

HOW ENTREPRENEURS ACQUIRE THE CAPACITY TO EXCEL: INSIGHTS FROM RESEARCH ON EXPERT PERFORMANCE

ROBERT A. BARON* and REBECCA A. HENRY

Department of Entrepreneurship, Spears School of Business, Oklahoma State University, Stillwater, Oklahoma, U.S.A.

Most new ventures fail, but a few prosper and attain rapid growth. Many factors contribute to such outcomes, but we propose that among these are mechanisms identified by cognitive science research on the origins of expert performance. Literature on this topic indicates that across many fields (e.g., medicine, science, sports, music), outstanding performance derives largely from participation in intense, prolonged, and highly focused efforts to improve current performance—a process known as deliberate practice. By comparison, mere experience in a field and individual talent play smaller roles in generating expert performance. Additional evidence indicates that participation in deliberate practice does not simply expand domain-specific knowledge and skills; it also generates actual enhancements to basic cognitive resources (e.g., memory, perception, metacognition). We suggest that to the extent entrepreneurs acquire enhanced cognitive resources through current or past deliberate practice, their capacity to perform tasks related to new venture success (e.g., accurate identification and evaluation of business opportunities) is enhanced and, hence, the performance of their new ventures, too, is augmented. Specific ways in which entrepreneurs can gain enhanced cognitive resources are described, and implications for entrepreneurship theory and practice are considered. Copyright © 2010 Strategic Management Society.

INTRODUCTION

Some new ventures—a very small proportion—are highly successful while most, in contrast, fail. Past research suggests that many different factors operating at several levels of analysis (environmental, organizational, group, individual) influence these outcomes (e.g., Hitt *et al.*, 2007; Ireland and Webb, 2007). Here, however, we focus on the role of individual entrepreneurs in new venture success and, in doing so, address a closely related question in the field of entrepreneurship: *Why are some*

entrepreneurs so much more successful in starting and operating new ventures than others? Clearly, a comprehensive answer to this question will involve the joint effects of a large number of variables relating to entrepreneurs (e.g., their skills, motives, values, actions, etc.), a host of environmental and market conditions, and complex interactions between these variables. Despite these complexities, the field of entrepreneurship has long recognized the importance of founding entrepreneurs in new venture creation and success. More than 40 years ago, Baumol (1968: 67) noted that ‘Trying to understand entrepreneurship without the entrepreneur is like trying to understand Shakespeare without Hamlet.’ Similarly, Shane, Locke, and Collins (2003: 259) suggested ‘The entrepreneurial process occurs because people act to pursue opportunities . . .’ Precisely how individual entrepreneurs ultimately influence

Keywords: entrepreneurs; expert performance; cognition; entrepreneurial cognition; new venture performance

*Correspondence to: Robert A. Baron, Department of Entrepreneurship, Spears School of Business, 106 Business Building, Oklahoma State University, Stillwater, OK 74078-4011, U.S.A. E-mail: robert.baron@okstate.edu

firm-level measures such as growth in sales, profits, or employment, however, remains relatively unexplored (e.g., Locke and Baum, 2006; Shane *et al.*, 2003).

We suggest that useful insights into this crucial issue are provided by research on expert performance—the nature and origins of consistently exceptional performance. This research indicates that outstanding performance on a wide range of tasks across many different fields derives, at least in part, from participation in a specific set of activities known, collectively, as *deliberate practice*. Such practice involves intense, effortful, prolonged, and highly focused efforts to improve current performance and has been found to be a key ingredient in the attainment of performance that is consistently above the ordinary. The mechanisms behind these powerful effects have been clarified by extensive research. Briefly, research on this topic indicates that participation in deliberate practice does much more than merely add to domain-related knowledge and skills; in addition, it also generates *actual enhancements to basic cognitive resources* (e.g., Feltovich, Prietula, and Ericsson, 2006; Hacker, 2003). In other words, in a manner analogous to increments in physical strength gained through vigorous exercise, participation in intense, persistent, and highly focused efforts to improve current performance result in changes in cognitive systems that, together, generate enhanced capacity to process new information and integrate it with existing stores of knowledge. We suggest that these effects—which have been observed in many different fields (e.g., Kellogg, 2006)—can provide entrepreneurs with cognitive resources that help them effectively perform key tasks such as identifying and evaluating new business opportunities and accurately identifying crucial resources.

