Knowing what to do and doing what you know: Effectuation as a form of entrepreneurial expertise

Stuart Read and Saras Sarasvathy

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Stuart Read
IMD - International Institute for Management Development (IMD)
23, Chemin de Bellerive
Chemin de Bellerive 23, P.O. Box 915
CH-1001 Lausanne, Switzerland
Phone: + 41 (0)21 618 01 11
Fax: + 41 (0)21 618 07 07
Email: stuart.read@imd.ch

Saras Sarasvathy
Darden Graduate School of Business Administration
University of Virginia
P O Box 6550
Charlottesville, VA 22906-6550
Voice: 434-982-2079
Email: sarasvathys@darden.edu

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ABSTRACT

Entrepreneurship has traditionally been studied either as a set of psychological characteristics, or as a residual of environmental structures such as social networks. In line with more recent process views, we propose the study of entrepreneurship as a form of expertise – i.e., a set of skills, models and processes that can be acquired with time and deliberate practice. The framework we build draws upon the literature on expertise in cognitive science, psychology, and decision-making, and relates it to effectuation theory. The paper delineates the domain of entrepreneurial expertise and demarcates the role of deliberate practice within it; demonstrates the efficacy of effectuation as a theory about entrepreneurial expertise; and develops testable propositions about the role of effectual action in the development of entrepreneurial expertise and firm growth.

When we imagine an expert, glamorous images of a brilliant scientist conducting groundbreaking medical research, a chess master conquering a computer, or a virtuoso flawlessly performing a complex piano sonata are conjured up. Exceptionally high task performance is consistently associated with experts as they solve complex problems in their domain more quickly, more easily, and more accurately than novices (Charness, Reingold, Pomplun, & Stampe, 2001; Larkin, McDermott, Simon, & Simon, 1980; Simon & Simon, 1978). The desire to understand expert performance has inspired research in areas such as psychology, cognition and decision-making, and the differences between experts and novices have been investigated in a variety of empirical settings. In the business domain, expert CEOs, marketing managers and accountants can be found across firms and industries. And the same positive attributions of high performance are associated with experts in management as are linked to experts in other fields. Yet, management research has barely begun to leverage advancements made in the psychology and cognitive science literature to investigate expertise in a business setting. A thorough search of articles published in major management and entrepreneurship journals revealed one article that seeks to understand the nature of entrepreneurial expertise in management (Mitchell, 1997); one empirical study that shows a strong relationship between entrepreneurial expertise and firm performance (Reuber & Fischer, 1994); work investigating venture capitalist experience (Shepherd & Zacharakis, 2003); and a 1998 dissertation that studied expert entrepreneurs (Sarasvathy, 1998). While this dissertation used methods from the expertise and cognitive science literature, the study made no attempt to address the connection between entrepreneurial expertise and expertise in general. For example, it does not address the fundamental question of whether it is important to study entrepreneurship as a domain of expertise. Perhaps one explanation could be that entrepreneurship has traditionally been viewed as an individual characteristic. Besides investigating personality traits and attributes, studies have examined

gender differences (Carter, Gartner, Shaver, & Gatewood, 2003), risk aversion (Miner, Smith, & Bracker, 1994) and even sociopathy as relevant traits that explain entrepreneurial performance (Winslow & Solomon, 1987). A more productive recent approach involves theories from cognitive psychology such as the impact of heuristics and biases (Busenitz & Barney, 1997). Another increasingly mainstream focus is on the central role of entrepreneurial opportunity in the entrepreneurial process (Shane & Venkataraman, 2000; Venkataraman, 1997).

We acknowledge that entrepreneurship is a complex phenomenon that merits a variety of approaches to study it. We add to extant approaches the study of entrepreneurial expertise – i.e. a set of skills, models and processes that can be acquired with time and deliberate practice. We will not only argue that expertise is a significant factor that can explain entrepreneurial performance, but we will also show that it enables us to identify testable elements of entrepreneurship that are teachable. There is much current interest in the education of entrepreneurship, and developing a body of information to be shared with aspiring entrepreneurs is a valuable goal for scholarship and pedagogy alike, particularly in schools of business management. Understanding the cognitive processes used by expert entrepreneurs offers the potential to provide a foundation for that body of knowledge. And as Ericsson (1993) suggests that coaching and instruction can enhance the power of deliberate practice, one goal of our effort is to identify the foundation for what instructors might teach to aspiring expert entrepreneurs. More broadly, studying entrepreneurship as a form of expertise promises to shed light not only on how new businesses and markets are created, but also on how to make existing large enterprises more entrepreneurial as well.

We bring to bear on our endeavor the power of three rigorous streams of expertise research from the disciplines of psychology, cognitive science and decision-making, to describe how experience rooted in deliberate practice changes the way that experts perceive, process and

use information. We then draw on effectuation theory (Sarasvathy, 2001a) and show how results from the expertise literature apply to the specifics of effectual entrepreneurial practice in new venture creation. The results of our integration of the two lines of thought culminate in Table 3 and Figure 1, where we present a precise set of constructs and hypotheses to hone in on entrepreneurial expertise in future empirical work. In a nutshell, we attempt to make three contributions to the thriving literature on entrepreneurship today:

- First, we introduce to current discourse in management the body of knowledge from disciplines of psychology, cognitive science, and decision-making regarding expertise.
- Second, we develop a set of observations based on theoretical parallels between experts in general and expert entrepreneurs.
- Third, we integrate the expertise literature with effectuation theory in order to build testable propositions relating the development of entrepreneurial expertise with the performance of firms and entrepreneurs.

EXPERTISE LITERATURE

In keeping with traditions from psychology, we define an expert as "someone who has attained a high level of performance in the domain as a result of years of experience" (Foley & Hart, 1992) and deliberate practice (Ericsson et al., 1993). Furthermore, we restrict our discussions to "strong-form" expertise, associated with deep personal ability and knowledge derived from extensive practice and experience based on immersion in the relevant domain. We do not seek to investigate "weak-form" expertise, associated with forecasting that can be done through computer models and simulations or through private information (Mieg, 2001).

Though experts have interested scholars for centuries, investigation of expert performance using modern approaches began about 30 years ago, focusing on understanding the nature of chess masters (Chase & Simon, 1973; Simon & Chase, 1973)[1]. In their early study of expert chess players, Chase and Simon quickly observed that simple intelligence had no correlation with chess mastery (Ceci & Liker, 1986; Chase & Simon, 1973; Doll & Mayr, 1987;

[1] de Groot began sporadic work on the topic as early as 1946 de Groot, A. 1978. ***Thought and Choice in Chess***. The Hague: Mouton.

