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The role of entrepreneurial decision-making in opportunity creation and recognition



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ABSTRACT

This qualitative study investigates effectuation and causation as two opposing decisionmaking modes leading to opportunity creation and recognition. Prior literature posits that effectuation is linked to opportunity creation when the venture's future is highly uncertain and causation to opportunity recognition when the entrepreneur perceives risk rather than uncertainty. However, such a linear approach towards opportunity generation offers limited explanation as to how entrepreneurs decide to either create or search for entrepreneurial opportunities. This limitation becomes particularly apparent in the highly uncertain context of the biotechnology industry, where entrepreneurial decision-making processes iterate over long periods of time. To address this gap, we employ the embedded case study method to investigate 30 decisions made by three scientist-entrepreneurs commercializing platform biotechnology inventions.

We inductively derive a model of entrepreneurial decision-making, which connects the environment to decision-making mode and opportunity generation. Our evidence reveals the iterative nature of opportunity generation and of decision-making modes as entrepreneurs respond to their evolving environment and to the level of regulatory and funding constraint, such that entrepreneurs can shift from effectuation to causation, remain in one particular mode, or adopt a combination mode. We also illustrate that effectuation does not always lead to opportunity creation.

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1. Introduction

Although there is active debate in the entrepreneurship literature as to whether opportunities are recognized or created, there is broad agreement that quantifiable risk is associated with the former type of opportunity generation, whereas uncertainty is inherent to the latter. The opportunity recognition theory assumes that alert entrepreneurs will recognize and exploit existing market imperfections (Shane and Venkataraman, 2000). This camp of entrepreneurship scholars argue that “opportunities, like mountains, exist as a real and objective phenomena, independent of the actions or perceptions of entrepreneurs, just waiting to be discovered and exploited” (Alvarez and Barney, 2007: p. 13). Under this theory, an entrepreneur's goal is to discover new opportunities in the market earlier than other individuals do, recognize and make an accurate conjecture about the values of specific opportunities, and find the right means-ends relationships to capture entrepreneurial profits (Kirzner, 1997; Shane, 2003). On

the contrary, opportunity creation theory assumes that either the entrepreneurial means or the market application do not exist independent of the entrepreneur's actions (Alvarez and Barney, 2007; Gartner, 1985; Sarasvathy, 2001). There are no risks to quantify, but there exists some level of uncertainty regarding outcome. Many significant opportunities, such as the modern consumer electronics industry, could not have been discovered, as it emerged from the new attributes of the transistor, and the imaginations and actions of entrepreneurs such as Robert Noyce (Maine et al., 2013). This distinction is important to scholars and practitioners because opportunity creation and opportunity recognition are thought to involve very different entrepreneurial decision-making modes.

Prior literature suggests two opposing modes of entrepreneurial decision-making in the context of opportunity generation: *effectuation and causation*. Our aim is to explore how entrepreneurs make decisions to create or to recognize opportunities and under what conditions each mode prevails. *Effectuation*, as an entrepreneurial decision-making mode, puts an emphasis on the principles of experimentation, affordable loss, and on using means at the immediate disposal of the entrepreneur to achieve imagined ends (Sarasvathy, 2001). In contrast, *causation* relies on predicting

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the future and pre-determining commercialization goals (Saravathy, 2001). Saravathy, together with her colleagues in a growing stream of studies (e.g. Dew et al., 2009; Read and Saravathy, 2005; Saravathy and Dew, 2005; Saravathy and Kotha, 2001; Wiltbank et al., 2006), has argued that effectuation is more appropriate as a perspective for understanding how entrepreneurs perceive and process information and exploit environmental contingencies to create opportunities under conditions of uncertainty. However, we question the limits of that assumption. Are there circumstances under which, even in a highly uncertain environment, entrepreneurs are more likely to make decisions in causation mode? And does effectuation always lead to opportunity creation? Thus, in this paper, we investigate the interplay between environment and decision-making mode, and opportunity creation or recognition, considering the context of each decision made by the entrepreneurs.

Biotechnology venture creation provides an especially appropriate context for this investigation as biotechnology entrepreneurs operate under challenging conditions, with sustained levels of high technology and market uncertainty, high levels of capital investment, and stringent regulatory requirements during clinical development (DiMasi et al., 2003; Liebeskind et al., 1996; Niosi, 2003; Pisano, 2006, 2010). Previous entrepreneurship studies, through which existing theories have been built, have focused on shorter timelines and environments with lower uncertainty and lower constraints. We conducted in-depth interviews with three founder CEOs and examined 30 entrepreneurial decisions made in relation to commercializing platform biotechnology inventions over at least 10 years during and after founding their companies. In so doing, we wish to address whether the stream of research on entrepreneurial decision-making as it relates to opportunity generation is robust to the conditions prevalent in the biotechnology sector.