In the remainder of this article, we develop this basic thesis. In order to do so, and to clearly explain the potential role of expert performance in entrepreneurship, we proceed as follows. First, the findings of basic research on expert performance are briefly reviewed, with special attention to key principles particularly relevant to entrepreneurship (e.g., Ericsson, Krampe, and Tesch-Römer, 1993; Ericsson, and Lehmann, 1996). Next, the nature of *deliberate practice* is described and its relationship to other forms of entrepreneurial learning explained (e.g., Corbett, 2007; Kolb and Kolb, 2005). Third, antecedents of deliberate practice are examined—factors that influence whether, and to what extent,

individuals can engage in this highly effortful behavior. Following these discussions, we turn to the unique cognitive benefits provided by deliberate practice, emphasizing the expansions in cognitive systems mentioned above. Drawing on previous theory and research concerning experiential and vicarious entrepreneurial learning (e.g., Corbett, 2007), we next explain how entrepreneurs can obtain the benefits of deliberate practice either by engaging in deliberate practice with respect to certain entrepreneurial tasks, or by transferring into their current entrepreneurial activities the enhanced cognitive resources produced by previous deliberate practice in other domains (e.g., prior training in music, sports, or various professions). Finally, implications of the present framework for entrepreneurship theory and practice are discussed.

THE ORIGINS OF EXPERT PERFORMANCE: FINDINGS OF BASIC RESEARCH

Individuals who achieve unusually high levels of performance exist in many domains—sports, medicine, music, science, entertainment, business—and the feats they accomplish are often astonishing. Professional musicians can play many complex pieces from memory with few errors; professional athletes show skills that sometimes seem almost superhuman; and world-class chess champions can almost instantaneously identify the best move for a particular situation out of many thousands of possible moves (Ericsson, 1996). What are the origins of such performance? Efforts to develop an accurate answer to this question have occupied the attention of researchers in several different fields for many years.

Conventional wisdom generally assumes that inherited talents or aptitudes play a crucial role. Presumably, only individuals who possessed particular, genetically determined aptitudes can hope to demonstrate exceptional performance in music, art, athletics, or science. Research designed to test this suggestion, however, generally failed to provide confirming evidence. Persons who achieve exceptional performance in various fields are usually *not* consistently superior—in terms of talent or intelligence—to those who demonstrate more ordinary levels of achievement (e.g., Ericsson, 2006). Similarly, additional findings indicate that rates of improvement in performing various tasks cannot be

accurately predicted from initial levels of talent on the part of persons performing these tasks (Henry and Hulin, 1987; Hulin, Henry, and Noon, 1990). While these findings in no way suggest that individual aptitudes or talents are unimportant, they do indicate that such factors are not as central as has often been assumed.

Another suggestion of conventional wisdom that has *not* been confirmed in systematic research is that exceptional levels of performance are the result of growing *experience*—the sheer amount of time spent in a given domain. In fact, there is little evidence for this contention. Across many different activities, most individuals show relatively rapid increments in performance up to levels they and others view as *acceptable*. This is then followed by a *plateau* and no further gains. As a result, most individuals remain at a particular level of competence for years or even decades *despite growing experience as measured by time of active involvement in a particular domain* (Ericsson, 2006; Ericsson and Lehmann, 1996). For instance, most individuals who engage in particular sports activities (e.g., tennis, golf) never move far above average levels of performance no matter how long they participate in these sports.