Taylor, 1975). There were more complex factors at work, revolving around how players store information, perceive problems and generate solutions. On the foundation of their work, the field began to expand. While some of the early empirical literature and theory development focused on chess, subsequent work has validated and expanded the theoretical base to more dynamic settings, such as taxi-driving, medicine, fire-fighting and consumer decision-making. It is important to note that the majority of findings in less dynamic settings are robust in more dynamic settings as well.

In this section, we focus on three issues germane to the development of a more precise framework for studying entrepreneurial expertise. First, we briefly outline four theoretical drivers of expertise and explain why we chose "deliberate practice" as the lens through which to investigate entrepreneurial expertise. Second, we clarify what constitutes the domain of entrepreneurial expertise and how it fits into predominant approaches in current entrepreneurship research. Finally, we list key elements of deliberate practice within the domain of entrepreneurial expertise.

Expertise and Deliberate Practice

The study of expertise is hardly a united field. Our review of the literature identified four theoretical approaches, each conceptually anchored to a unique view of what underlies the development of expertise. These approaches include: (1) Individual differences; (2) Knowledge structures; (3) Experience; and (4) Deliberate practice.

(1) Individual differences. Of these, individual differences were the very first to be examined in detail starting with Galton's (1869) work on inherited traits. Work in this stream seems to have slowed based on notable studies showing intelligence, the most promising of individual characteristics, unrelated to expert performance among the most successful and creative artists and scientists (Taylor, 1975) and the best chess players (Doll & Mayr, 1987).

These findings have been supported and extended such that contemporary literature discounts the impact virtually all but physical individual differences in understanding expert performance. Clearly, being taller makes it easier to be a successful basketball player in, while being smaller makes it easier to be a winning jockey on a race-horse (Ericsson & Lehmann, 1996).

(2) Knowledge structures. As researchers began to question the long-held assumption underlying the relationship between individual characteristics and expertise in light of deGroot's (1946/1978) surprising finding that expert chess players identify best moves in initial perception of the game, as opposed to through detailed analysis and thought, new approaches emerged. A vast body of empirical work has since accumulated on the general association of superior knowledge storage and retrieval abilities of experts with quicker and more accurate problem-solving in a domain (Anderson, 1981; Bedard & Chi, 1992; Chase & Simon, 1973; Simon & Simon, 1978; VanLehn, 1996), perhaps manifest in entrepreneurship as "successful intelligence" (Sternberg, 2004).

(3) Experience. In parallel to the investigations of knowledge structure, researchers have also investigated the sheer quantity and complexity of knowledge gained through experience (Camerer & Johnson, 1991; Shanteau, 1992). When simple expertise is approached using the simple construct of experience, however, the connection with performance weakens. For example, experienced individuals are subject to the pitfall of inferring too much from too little information and misreading evidence which confirms prior beliefs; furthermore, those with significant experience are at particular risk because they may have become so mechanical that they miss things (Rabin, 1998). This assertion has been empirically tested using problems involving electronics circuits (Besnard & Bastien-Toniazzo, 1999). Experience can also cause individuals to inappropriately weight information cues, make errors combining them, and be overconfident in their judgments (Bolger & Wright, 1992; Brailey, Vasterling, & Franks, 2001;

Camerer & Johnson, 1991; Shanteau, 1992).

(4) Deliberate practice. A more sophisticated articulation of the experience view suggests that the expertise that leads to superior performance is developed through a special type of experience that involves "deliberate practice." As Greeno and Simon (1988) put it, experts learn by doing and doing and doing. But that alone is not sufficient. Systematic differences between experts and less proficient individuals within a domain nearly always reflect attributes acquired by experts during their lengthy period of deliberate practice (Ericsson & Lehmann, 1996). According to the deliberate practice view, individuals that engage in deliberate practice acquire superior knowledge structures, and from that, derive superior expert performance (Ericsson et al., 1993). The growing literature on deliberate practice identifies five necessary requirements of deliberate practice that together form the foundation upon which superior expert performance is built:

1. **Motivation.** Ericsson et al. (1993) pointed out that a greater objective that motivates performance improvement is critical, because deliberate practice in itself is not inherently motivating. As such, individuals must identify some larger instrumental objective for their practice in order to motivate themselves to engage in it, day in and day out. Not surprisingly, however, additional research showed that deliberate practice can be moderated by inherent enjoyment in the activity to predict the acquisition of expertise (Ericsson et al., 1993; Ericsson & Lehmann, 1996; Sloboda, Davidson, Howe, & Moore, 1996). For an entrepreneur, this kind of motivation might range from the satisfaction of building a new product or process, an efficient company, an enduring organization, or a personal fortune.

2. **Understandability.** Complex tasks in the domain must be decomposed into component pieces in order to be completely understood so that the patterns which enable rapid and accurate recall of the solution, or application of the solution to a new problem can be properly organized and stored (Ericsson et al., 1993). In the next section we will outline several task decompositions in the creation of new firms and markets that form the basis for development of entrepreneurial expertise. It is on these task components that expert entrepreneurs receive continual feedback as they repeat them in deliberate practice in order to develop expertise.

3. **Feedback.** Individuals involved in deliberate practice should receive immediate feedback on performance (Trowbridge & Cason, 1932). Feedback is critical, because people experiment with new methods and refine existing methods when presented with negative feedback (Chase & Ericsson, 1981) (VanLehn, 1991), a process that continuously upgrades the sophisticated pattern recognition and matching systems that are developed by experts.

4. **Repetition.** The requirement that deliberate practice involves repeated performance of the same or similar tasks, is consistent with the popular notion that practice makes perfect. But practice, and

especially deliberate practice requires time, energy and focus. The dedication and motivation to repeatedly perform the same task is one of the key distinctions that separates experts from people with mere experience (Ericsson et al., 1993).

5. **Fit.** The design of the task must account for knowledge and limitations of the individual. A pitcher who performs well against right-handed batters, but not against left-handers must deliberately practice pitching to left-handed batters in order to advance to an expert level where he can perform well against any comer. While design of deliberate practice tasks are ideally facilitated by an instructor (Baltes & Kliegl, 1992), the literature is quick to point out that the alternative of self-directed learning activities can be equally powerful for individuals with the creativity to develop new challenges for themselves and the discipline to overcome them (Glaser & Bassok, 1989; Wagner, 1991). As novices navigate the trajectory toward expertise, finding existing challenging lessons or knowledgeable instructors becomes increasingly difficult, and Glaser (1996) highlights how this transition is often accompanied by an individual's increasing control over their own learning.