Using an embedded case study approach, we analyzed the interview data first by each entrepreneur and then by decision-making processes within and across entrepreneurs. Based on our case observations at both entrepreneur and decision levels, we inductively developed a model of the entrepreneurial decision-making process. The model features the interplay between environment and decision-making mode, depicting how entrepreneurs make use of effectuation and causation principles iteratively in response to their evolving environments, which in turn lead to opportunity creation or recognition. All of our observations were of decisions made in environments characterized by high uncertainty. Our cases on the entrepreneurs also revealed some interesting observations about their perceptions of external constraints that exert different levels of influence on their decision-making processes. Perceived external constraints included the expectations of angel investors, alliance partners, venture capital investors, and regulatory requirements. Our qualitative findings suggest that decisions made in effectuation mode were observed under a mainly low level of external constraints, but never observed under high level of external constraints. Interestingly, we found that several decisions made under such conditions actually led to the recognition rather than the creation of opportunities, challenging the deterministic relationship between decision-making mode and opportunity generation. Conversely, only decisions made in causation mode were observed under high level of external constraints, though overall outcome was consistent with opportunity recognition.

This research contributes to the entrepreneurship literature in three ways. First, the implications of our research address the recent debates in the entrepreneurship literature on shaping the future vs. predicting the future, and on creating or recognizing entrepreneurial opportunities (Alvarez and Barney, 2007; Dew et al., 2009; Saravathy, 2001; Shane, 2000). We argue that, in conditions of high technological and market uncertainty, the future must be created to some degree, and effectuation principles

are utilized for that creation, but that certain external constraints can moderate the relationship between highly uncertain environments and decision-making mode. Second, our paper sheds light on entrepreneurial decisions and actions intrinsic to effectuation and causation reasoning: we provide and analyze evidence of how individual entrepreneurs perceive risks and uncertainty, frame their decision problems and assess the contingencies (or constraints) associated with imagined paths (or predicted paths) into the future. Third, this research adds to the growing body of literature on science-based entrepreneurship by examining the role of entrepreneurial decision-making in scientists' founding activities and in their experimentation with alternative commercialization paths for science-based ventures. Many empirical studies tend to focus on the internal structures and mechanisms of translating scientific discovery into useful innovation (e.g. Stuart et al., 2007; Subramanian et al., 2013) and on the profiles or motivations of scientists to participate in commercialization activities, including patenting and forming companies (e.g. Ding and Choi, 2011; Jain et al., 2009). To the best of our knowledge, none has paid attention to the role of entrepreneurial decision-making in scientists' founding and commercialization activities.

Following our literature review (Section 2) and methodology (Section 3), in Section 4 we present case studies of each scientist-entrepreneur's overall experience in founding and growing their biotechnology venture. In Section 5, we analyze the 30 decisions that emerged from the data, categorized into six decision-making processes. We elucidate the iterative nature of three of these decision-making processes. In Section 6, we propose a model of entrepreneurial decision-making in opportunity generation and discuss the implications of our findings for the entrepreneurship literature and for entrepreneurs. We conclude in Section 7 with a summary of our findings and contributions.

2. Literature review

We begin by reviewing the literature on entrepreneurial decision-making modes, introducing effectuation and causation. We also discuss how these two decision-making modes, and the principles guiding each mode, influence entrepreneurs in creating and recognizing opportunities under uncertainty. Next, we provide an overview of biotechnology commercialization, including industry value chain and the stages of drug development.

2.1. Entrepreneurial decision-making modes: effectuation vs. causation

Entrepreneurs have cognitive preferences and mental frameworks which influence their decision-making, and in turn explain why some people and not others recognize and exploit entrepreneurial opportunities (Mitchell et al., 2002; Shane and Venkataraman, 2000). The two main entrepreneurial decision-making modes, namely, effectuation and causation, reflect extremes of these mental frameworks (Saravathy, 2001).

Saravathy (2001) has argued that individuals employ effectuation processes when pursuing entrepreneurial opportunities by using resources at their immediate disposal (i.e. who they are, what they know and whom they know). An entrepreneur using effectual logic begins with a given set of means, focuses on affordable loss, strategic alliances, exploits contingencies and seeks to control an unpredictable future (Saravathy, 2001). In effectual processes, the overall entrepreneurial objective is not clearly envisioned at the beginning of the venture and opportunity creating processes remain flexible, allowing the entrepreneur to take advantage of environmental contingencies as they arise and to learn as they go (Saravathy and Dew, 2005).

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