Examples of such *performance plateaus* have also been reported in the entrepreneurship literature. For instance, Ucbasaran, Westhead, and Wright (2009) found that up to a point, growing experience among entrepreneurs is positively related to their ability to recognize opportunities. Beyond some determinable point, however, (perhaps 4.5 previous businesses), their ability to recognize opportunities actually *declines*, thus suggesting a curvilinear rather than linear relationship between growing experience and performance of this crucial task. Similarly, Shepherd, Zacharakis, and Baron (2003) found that venture capitalists' performance in identifying potentially successful new ventures did *not* increase linearly with their years of experience in this role. Rather, once again, performance rose with growing experience, but only up to a point, after which it actually declined. Together with the findings of basic research in cognitive science (e.g., Ericsson *et al.*, 2006), this evidence suggests that performance does not necessarily improve with increasing experience. As noted below, performance on many different tasks seems to move beyond *typical* or *average* levels *only* when individuals engage, actively and intently, in a particular form of learning—deliberate practice (Ericsson, *et al.*, 2006).

The basic requirements of such practice have been established by a large body of research evidence (e.g., Feltovich *et al.*, 2006) and are straightforward in nature. However, their application is often very challenging and is, in fact, beyond the motivation or capacities of most persons—which is one reason why few individuals demonstrate exceptional performance in their chosen fields. We now describe the basic requirements of deliberate practice and, following that, turn to factors that influence individuals' (including entrepreneurs') capacity to perform it.

THE NATURE OF DELIBERATE PRACTICE: COGNITIVE FOUNDATIONS OF EXCELLENCE

In a sense, the essence of deliberate practice is clearly captured by the following words, uttered by Michael Jordan, a basketball superstar, who in describing his own efforts to acquire—and maintain—exceptional performance, put it this way in a TV interview: 'I'm not out there sweating for three hours every day just to find out what it feels like to sweat' (Michael Jordan, 1994). In short, this highly accomplished athlete recognized that achieving exceptional levels of performance requires equally unusual amounts of *carefully focused* effort. Research on the origins of expert performance confirms this basic idea. In essence, it suggests that deliberate practice involves the following key features (e.g., Ericsson *et al.*, 2006; Colvin, 2008):

1. Deliberate practice is highly demanding mentally, requiring high levels of focus and concentration. Crucially, for deliberate practice to be effective, persons performing it must be fully absorbed in their efforts to improve and focus all their effort and attention on the task in question (Ericsson *et al.*, 1993).
2. It is designed specifically to improve performance—to strengthen it beyond its current levels. Areas of weakness must be identified and strenuous efforts must be made to improve these. Merely repeating aspects of performance or information that are already well established is insufficient.
3. It must continue for long of periods of time. Basic research on expert performance suggests that the benefits it generates cannot usually be attained with less than 10 years of continued, vigorous effort (e.g., Ericsson, 2006).

4. It must be repeated. This is one reason why attaining truly excellent levels of performance requires long periods of time; deliberate practice must continue and be repeated many times (the precise number of repetitions depends, in part, on the specific skills being mastered) to produce lasting, stable benefits.
5. It requires continuous feedback on results. This should be continuously available, either from others or from the tasks themselves.
6. Preperformance preparation is essential. Before beginning, individuals must set appropriate goals—ones that are specific and relate to the skills being practiced and acquired. These should involve not merely outcomes, but also the processes involved in reaching predetermined goals.
7. It involves self-observation and self-reflection. Individuals hoping to achieve expert levels of performance in any field must closely observe their own behavior and monitor their performance and progress. This is a key aspect of *metacognition*—individuals' knowledge and understanding of their own cognition and performance.
8. It involves careful reflection on performance *after* practice sessions are completed. Recently achieved levels of performance must be compared with goals so that further practice can be adjusted to achieve maximum results.

While individuals who engage in deliberate practice significantly improve the basic skills or skill components on which they focus, the key point to emphasize is that such activity—when performed in accordance with the requirements listed above—yields actual enhancements in basic cognitive systems. Since such systems underlie the capacity to assimilate new information with existing knowledge and skills (e.g., Corbett, 2005, 2007), they are closely related to entrepreneurial learning and—ultimately—to new venture performance. The nature of these cognitive benefits is discussed below. Before turning to that topic, and to antecedents of deliberate practice, we wish to call attention to three important points. First, the framework offered here is focused primarily on understanding the origins of *exceptional* entrepreneurial performance—not entrepreneurial behavior or actions generally. In other words, our primary goal is that of shedding new light on the cognitive foundations of the high levels of success attained by a small proportion of entrepreneurs.