Practice under these five characteristics, described as "deliberate practice", results in a performance improvement within a domain (Ericsson et al., 1993; Gibson, 1969). Deliberate practice takes time. Research in the area has converged on the "10-year rule" (Chase & Simon, 1973). While not hard and fast, the "10-year rule" suggests that it takes a minimum of 10 years of deliberate practice for a novice to ascend to the rank of expert. Before we identify specific elements of deliberate practice in entrepreneurship, we examine what constitutes the domain of entrepreneurial expertise and how it fits with mainstream research in entrepreneurship.

The Domain of Entrepreneurial Expertise

There is little argument that expertise is contextual (Djakow, Petrowski, & Rudik, 1927; Ericsson & Smith, 1991). While a neurosurgeon's talents may be unsurpassed in the operating room, her abilities there predict nothing about her abilities in the grocery store, or on the computer. As such, expertise research examines experts in their own context, and likewise we do not expect that entrepreneurial expertise is generalizeable out of context. Please note that for the purposes of this paper, we think of entrepreneurship as the creation of new ventures, new products and new markets, but we hope our ideas will apply to areas that include corporate innovation and entrepreneurship.

So, what is entrepreneurial expertise and how does it fit with other factors involved in the

entrepreneurial process? Basically, studying entrepreneurship as a form of expertise is consistent with process views of entrepreneurship (Aldrich, 1999; Brockner, Higgins, & Low, 2004; Bygrave & Hofer, 1991; Harvey & Evans, 1995; Low & Abrahamson, 1997; Stevenson & Jarillo, 1990). While each of the cited works here have different conceptual frameworks and definitions of the entrepreneurial process, there are several common elements. Universally, the entrepreneurial process is conceived as a collection of decision tasks such as selecting an idea or opportunity to begin with, creating a legal entity, garnering resources, bringing stakeholders on board, managing growth and exit strategies, and so on. Becoming an expert entrepreneur involves mastering these staged elements of the entrepreneurial process, particularly the recurring decisions and actions that constitute those elements. We examine these in greater detail in the next section on what constitutes deliberate practice in entrepreneurship.

Studying entrepreneurship as a form of expertise encourages us to match the general elements of expertise with heuristics specific to the new venture domain. Effectuation theory (Sarasvathy, 1998), as elaborated later in the paper, consists of a set of heuristic principles such as the affordable loss principle or the logic of control that apply specifically to the creations of new organizations and markets. Our focus on these particular aspects of entrepreneurial expertise does not negate the importance and validity of other factors that predict and explain entrepreneurial performance, be it traits, or human and social capital of the entrepreneur, environmental constraints and opportunities, or any other random or systematic effects impacting the process. Instead, theories of entrepreneurial expertise should explicitly take these important internal and external factors either as constraints or covariates in analyses of performance.

This brings us to a unique aspect of entrepreneurial expertise that makes our investment in this scholarly endeavor even more worthwhile. Current studies of entrepreneurship almost exclusively focus on the performance of the entrepreneurial venture as the primary dependent

variable. Even the literature on traits, knowledge acquisition (tacit and otherwise), learning, and the use of general (non domain-specific) heuristics and biases, all seek to explain how these factors impact the performance of the firms that entrepreneurs create. The view from entrepreneurial expertise, however, turns the spotlight on the performance of the *entrepreneur*, sometimes in juxtaposition with but at other times even in opposition to the performance of the firm. Entrepreneurs, in current scholarship, are seen as instruments in the birth and growth of firms. Entrepreneurial expertise suggests an instrumental view of the firm instead.

Analyzing results from labor and micro-economics, industrial organization, population ecology, and serial entrepreneurship, Sarasvathy and Menon (2002) have argued in great detail, that equating firm success with entrepreneurial success has been one of the most powerful confounds plaguing the development of our field. Studies of expertise suggest that while expertise often overlaps with and explains success, expertise is NOT the same as success. The fact that a chess player wins a tournament does not automatically imply he is a grand master and similarly, being an expert chess player does not guarantee a win. This is even truer in the case of entrepreneurial expertise, where an expert entrepreneur may found one or more failed firms; and novice entrepreneurs may achieve supra-normal profits in their very first ventures. That is why studying expertise in complex domains involves investigating consistent commonalties in cognitive processes used by several experts within a given domain, while not defining experts using criteria in terms of single-outcome successes.

Teasing out some of the subtleties involved in the relationships between entrepreneurial expertise and the success of firms and entrepreneurs is an important empirical phenomenon the study of which we hope to engender and enable through the propositions we develop later in this paper. One of the most intriguing subtleties is the relationship between expertise and success in the case of an extraordinarily successful one-time entrepreneur such as Bill Gates or Michael

Dell, and the more easily understandable ”expertise” of a serial entrepreneur. One of our propositions explicitly addresses this issue by examining the inflection point at which the effectual cognitive processes in successful founding need to be transformed into causal processes to grow and manage a large corporation. Before we explicate details of a theory of entrepreneurial expertise based on effectuation, we need to specify the role of deliberate practice in developing expertise within the domain of entrepreneurship.

Elements of Deliberate Practice in Entrepreneurship

Does an entrepreneurial setting provide for deliberate practice? We begin our discourse on this matter with a simple accounting of time available to deliberate practice. According to a survey of 500 small businesses, the average small business owner puts in 52 hours of work every week, 50% more than that of an average production employee in the US (Willard&Shullman, 2000). By comparison, Olympic swimmers get relatively little practice, putting in a mere 28 hours of swimming in a training week (Banks, 1997). Given the high level of time commitment to a new venture, it seems reasonable to believe that the entrepreneurial setting enables immersion at a level at least commensurate with other fields where expert performance is attained.

As stated earlier, the literature on deliberate practice specifies five criteria for a domain to qualify for the development of expertise: motivation, understandability, feedback, repetition, and fit. It is easy to see that motivation and fit are satisfied in an entrepreneurial setting. Entrepreneurial motivation ranges from making personal fortunes to creating an enduring organization of great value to society. Passion, commitment, workaholism, perseverance, and a host of other attributes of the setting, both in the popular press and in academic research, point to motivations that go beyond what the mere practice of entrepreneurship provides. Similarly, the sheer variety of possible firms and markets allows entrepreneurs to select into ventures that they

are better suited for and set in motion a chain of tasks for self-directed learning and deliberate practice. In fact, the theory of effectuation, as elaborated later in the paper, points to an explanation as to why previous research has not unearthed a compelling set of factors that predict the success of entrepreneurial firms. As Sarasvathy (2001a) puts it,

> The theory of effectuation brings another perspective to the table. It suggests we need to give up ideas such as *the* successful personality, or clearly superior characteristics of *the* successful firm or organization. …The focus in our journals and classrooms for example, would shift from "How to build a successful firm?" or "How to become a successful entrepreneur?" to "What types of ideas and opportunities should *YOU* pursue?" and "Given who you are, what you know, and whom you know, what types of economic and/or social artifacts can you, would you want to, and should you create?" The old adage about invention captures this shift rather pithily: *Both the optimist and the pessimist contribute to successful inventions. The optimist invents the airplane; the pessimist, the parachute.*

The remaining three requirements for deliberate practice, namely, the decomposability of entrepreneurial tasks into sub-tasks that provide feedback and are also repeatable, may be a little more difficult to see due to the perception that entrepreneurial ventures are rather idiosyncratic in nature. But the typical daily routines of entrepreneurs, however unique their circumstances and however quirky their venture, do consist of a variety of tasks that fit the bill for deliberate practice. In fact, these tasks form the building blocks of the various phases identified by well-received process views of entrepreneurship that dominate our research today.

