partnerships, gain an illusion of perception of personal control, and make ineffective decisions. Under these circumstances, effectuation may destroy value rather than enhance. Previous research has not addressed these relationships, making a gap in understanding the decision making process in entrepreneurship.

In addition to providing insights into the decision making process in entrepreneurship, this focus may help us understand why entrepreneurs may have a nature tendency towards effectual approaches. It also helps us understand if entrepreneurs actually do effectuation, whether they are right to do so? My arguments suggest that effectuation process gives rises to biases that lead to context-specific misperception that, in turn, impact the decision they make and the outcome of their act.

Although this article sheds lights on the negative side of cognitive biases and effectual outcome, it should be noticed that heuristics and effectual reasoning also facilitate the entrepreneurs’ willingness to exploit opportunity. Otherwise, under high uncertainty, with limited resources, no entrepreneurs will take risky actions if they all rely on precisely rational analysis. Regardless of whether the net effects of biases are positive or negative, it is beneficial to have an increasing understanding of how specific biases arise in the process of effectuation and what the resulting consequences are. As an entrepreneur, one may take into account the potential effects of cognitive biases and seek to minimize their negative influences. Understanding the situation where misperceptions are most likely to arise, it may help entrepreneurs to effectuate efficiently.

Future Research

Although this paper explores the effects of heuristics and biases on effectual decision making, and demonstrates the conditions under which effectual approach may destroy value, the relationship between effectual behavior and entrepreneurial cognition are still far from
comprehensive. It is highly possible that there are other factors other than heuristic biases influencing the process of effectuation. We hope this article can provide insights and serve as a catalyst calling for a more detailed look at the effectual decision making in the field of entrepreneurship.

CONCLUSION

Effectuation has been identified as emerging themes in entrepreneurship and a theory which will help us understand the decision making processes in entrepreneurship. The goal of this paper is to extend the important contributions from recent research in this area. I believe this study will make an important contribution to our understanding of why individuals may choose effectual approaches and how this behavior may or may not enhance entrepreneurial outcomes.

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APPENDIX A

Table I. Selected heuristics and biases

<table>
<thead>
<tr>
<th>Bias</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Availability</td>
<td>Judgements of probability of easily-recalled</td>
</tr>
<tr>
<td></td>
<td>events distorted.</td>
</tr>
<tr>
<td>(2) Selective</td>
<td>Expectations may bias observations of variables</td>
</tr>
<tr>
<td>perception</td>
<td>relevant to strategy.</td>
</tr>
<tr>
<td>(3) Illusory</td>
<td>Encourages belief that unrelated variables</td>
</tr>
<tr>
<td>correlation</td>
<td>are correlated.</td>
</tr>
<tr>
<td>(4) Conservatism</td>
<td>Failure sufficiently to revise forecasts based</td>
</tr>
<tr>
<td></td>
<td>on new information.</td>
</tr>
<tr>
<td>(5) Law of small</td>
<td>Overestimation of the degree to which small</td>
</tr>
<tr>
<td>numbers</td>
<td>samples are representative of populations.</td>
</tr>
<tr>
<td>(6) Regression bias</td>
<td>Failure to allow for regression to the mean.</td>
</tr>
<tr>
<td>(7) Wishful thinking</td>
<td>Probability of desired outcomes judged to be</td>
</tr>
<tr>
<td></td>
<td>inappropriately high.</td>
</tr>
<tr>
<td>(8) Illusion of</td>
<td>Overestimation of personal control over outcomes.</td>
</tr>
<tr>
<td>control</td>
<td></td>
</tr>
<tr>
<td>(9) Logical</td>
<td>‘Logical’ reconstruction of events which</td>
</tr>
<tr>
<td>reconstruction</td>
<td>cannot be accurately recalled.</td>
</tr>
<tr>
<td>(10) Hindsight bias</td>
<td>Overestimation of predictability of past events.</td>
</tr>
</tbody>
</table>