Second, it is important to note that deliberate practice is not simply *hard work* or *prolonged practice*. Rather, it must be not merely effortful, but also carefully directed and focused to yield beneficial effects. Third, the potential relevance to entrepreneurship of research on deliberate practice and expert performance has previously been recognized by several researchers (e.g., Baron and Henry, 2006; Mitchell, 1994; Mitchell *et al.*, 1994; Mitchell, *et al.*, 2005). For instance, Mitchell *et al.* (2007: 8), suggest that ‘... entrepreneurs are *experts* in the entrepreneurial domain who possess and can acquire through... scripts or knowledge structures that enable them to use information significantly better than nonexperts or nonentrepreneurs...’ (italics added). Similarly, Ucbasaran *et al.* (2009: 111) note that ‘experience need not peak and end up becoming a barrier to opportunity identification if the entrepreneur engages in deliberate practice, that is, activities design by a teacher (or mentor) to improve individuals’ performance...’ Holcomb *et al.*, (2009: 182) offer similar proposals, noting that: ‘... scholars should consider the influence of judgmental processes on development of expertise and expert performance in entrepreneurial settings...’ While these suggestions call attention to the potentially important role of expert performance in new venture creation, they do not describe the specific mechanisms through which such exceptional performance may be obtained. The model developed below seeks to explicate these underlying mechanisms and, thus, make both theoretical and practical contributions to the field of entrepreneurship.

One additional point should also be emphasized: although research on expert performance indicates that deliberate practice plays a key role in the development of exceptional performance in many fields (and may be more important in this regard than either increasing experience or initial talent), this in no way suggests that deliberate practice, in and of itself, is sufficient to generate high levels of performance. Rather, in a sense, such practice can be viewed as a *magnifier* or *intensifier* of initial skills and capabilities. Unless these are present to some extent, even long periods of deliberate practice may fail to produce high levels of performance.

ANTECEDENTS OF DELIBERATE PRACTICE

Because it involves high levels of effort, concentration, and persistence, deliberate practice has often been described by scholars in the field of expert

performance as *the opposite of fun* (e.g., Ericsson, 2006). Indeed, research findings indicate that even highly accomplished performers in many fields cannot engage in it for more a few hours each day (e.g., Zimmerman, 2006). Clearly, it is not an activity individuals choose because it is pleasurable or appealing; rather, it occurs because persons seeking expertise in various fields recognize, to varying degrees, that it is an essential ingredient in attaining exceptional levels of achievement (Ericsson, 2006). When combined, these basic facts suggest that individuals differ greatly in terms of their capacity to engage in deliberate practice and that, by extension, only those who can pursue it vigorously and persistently for relatively long periods of time will reach the goal of performance far above the ordinary. This raises an important question: what factors play a role in individuals' capacity to engage in deliberate practice? To date, only a relatively small amount of research has investigated this issue (e.g., Chi, 2006), but drawing on existing data, we now review several factors that are related to engaging in deliberate practice and may be of particular importance with respect to entrepreneurship.

First, it is clear that motivation plays a key role in this respect. Only to the extent individuals are motivated to attain truly exceptional levels of performance will they subject themselves to the very hard cognitive work reaching these goals involves. As noted by prominent scholars in the field of expert performance, even expert performers find the actual process of training much less enjoyable than leisure and social activities (Ericsson *et al.*, 1993; Ericsson, 2006). This suggests that *achievement motivation* may play a key role in deliberate practice and the development of expert performance. More specifically, all other factors being equal, the higher individuals are on this dimension, the greater their motivation to seek truly exceptional levels of performance in their chosen fields and, hence, to engage in deliberate practice. Entrepreneurs have generally been found to be higher in achievement motivation than other persons, so this suggests that, in a sense, they are reasonable candidates for engaging in deliberate practice.