Table 1 lists a variety of exemplar tasks that every entrepreneur has to perform and shows how each fulfils the three deliberate practice criteria of understandability, feedback and repetition. It also relates each task to specific principles of effectuation used by expert entrepreneurs in performing it. We turn to explicating those principles next.

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EFFECTUATION: A THEORY OF ENTREPRENEURIAL EXPERTISE

Effectuation theory (Sarasvathy, 2001a) has been the first attempt to develop a baseline of entrepreneurial expertise. Although the theory was induced from an investigation of actual expert entrepreneurs using the classic method of protocol analysis from cognitive science

(Sarasvathy, 2001b), exact differences between expert and novice entrepreneurs have yet to be worked out, even in theory. We begin this task with a concise summary of effectuation theory including six key constructs that we then use to differentiate it from the many versions of rational choice that dominate extant theories: (1) prediction; (2) commitment; (3) action; (4) planning; (5) risk; and, (6) attitude toward outside firms, as described in Table 2.

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Effectuation and Rational Choice

Effectuation is a straight inversion of rational choice theory (also referred to as causal or predictive rationality). Particularly in the second half of the twentieth century, rational choice theory has been questioned in a variety of ways. Simon's (1991) assaults on its empirical validity based on cognitive bounds of the human mind inspired a slew of research results on heuristics and biases that *deviate* from rationality in a variety of ways, Ex: (Kahneman & Tversky, 1979). Effectuation theory too was inspired by Simon's work and was in fact developed in close collaboration with him (Sarasvathy & Simon, 2000) (Sarasvathy, 2002). While bounded rationality has been construed by some as a *subset* of rational choice, and the vast literature on heuristics and biases is considered a set of *deviations* from rationality, effectuation is a complete *inversion* of rational choice. In other words, as Sarasvathy and Simon (2000) puts it, effectuation answers the question:

> "Where do we find rationality when the environment does not independently influence outcomes or even rules of the game (Weick, 1979), the future is truly unpredictable (Knight, 1921), and the decision maker is unsure of his/her own preferences (March, 1982)?"

Effectuation: Inverse of causation. Effectuation inverts every aspect of causal rationality, including its problem space, solution process, fundamental principles, and overall logic. Causal rationality is goal-driven; effectuation is means-driven. Rational choice rests on a logic of prediction – i.e. *To the extent we can predict the future, we can control it.* Effectuation rests on a logic of non-predictive control – i.e., *To the extent we can control the future, we do not*

need to predict it. Causal rationality takes the environment as largely outside the control of the decision-maker, and therefore seeks to predict it and adapt to changes in it. Effectuation considers the environment endogenous to the actions of effectuators and therefore seeks to fabricate it through pre-commitments from stakeholders. Effectuation is enactive and exaptive where causation is reactive and adaptive.

The overall inversion of the problem space and solution logic of rational choice is implemented through a series of effectual heuristic principles, each of which inverts causal heuristics. In entrepreneurial settings in particular, (1) While causal rationality suggests using expected return as a decision criterion, effectuation prescribes the affordable loss principle; (2) Instead of competitive analyses, effectuation involves building partnerships through precommitments from stakeholders; and (3) In contrast to rational choice that seeks to avoid unexpected contingencies in order to efficiently achieve pre-determined goals, effectuation seeks them out and leverages them to create novelty.

Causation and effectuation: Empirical examples. In Table 2, we have laid out a series of individual constructs from rational choice that are inverted in effectuation. But to get an integrated picture of effectuation, it may be more useful to cite a concrete example. At least one major thread of research in entrepreneurship sets out a causal process that begins with the identification, recognition or discovery of an opportunity, followed by a series of tasks that include (a) developing a business plan based on (b) extensive market research and (c) detailed competitive analyses, followed by (d) the acquisition of resources and stakeholders for implementing the plan, and then (e) adapting to the environment as it changes over time with a view to (f) creating and sustaining a competitive advantage. In this view, if an entrepreneur wanted to start a restaurant, he or she would start by identifying a high potential location, analyzing the competition in the area, identifying particular target segments, developing

marketing strategies to fit the targets, obtaining necessary funding, hiring the appropriate chef to develop the right menu and then opening the doors to the restaurant.

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As Figure 1 shows, effectuators, in contrast, would start with the means available. Based on who they are, what they know, and whom they know, they would start with a list of things they can afford to do. Most important of this list would be to call people they know, and plunge straight into negotiating a series of pre-commitments. Depending on who comes on board the venture, and other contingencies along the way, they would set in motion two contrasting cycles. The first one would be an expanding cycle that increases the resources available to the venture; the second would accrete constraints on the venture that converge into specific goals over time. In the restaurant example above, the effectual entrepreneur may or may not start with a location. Instead it would all depend on who the effectuator is. If the effectuator is a cook, he might start a catering service, or a lunch service, or even just hire himself out as a chef who does house calls – it depends on what he can afford to invest in terms of money, time, and emotion. An expert entrepreneur would not even jump into one of these projects. She would start by calling people she knows and start putting together partnerships and pre-commitments. For example, if she knew someone who owned a grocery store, she might start making dishes for their deli. Or if she knows someone in the popular media, she might start producing cooking videos. And so on.

In causation, the end product is determined by the initial "opportunity" identified by the entrepreneur, and the adaptive changes over time to fit their pre-selected "market" and/or "vision." The end product in effectuation is fundamentally unpredictable at the beginning of the process. In fact, the opportunity and even the market itself get created through the very process of effectuation. In other words, both market and opportunity are contingent on who comes on board and the actions and goals they enable and constrain; goals and visions of an opportunity

seldom determine who comes on board or what resources are gathered.

It is important to note that the extreme dichotomy described above is meant to create a powerful *theoretical* separation between effectuation and rational choice. Empirically speaking, of course, both causal and effectual processes would be at work in reality. We would expect, therefore, that the data entrepreneurship scholars gather would contain decisions and actions that confound the two. Yet, preliminary investigations into expert entrepreneurial decision making (Sarasvathy, 2001b) and the histories of early-stage firms (Sarasvathy & Kotha, 2001) (Dew & Sarasvathy, 2002) indicate that strong patterns of one of the other can be isolated and evidenced. Our contribution in this paper consists in developing a more precise set of tools to empirically tease out these patterns and relate them to performance variables within the life cycles of both entrepreneurial firms and entrepreneurial careers. And it is in this connection that the literature on expertise is pertinent to entrepreneurship as a field of research.

Effectuation theory and theories of expertise in general

At a gross level, effectuation theory and expert theory work to understand similar questions of how experience changes the way people think. Perhaps it is not surprising then, that effectuation theory utilizes many of the same axes that the scholarship on expertise has focused on in determining the characteristics of expertise. Sarasvathy (2001b) provides several clues as to how we might proceed in the task of describing the strategies of expert entrepreneurs. For example, when we examine how expert entrepreneurs perceive, process and use market research information, or information relating to the creation of markets, we find striking parallels to the expertise literature we reviewed above.

One observation is that the articulation of forward thinking employed by experts and backward thinking employed by novices (Larkin et al., 1980) has some similarities with effectual and causal reasoning. In forward thinking, experts use information cues to *take* action. One of

the most important inputs available to entrepreneurs consists in stakeholder commitments, and as such, these and other means can substitute for information cues. In the case of effectual reasoners, these cues can provide a basis for action. Similarly backward reasoning novices that use information cues to *validate* their actions can be likened to causal thinkers basing action on goals. Yet, effectuation is different from forward thinking in that effectuators *negotiate* stakeholder commitments, and do not take them as passive cues from the task environment. The implications of this endogeneity are particularly important in an entrepreneurial setting.

Anderson (1993), Larkin et al. (1980) and Newell & Simon (1972) highlight another important analogy of effectuation to expertise in general, namely, the means orientation of experts and the goals orientation of novices. In contrast to the way in which stakeholders shape commitment to particular goals in the effectual example, the causal or goal-oriented novice seeks stakeholders only after first committing to a vision specified through particular goals. Further investigation into the similarities of expert entrepreneurs and experts in general bring to light several intriguing parallels between observations regarding expertise in general and effectuation as a form of entrepreneurial expertise in particular.

Observation 1 from the expertise literature: *Experts eschew prediction.*

Parallel in effectuation: *Expert entrepreneurs reject the use of predictive information.*

The literature on expert decision-making shows us that experts amass and organize the knowledge necessary to make good decisions without a great reliance on external inputs, particularly predictive inputs (Rikers, Schmidt, Boshuizen, Linssen, & al, 2002). Instead, experts have learned to filter information from external sources (Leifer, 1991), likely validating it against stored patterns from previous experiences (Chase & Simon, 1973). Similarly, expert entrepreneurs are likely to ignore predictive information, as it is based on the existing environment and does not account for the impact of actions that the entrepreneur will take

(Sarasvathy, 2001a). Empirical research into the creation of media software giant, Real Networks, showed that not only did the founder act without predictive tools, he consciously acted counter to predictions made by market analysts at the time (Sarasvathy & Kotha, 2001).

Observation 2 from the expertise literature: ***Experts focus on "Can".***

Parallel in effectuation: *Expert entrepreneurs prefer to do the things they can to control those parts of the environment they deem controllable*.

Experts automatically store information according to outcomes (Ericsson & Kintsch, 1995), so that as they match and recognize stored patterns against existing situations (Reingold, Charness, Schultetus, & Stampe, 2001), they are likely to retrieve strategies they already know they can implement (Kalakoski & Saariluoma, 2001). Expert entrepreneurs do the same thing, matching current actions with past experiences so that they can come up with creative courses of action that are realistically executable, rather than elaborate plans contingent upon things outside their control (Sarasvathy, 2001a). Instead of wondering what she *should* do, founder of GeniusBabies.com says; "We have LOW budget. We try to think of different marketing things that we can do" (Isidro). She goes on to describe fairs assembled by groups of like entrepreneurs, networking and interactions with e-colleagues as strong enablers of what can be done in her setting (Isidro).

Observation 3 from the expertise literature: ***Experts employ means-based action.***

Parallel in effectuation: *Expert entrepreneurs are tethered to their means, and flexible on goals.*

From experience, experts have more extensive knowledge assets, or means, to apply to a problem than novices (Gobet & Simon, 1996). Through superior memory, utilization of "Broken Leg" clues (Shanteau, 1992) and sophisticated search (Selnes, 1989), experts can draw on processes and results of previous experiences as they make decisions (Shiffrin & Schneider, 1977). The volume of knowledge is only one of the means that experts have developed. As part of assembling a base of experience, experts also learn how to integrate and synthesize that

knowledge (Boshuizen & Schmidt, 1992) and use it to model solutions to new problems (Adelson, 1984). While novices are likely to use goals as the basis for taking action, expert knowledge means provide alternative rationales for taking action that simply are not available to novices (Larkin et al., 1980). Likewise, expert entrepreneurs facing decision ambiguity and environmental uncertainty fall back on the means of who they are, what they know, and whom they know (Sarasvathy, 2001a). All that the two founders of Ben and Jerry's had for example, was the fact that Ben knew how to make ice cream, their unwavering faith in the (hippie?) values of the "sixties," and the liberal folks in Vermont who enjoyed both. They combined who they were, what they knew, and whom they knew to create the foundation for a unique offering within an existing industry that succeeded against the most powerful precepts of received wisdom on building and managing an ice cream company (Sarasvathy & Wicks, 2003).

Observation 4 from the expertise literature: *Experts leverage contingencies.*

Parallel in effectuation: *Contingency, as opposed to planning, provides expert entrepreneurs with a wider range of viable strategy choices.*

Thus far, we have explained why experts may make better decisions than novices. But we also know that experts are human and so, fallible. Experts intuitively realize from past experiences where failure is possible (Schenk, Vitalari, & Davis, 1998), and work to frame problems in such a way that they build contingency into their strategies (Glaser, 1996). Deferring the elimination of options and selecting paths that may have many positive outcomes, enables experts to recover from mistakes (Shanteau, 1992) more quickly than novices (Presley & McCormick, 1995). Expert entrepreneurs frame decisions in the same way, replacing elaborate planning toward a single outcome with strategies that enable many different paths that are contingent on intermediate outcomes (Sarasvathy, 2001a). Some form of informal real options (McGrath, 1999), for example, is more likely to be a useful tool to entrepreneurs than standard financial planning techniques. Interviews with executives at ten technology startups in the

Ottawa area about what makes a new venture succeed revealed only a single common response, which is that “all goals are contingent on what comes next” (Hammond, 2002).