Another variable closely related to both motivation and performance is *self-efficacy*—an individual's belief that he/she can indeed accomplish what he/she set out to accomplish (Bandura, 1986, 1977, 1997). Self-efficacy has been found to play an important role in the performance of many tasks and has recently been shown to be significantly related to various mea-

asures of entrepreneurs' success (e.g., Zhao, Seibert, and Hills, 2005). The higher individuals are in generalized self-efficacy, the stronger their beliefs that they can accomplish whatever they set out to accomplish. Such beliefs may strengthen perceived links between engaging in deliberate practice and achieving exceptional performance. Again, entrepreneurs have been found to be relatively high in self-efficacy, so this factor, too, may increase the likelihood of their engaging in such practice.

Other important determinants of the extent to which individuals engage in effortful, focused, sustained deliberate practice may involve *self-regulatory mechanisms*—cognitive systems that permit individuals to regulate their own behavior in order to achieve specific personal goals (Winne, 1997). Among these, one process that has received considerable attention in recent research is *self-control* (e.g., Baumeister, Vohs, and Tice, 2007). Every day, people exert such control over their own behavior, resisting powerful impulses to engage in behaviors they believe they should *not* perform (e.g., overeating, speeding, spending more than they can afford) and requiring themselves to perform actions they believe they *should* execute but do not find intrinsically enjoyable (e.g., sticking to a diet, exercising). Self-control is one important self-regulatory mechanism (Baumeister, Vohs, and Tice, 2007), and a growing body of research has examined its effects in a wide range of contexts (Tice *et al.*, 2007). A key finding of this research is that the exercise of self-control on one task often reduces the capacity of the individuals involved to exercise self-control on a subsequent task (Wan and Sternthal, 2008). This suggests that self-control is a cognitive resource that can be exhausted through use.

Additional findings indicate that individuals differ greatly with respect to self-control. Some are able to exercise such control across different tasks and over long periods of time, while others demonstrate much less capacity to do so (e.g., Tangney, Baumeister, and Boone, 2004). Other research evidence indicates that people high in self-control show several important characteristics: they are successful in deferring current gratification in order to obtain larger rewards at later times (e.g., Mischel and Ayduk, 2004), can effectively regulate their own emotions, and can persist in performing effortful tasks despite the presence of distractions and temptations to stop (e.g., Baumeister, Heatherton, and Tice, 1994). Additional evidence (e.g., Baumeister *et al.*, 2007) suggests that self control can be strengthened through carefully

designed regimens. Expert performers in many fields appear to be individuals who have succeeded in strengthening their self-control so that they are able to exert the extremely high levels of effort and concentration required by deliberate practice over long periods of time.

Indirect support for this reasoning is provided by the fact that when children and adolescents first become involved in a sport or music, they typically engage in deliberate practice for only 15 minutes per session, a few times a week. After 10 years of regular practice, however, the best performers increase their daily amount of practice and ultimately reach a point at which they are engaging in deliberate practice for three to five hours per day (Ericsson, 1996; Starkes *et al.*, 2006). These findings suggest that self-regulatory skills, including strengthened self-control, may be important determinants of the ability to engage in focused deliberative practice, especially early in the process of acquiring expert performance.

Additional factors, too, may influence the capacity to engage in deliberate practice. As noted by Yates and Tschirhart (2006), the development of expert performance and the cognitive skills that often accompany it may rest, at least in part, on differences in temperament and related factors; specifically, several of the *Big Five* dimensions of personality may be relevant. *Conscientiousness*, one of these dimensions, refers to the extent to which individuals are organized, persistent, capable of hard work, and motivated to pursue goal accomplishment (Mount and Barrick, 1995). Conscientiousness has been found to be a significant predictor of job performance across many occupations and types of work (Barrick and Mount, 1991). Further, research findings suggest that this characteristic is also closely related to important outcomes in the domain of entrepreneurship (e.g., Ciavarella *et al.*, 2004; Zhao and Seibert, 2006). Perhaps one mechanism by which conscientiousness generates high levels of performance across many different tasks is through its impact on deliberate practice: individuals high in conscientiousness are better able to invest the long, tedious hours required by such practice—and, hence, more likely to reap the benefits of such experience.