These parallels are detailed in Table 3 and related to the constructs in Tables 1 and 3.

- - - - - - - - - Insert Table 3 about here - - - - - - - - -

In the exposition above, we have highlighted the commonalities between elements of effectual thought and of experts in general that are already in evidence in empirical work. There are, however, several open issues initiated by theory on both sides that suggest fruitful avenues for future research. For example, expertise theory provides significant explanations as to why expert task performance is much more rapid than that of novices. The attributes of automatic pattern coding and matching, information organization, combining steps, advanced search and superior memory all predict that experts will analyze problems and arrive at solutions more quickly than novices. Yet, effectuation theory provides no hypotheses about the generation of speedier analyses than causal reasoning. We anticipate future extensions of research around effectuation will address this issue as solution speed seems important in the entrepreneurial environment and in other environments where people are likely to employ effectual thought.

Similarly, while effectuation theory provides detailed principles such as those relating to partnership and affordable loss, expert theory references to these are conspicuously missing from Table 3. Of course, it is to be expected that there exist non-overlapping areas between expertise in any one domain and expertise in general. It might be interesting, however, to empirically examine whether the affordable loss principle and partnership pre-commitments find parallels in other domains of expertise – say, in functional areas of management. In fact, this suggests yet another reason investing in research into management as a form of expertise.

Given these observations, we develop propositions that relate the use of causal and effectual reasoning to performance, both in the life cycle of firms and entrepreneurs.

PROPOSITIONS REGARDING EXPERT ENTREPRENEURIAL PERFORMANCE

While we may be tempted to simply associate causal thought with novices, and effectual thought with experts, preliminary empirical investigations have shown us that the relationship is more complex. A study of the relationship between expertise and an effectual approach showed that while expert entrepreneurs are more likely to adopt an effectual approach, experts and novices cannot be differentiated by their use of causal reasoning (Read, Wiltbank, & Sarasvathy, 2003). In light of these findings, we integrate our entire theorizing about the role of causal and effectual reasoning in the development of entrepreneurial expertise, and the creation and growth of firms into four propositions that culminate in Figure 2:

- - - - - - - - Insert Figure 2 about here[2] - - - - - - - - - -

First, how is effectual action related to the development of entrepreneurial expertise?

An obvious answer to this question might be that while expert entrepreneurs are highly effectual, novice entrepreneurs tend to use more causal modes of reasoning. We believe, however, that we might find more variation in the behavior of novices, ranging across the entire spectrum of causal and effectual action. One reason for surmising this consists in the possible existence of individual variation in a pre-existing *propensity* for causal or effectual thought and action. While we strongly aver that effectuation is for the most part a learned process consisting of specific skills, techniques and heuristics, we do not completely rule out the role of "talent" in developing entrepreneurial expertise. To use the analogy from music, while key aspects of musical expertise might be learned through formal training and hands-on experience, a certain base level of pre-existing musical talent may differentiate the performance of novice musicians. Further, as expertise is developed over time and through experience, individuals will be exposed to strategies that may be antithetical to their original starting point. The incorporation of these

[2] Figure 2 is not intended to be a mathematical model, but rather a graphical representation of our four propositions.

strategies into the individual's knowledge base will serve to "soften" an extreme position that individual may have started with. Therefore, our first proposition goes as follows:

Proposition 1a: *While novices may vary in their use of causal and effectual action, their preferences for effectuation in the early stages of new ventures will increase as they become experts.*

Proposition 1b: *Furthermore, both highly causal and highly effectual novices learn to balance causal and effectual approaches during the growth phase of new ventures, before developing a clear preference for highly effectual strategies as their expertise grows.*

Second, what is the role of resources in moderating the relationship between effectual action and entrepreneurial expertise?

In a predominately resource-poor situation, such as in the case of bootstrapped startups, effectual strategies are more likely, simply because the resources required for implementing causal strategies may not be available. Also, novices are less likely to change their "vision" when the resources to implement it are available.[3] In such cases, they are more likely to stay tethered to their goals even in the face of negative feedback, leading to our second proposition:

Proposition 2: *The more resources available to novices, the more causal their actions are likely to be. In the case of expert entrepreneurs, availability of resources will not affect their use of highly effectual action.*

Third, how is effectual action related to the development and growth of the firm?

We now look at the life cycle of a firm as opposed to the growth of an individual entrepreneur, who, during the development of his or her entrepreneurial expertise may start several firms including ones that fail. In the case of firm development and growth, there is extant evidence that successful firms, especially highly innovative firms that endure over long periods of time, are more likely to have started through effectual action (Sarasvathy, 2002; Sarasvathy & Kotha, 2001). Therefore we posit the following relationship:

Proposition 3: *Successful firms are more likely to have begun through effectual action and grown through causal action as they expand and endure over time.*

[3] In "resources" we include financial resources as well as prior knowledge and social networks.

What are the interactions between firm growth and effectual entrepreneurial expertise?

Our final proposition addresses a fundamental irony of effectuation. Clearly, an entrepreneur uses effectual thought in order to improve the new firm's chances of survival, growth and success. But as the entrepreneur and the firm achieve these goals, the relevance of effectual action is minimized. The very expertise that contributed to fledgling firm survival and growth in the highly uncertain and ambiguous startup setting is not as appropriate for the more static, causal environment of a large organization. In other words, the expert entrepreneur who effectuates has less and less advantage as the organization that he created becomes increasingly "corporate". Ironically, therefore, level of entrepreneurial expertise, as measured by effectuation, predicts the necessary departure of the effectual entrepreneur (through exit, supercession, stepping aside or other ways) once the firm has successfully expands to the inflection point at which causal reasoning becomes necessary for firm survival.

Proposition 4: *Only a small subset of expert entrepreneurs will successfully make the transition from an entrepreneurial firm to a large corporation.*

IMPLICATIONS

In comparing theoretical biology with actual biological evolution, Dennett argued that the latter gets "physics for free" -- i.e. there is no need for Mother Nature to second-guess the laws of physics or even to have a complete theoretical understanding of physics. The physics already exists within the molecular stuff of life. Similarly, implicit in our association of expertise and effectuation is that the very process of effectuation provides entrepreneurs with "the market" for free – i.e., immediate and tangible feedback on their ideas, strategies and actions. No effectual manager/entrepreneur need wonder whether a forecast is accurate, or whether the market was segmented correctly. These facts are simply endogenous to the processes of effectual action. In this light, the development of entrepreneurial expertise is nurtured through effectual reasoning, and effectual action becomes a primary tool of expertise. Exactly how various processes of

expertise development unfold has attracted attention in the field of psychology, but it merits further exploration, especially in managerial and entrepreneurial business settings.

For example, one of the things that we know is that an individual's ability to "self-explain" (Chi, de Leeuw, Chiu, & LaVancher, 1994) and generate inferences – even if some end up being incorrect is associated with expertise development. But what does this mean in the management area? Certainly experts learn from trial and error (Ohlsson, 1996), but discovering the underlying processes, or "self-explanation" promises to help enhance the teachability of expert development. Our nascent understanding of effectuation informs this line of inquiry to some degree, as it is a learned process that expert entrepreneurs selectively invoke depending on the situation. But the little we know thus far opens up a number of interesting questions revolving around the boundary conditions for the use of effectual thought, starting perhaps with the question of how experts *initiate* effectual reasoning. This may be best understood by investigating the transitions that managers/entrepreneurs make at different phases in their career, and different points in a firm's life cycle. Another question with regard to bounds and initiation may be: Do the lifecycles of firms started by experts versus novices differ? These questions may begin to identify issues in how effectuation and expertise interact in the management setting.

On a practical level, this work may help us understand the communication gap that has been described to exist between entrepreneurs and investors. If it is true that expert entrepreneurs resist predictive tools for decision-making then it is easy to imagine how entrepreneurs might share little common ground with investors that are, by virtue of their task, predominantly causal, predictive thinkers. Understanding this issue raises others, though. For example, might it make sense for early stage investors to adopt a less predictive approach to decision-making? Might successful entrepreneurs be modal in their thinking, presenting predictive information to investors while acting effectually during the operation of their firms?

And given that a non-predictive approach is positively related to new venture success, how might a prospective investor look for teams with this expertise?

George Bernard Shaw said, “In literature the ambition of the novice is to acquire the literary language: the struggle of the adept is to get rid of it.” Similarly, in entrepreneurship, while we teach novices the tools of market research and business planning, expert entrepreneurs, empirical research suggests, seek to do without such predictive tools. Our primary aim in this paper was to initiate a dialog about the nature and role of entrepreneurial expertise in the creation and growth of new firms and markets. We are convinced that such a dialog will provide a rigorous foundation for making some of the hard-learned lessons of expert entrepreneurs teachable to novice entrepreneurs, a task currently based almost entirely on anecdotal evidence and individual war stories. In the process we hope also to have initiated a dialog between cognitive science and management on what each can learn from the other about expertise development and expert performance.

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TABLE 1

Deliberate Practice in the Entrepreneurial Process

Entrepren-eurial Task	**Understand-able, repetitive Sub-Task**	**Feedback from Sub-Task shows you** **How to:**	**Effectual Principles**
Bringing people on board	Cold calling people	• Open conversations with strangers; • Generate new leads; • Take rejection.	Means (Whom you know), Leveraging contingencies
	Taking and giving advice	• Get people to pay attention and care; • Extract useful and candid feedback; • Decide which information to ignore and which to heed.	Means (Who you are, What you know, Whom you know), Non-predictive control
	Negotiating stakeholder commitments	• Understand what matters to others; • Creatively find overlaps; • Structure contractual relationships.	Pre-Commitments
Generating goals and developing a vision	Transforming stakeholder commitments into executable goals	• Close the deal with customers and investors; • Creatively assess what each new stakeholder enables; • Re-assess venture strategies as resources become available.	Focus on "Can", Non-predictive control
	Business Plan development	• Develop compelling, yet flexible business model; • Revise and re-write myriad versions for a variety of resource-providers; • Re-write plan as means and goals change.	Focus on "Can", Leveraging Contingencies
	Resource acquisition	• Negotiate supplier partnerships; • Craft compelling stories - test them in market; • Creatively differentiate cheap money from the expensive, and smart money from the dumb.	Pre-commitments, Non-predictive control, Affordable Loss
New Venture Manage-ment	Cash Management	• Understand the difference between profit margins and cash flow; • Manage time lags in resource flows; • Create stakeholder back-ups for sudden inflow necessities.	Affordable Loss, Pre-commitments
	Time management	• Decide what not to do – i.e. which promising opportunities to give up; • Delegate responsibilities; • Meet payroll every single time period.	Affordable Loss, Pre-commitments
	People management	• Raise employee commitment through stock options and other tools; • Hire and fire people; • Balance decisiveness needed to turn on a dime when goals change, yet build a culture of consensus	Pre-commitments, Leveraging Contingencies, Non-predictive control

TABLE 2

Basic Differences Between Causal and Effectual Thought (Sarasvathy, 2001a)

Issue	**Causal or Predictive Position**	**Effectual Position**
View of the Future	**Prediction.** The causal approach views the future as a continuation of the past that can be acceptably and usefully predicted.	**Creation.** The effectual approach views the future as contingent on actions by willful agents, largely nonexistent and a residual of actions taken. Prediction is unimportant as a result.
Basis for Commitment	**Should.** Commit as a course of maximizing, analysis, and what should be done.	**Can.** The effectual approach is to do what you can (what you are able to do) rather than what your prediction says you should.
Basis for Taking Action And Acquiring Stakeholders	**Goals**. The causal approach is to let goals determine sub-goals. Commitment to particular sub-goals determined by larger goal constrained by means. Goals determine actions, including individuals brought on board.	**Means.** Actions emerge from means and imagination. Stakeholder commitments and actions lead to specific sub-goals. Feedback from achievement/non-achievement of sub-goals lead to design of major goals.
Planning	**Commitment.** Path selection is limited to those that support a commitment to an existing goal.	**Contingency.** Paths are chosen that allow more possible options later in the process, enabling strategy shift as necessary.
Predisposition Toward Risk	**Expected Return.** The causal approach is to pursue the (risk adjusted) maximum opportunity, but not focus on downside risk.	**Affordable Loss.** The effectual approach is to not risk more than can afford to be lost. Here, the calculation is focused on the downside potential.
Attitude Toward Outside Firms	**Competition.** The causal approach is to be concerned with competition and constrain task relationships with customers and suppliers to just what is necessary.	**Partnership.** The effectual approach is to create a market jointly, building YOUR market together with customers, suppliers and even prospective competitors.