In sum, several factors may influence individuals' willingness and capacity to engage in deliberate practice. As noted earlier, daily deliberate practice seems to be essential for generating truly superior performance in many different fields (Ericsson, 2006). The factors discussed above may influence

the likelihood that specific individuals actually engage in deliberate practice, and so acquire the cognitive benefits described earlier—benefits that then help them achieve their goal of consistently superior performance.

BENEFITS OF DELIBERATE PRACTICE: EXPANSION OF BASIC COGNITIVE RESOURCES

Deliberate practice is highly effortful—so effortful that even highly motivated persons can engage it in for no more than a few hours each day (Ericsson, 2006). The concentration, diligence, and effort it requires, however, yield important cognitive benefits (e.g., Ericsson, 2006; Ericsson and Lehmann, 1996). As noted earlier, deliberate practice appears to do considerably more than simply add to existing knowledge, refine specific skills, and enhance development of useful cognitive frameworks—outcomes yielded by traditional forms of learning that have been carefully investigated by scholars in the field of entrepreneurial learning (e.g., Corbett, 2007; Holcomb *et al.*, 2009). In addition to these effects, deliberate practice also generates *actual enhancements in basic cognitive resources*. Past research indicates that these benefits are both varied in nature and extensive in scope; here, however, we highlight several that may prove especially advantageous to entrepreneurs. These benefits fall into several major categories—involving enhancements to perception, memory, metacognition, and intuition (e.g., Dane and Pratt, 2007)—and they are described in detail below. Before turning to such benefits, however, we should note that research on expert performance indicates that to the extent individuals engage in deliberate practice, they will attain enhanced cognitive resources, at least to a degree (e.g., Colvin, 2008; Ericsson, 2006). Moreover, this appears to be so regardless of whether the activities being practiced are primarily physical in nature (e.g., sports or dance), primarily cognitive (e.g., chess, mathematics), or a mixture of both (e.g., creating rather than merely noticing business opportunities; Alvarez and Barney, 2007). The magnitude of such enhancements, however, will depend on many factors, including—as noted earlier—initial skills and capabilities.

Enhanced perceptual skills

In a key sense, perception provides the basis for cognition: it is through perception that input from

the external world enters cognitive systems for further processing that ultimately leads to overt actions. Deliberate practice enhances key aspects of perception, and in this manner, augments cognitive resources in several important ways. First, individuals who demonstrate expert performance in a given field (as a result of prolonged periods of deliberate practice) can often make finer discriminations than novices concerning incoming information. For instance, they are better at recognizing which information in the situation is crucial and which is relatively unimportant. This allows them to direct their attention primarily to the information that is, in fact, most pertinent and useful. Attention, like other key aspects of information processing (e.g., working memory), has definite limits, so the fact that experts can focus it more efficiently is often highly beneficial from the point of view of stretching or enhancing cognitive resources.

Second, experts in a given domain are generally much better than novices at recognizing complex patterns (Dane and Pratt, 2007; Simon and Chase, 1973). Not only do they recognize patterns present in large arrays of information more readily, they are also better at identifying the underlying *meaning* of such patterns. Moreover, they can do so more quickly and accurately than novices (Dane and Pratt, 2007). Recently, it has been suggested that the ability to identify patterns in complex arrays of information is one important basis for effective opportunity recognition (e.g., Baron, 2006; Baron and Ensley, 2006), so this enhancement to cognitive resources, too, provides important potential benefits for entrepreneurs and new ventures.

Enhancements to memory

Memory involves cognitive systems for retaining information (e.g., Baddeley, 1997) so that it can be processed and used at later times. Thus, it includes both entry of information into storage (encoding) and its later retrieval. New information not yet entered into memory and information retrieved from storage are actively processed in a key aspect of memory known as *working memory*. It is in working memory that, in a sense, consciousness exists, for it is in this system that information is actively processed and used to direct subsequent actions (e.g., Baddeley, 1997). Research on expert performance indicates that prolonged participation in the intense, focused effort involved in deliberate practice yields important expansions in several key aspects of memory.