TABLE 3

Parallels Between Expert Entrepreneurs and Experts in General

Effectual Position (Table 2)	**Experts in General (cites are only examples, each topic has much related work)**	**Expert Entrepreneurs**	**Observation**
Creation	Experts have a sense of information relevance (Charness et al., 2001) that they combine with information filtering (Leifer, 1991) to reduce reliance on prediction.	Expert entrepreneurs notice predictive nature of key pieces of market research and reject the use of such predictive pieces as irrelevant.	Expert entrepreneurs reject the use of predictive information. Ex: Real Networks
Can	Experts organize information (Ericsson & Lehmann, 1996) according to solutions, so that automatic pattern coding and matching (Chase & Simon, 1973) returns feasible solutions that can be implemented.	Expert entrepreneurs model the new venture creation problem as a Marchian (1982) –Knightian (1921) –Weickian (1979) space, focusing on problems that they are able to solve.	Expert entrepreneurs prefer to do the things they can to control those parts of the environment they deem controllable. Ex: Ben & Jerry's
Means	Through superior memory (Ericsson & Charness, 1994) and advanced search (Simon & Simon, 1978), experts' greater knowledge base enables them to integrate and synthesize information (Boshuizen & Schmidt, 1992), develop a physical intuition through modeling (Simon & Simon, 1978), and benefit from forward versus backward reasoning (Chi, Glaser, & Rees, 1982).	Expert entrepreneurs focus on available means of: who they are what they know whom they know And select solutions based on those means (as opposed to setting goals and then assembling the means necessary to accomplish those goals).	One of the means that separates expert entrepreneurs from novices is what they know.
Contingency	Experts use problem abstraction (Fiske, Kinder, & Larter, 1983) and decision framing (Bettman & Sujan, 1987) to build contingent (Glaser, 1996) strategies, enabling quick recovery from mistakes (Shanteau, 1992).	Expert entrepreneurs manage risk through creating or identifying contingent courses of action.	Contingency provides expert entrepreneurs with a wider range of viable strategy choices.
Affordable Loss	Not currently addressed by expert literature.	Expert entrepreneurs evaluate maximum downside risk as opposed to upside potential.	Future research opportunity.
Partnership	Not currently addressed by expert literature.	Expert entrepreneurs use pre-commitments from partners to shape the environment.	Future research opportunity.

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FIGURE 1

The Effectual Process

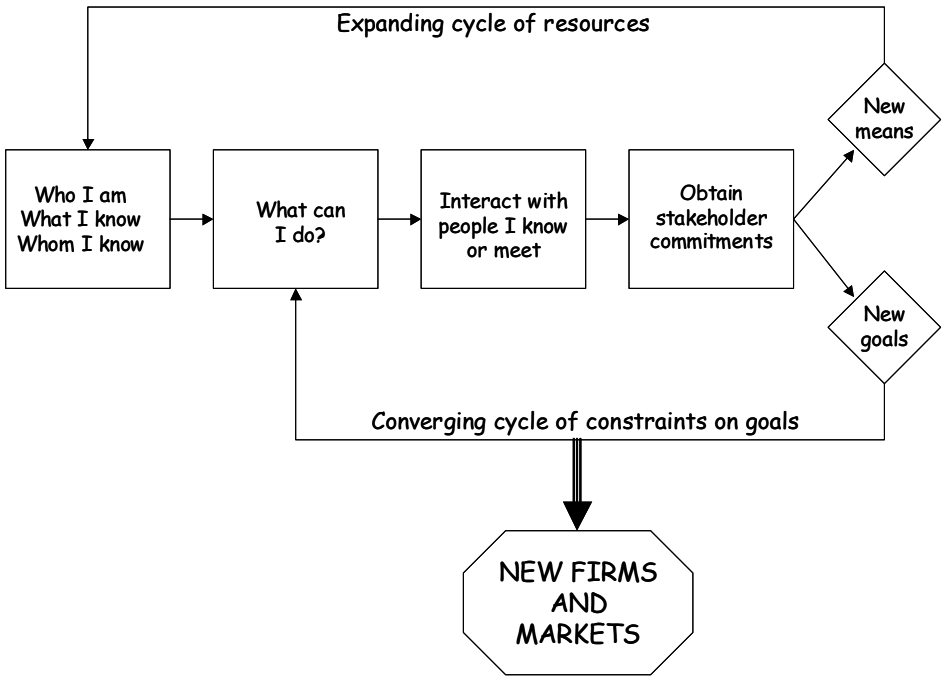
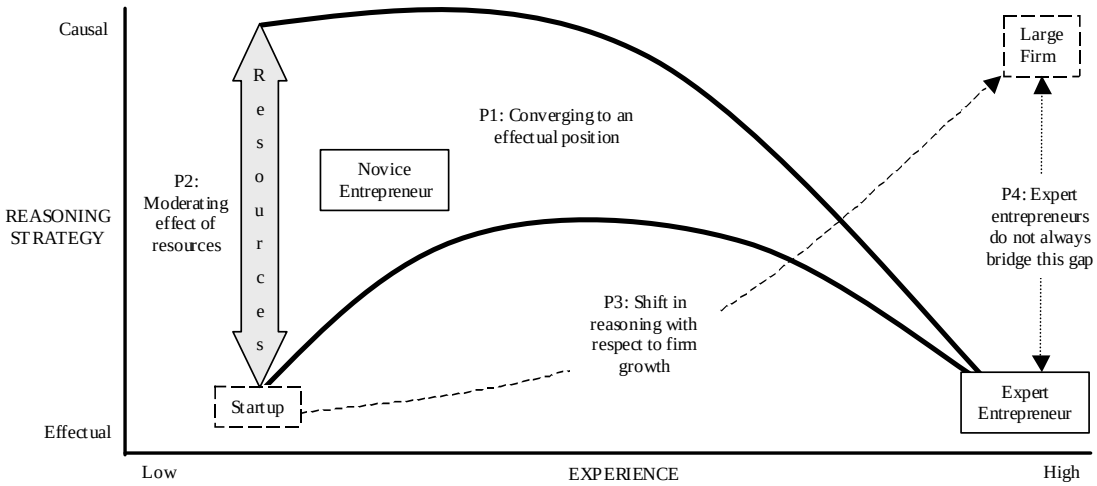


FIGURE 2

Type of Reasoning Approach With Respect to Experience and Firm Lifecycle



P1a: While novices may vary in their use of causal and effectual action, their preferences for effectuation in the early stages of new ventures will increase as they become experts.

P1b: Furthermore, both highly causal and highly effectual novices learn to balance causal and effectual approaches during the growth phase of new ventures, before developing a clear preference for highly effectual strategies as their expertise grows.

P2: The more resources available to novices, the more causal their actions are likely to be. In the case of expert entrepreneurs, availability of resources will not affect their use of highly effectual action.

P3: Successful firms are more likely to have begun through effectual action and grown through causal action as they expand and endure over time.

P4: Only a small subset of expert entrepreneurs will successfully make the transition from an entrepreneurial firm to a large corporation.