First, experts in a given domain have been found to be better than novices at storing (i.e., encoding) new information in memory. They enter new information into memory in more organized ways and at deeper levels than novices. They do not merely store information in memory in a haphazard manner; rather, they often store it in terms of general principles relating to this knowledge. More specifically, experts store information in memory in conjunction with *domain-related concepts* they have acquired through deliberate practice. These concepts often include procedures that can be helpful in using stored information to solve various commonly encountered problems.

In addition to enhanced storage of information, experts in a wide variety of domains also show superior access to information stored in memory—they can find and retrieve it more effectively than novices. Experts are better at retrieving information that is the most relevant to current situations or conditions and are, therefore, more effective at combining it with new information in order to plan overt actions and reason about alternative courses of action. In addition, enhanced access to information stored in memory permits experts to relate new, incoming information to general principles and previously established cognitive frameworks, and so augments their ability to recognize complex patterns.

Perhaps even more important, experts' enhanced capacity to retrieve relevant information from memory also serves to expand the scope of working memory. This crucial memory system has clear limits—it can hold only relatively small amounts of information at any given time. (This is one reason why drivers who send text messages while navigating through traffic are at high risk for disastrous consequences; they run the real risk of overloading their working memory systems with the result that they fail to notice—and process—crucial, incoming information about the actions of other drivers, road conditions, etc.). As a result of deliberate practice, however, experts acquire enhanced capacity to bring information from long-term memory into working memory, effectively increasing its effective capacity. The result is that experts are much better than novices at using information in long-term memory to plan, reason, and evaluate various alternative courses of action (Ericsson and Lehmann, 1996). These expanded cognitive resources help them adapt rapidly to changing circumstances and make superior decisions under conditions of high time constraint—conditions often faced by entrepreneurs.

Enhanced metacognition and intuition

Deliberate practice also enhances cognitive resources with respect to *metacognition*—individuals' understanding of their own knowledge and performance (Feltovich *et al.*, 2006). Experts in a given field not only perform at superior levels—they are also better than novices at reflecting on their own thoughts and actions and, hence, better able to understand the factors that have influenced their performance. In a sense, they *know what they know and do not know*, and this can be highly beneficial in terms of preparing for overt actions, which often involves defining current and future tasks in ways consistent with their current knowledge, skills, and abilities (Hacker, 2003). In addition, it may help them avoid overconfidence and hubris—dangerous pitfalls for entrepreneurs (Hayward, Shepherd, and Griffin, 2006). For instance, entrepreneurs suffering from hubris (which combines overconfidence with excessive optimism) often greatly underestimate the resources their new ventures will need while they simultaneously overestimate their own managerial capabilities.

Yet another benefit of enhanced metacognitive resources gained by experts in a given domain is enhanced capacity to conduct mental simulations—imagining what may follow from specific actions—so they can more effectively evaluate alternative courses of action in order to choose the most appropriate one (Hogarth, 2001).

Closely related to these expansions in metacognitive resources are enhancements to *intuition*—what cognitive scientists sometimes describe as *offline* processing (e.g., Myers, 2002). Intuition involves information processing that occurs below the level of conscious awareness but, nevertheless, has measurable effects on decisions, judgments, and overt actions. Dane and Pratt (2007) define intuition as involving judgments that arise through rapid, non-conscious, and holistic processes and are frequently accompanied by strong affect. While both novices and experts sometimes rely on intuition (as opposed to careful, systematic reasoning and analysis), growing evidence suggests that because they have acquired enhanced access to vast quantities of information stored in long-term memory and enhanced capacities to recognize complex patterns, experts sometimes attain a highly valuable form of intuition known as *mature intuition* (Baylor, 2001). Such intuition draws heavily on well-developed knowledge structures, but allows experts to make decisions accurately and rapidly—often with relatively little

cognitive effort. While novices struggle to analyze information and extract from it useful guides to decisions and actions, experts—as a result of their prolonged participation in deliberate practice—can draw on large stores of tacit knowledge effectively (Cianciolo *et al.*, 2006), and so move ahead with decisions and judgments in a seemingly effortless way.

A clear example of such mature intuition (coupled with enhanced pattern recognition) is provided by one highly successful entrepreneur known to the authors. Because of his great success and acknowledged expertise in high-tech areas, hundreds of ideas for new products or services are presented to this individual each year. When asked in an interview 'How can you tell which ones are worth pursuing?' his reply was simple: 'I can just tell . . . I know almost instantly whether it will work or not.' In response to the follow-up question 'But how do you know?' he remarked: 'Because I can compare it with other ideas that I have seen—and quickly get a gut-level feeling about whether it will work or not.' This is what Baylor and others mean by *mature intuition*—the capacity to draw on large amount of previously acquired information so rapidly and efficiently, that it truly dazzles onlookers who are left wondering 'How does he/she do it?'

In sum, an extensive body of research in cognitive science and related fields indicates that as a result of prolonged participation in deliberate practice, experts in many different fields obtain measurable—and potentially beneficial—enhancements to their cognitive resources. They have, of course, also acquired extensive stores of information and refined skills in their field. But more important, they have also gained expansions in their cognitive resources—expansions that help them apply their knowledge efficiently to new situations and challenges. In short, they have not merely *learned* (e.g., Corbett, 2005, 2007)—they have also acquired enhanced *capacity* to learn and adapt.

ENHANCED COGNITIVE RESOURCES: HOW ENTREPRENEURS CAN OBTAIN THEM

Basic research on expert performance (e.g., Ericsson *et al.*, 2006) suggests that to a large extent, truly exceptional performance emerges from the expansions in cognitive resources described above—enhancements generated by participation in

prolonged and highly focused deliberate practice. These basic facts raise an intriguing question: How can entrepreneurs engage in the deliberate practice that seems essential for enhancing their own cognitive resources? Unlike aspiring musicians, athletes, chess masters, and others, entrepreneurs engaged in launching and operating new ventures generally do not have the opportunity to engage in long, uninterrupted periods of deliberate practice. Further, even if they did, it is not clear what specific skills or tasks they would practice. By definition, entrepreneurs engage in a wide range of activities, and these often change rapidly and unpredictably during the course of each day, as well as over extended periods of time. In contrast to musicians, athletes, scientists, engineers, architects, and members of many other professional groups, entrepreneurs are *generalists*, not specialists. As a result, it is unclear which specific skills they should practice. Taking account of this fact, Ucbasaran *et al.* (2009: 112) have noted that ‘Considerable care is required when applying the concept of deliberate practice to entrepreneurship. Tasks performed by entrepreneurs need to be clearly identified and measures of performance relating to each task need to be operationalized . . .’

Entrepreneurs do, of course, sometimes practice specific skills in order to improve them—for instance, many rehearse their presentations to venture capitalists and others over and over again in numerous *dry-runs*. In general, though, the highly dynamic environments and ever-changing array of tasks entrepreneurs face make it difficult for them to devote large portions of their time to deliberate practice.

If this is so, then how can they acquire the expanded cognitive resources provided by such practice? We offer two potential resolutions to this key question. The first is suggested by extant literature on entrepreneurial learning, while the second relates to the long-term benefits of deliberate practice performed in other life domains—benefits entrepreneurs can transfer to the tasks involved in launching and growing new ventures.

Vicarious deliberate practice

Research on entrepreneurial learning notes that such learning can be either *experiential* (i.e., direct) or *vicarious* (i.e., occurring through observation of the actions and outcomes of others). For example, as noted by Corbett (2005) in a framework based on Kolb’s theory of experiential learning (Kolb, 1984;

Kolb and Kolb, 2005), individuals can learn through several mechanisms, including direct experience and reflection on such experience, or—alternatively—vicariously, through observing the actions and outcomes of others. Similarly, Holcomb *et al.*, (2009) explicitly distinguish between experiential learning—experience and assimilation of information yielded by experience with existing knowledge structures—and vicarious learning—which occurs when individuals observe others’ actions, retain information concerning such actions, and then assimilate such knowledge with information present in memory. Drawing on these suggestions, we suggest that although in many cases entrepreneurs cannot engage in *overt* deliberate practice, they may be able to benefit from such learning performed in a vicarious or symbolic manner (Bandura, 1997; Baron, 1970).

A very large literature in the field of psychology indicates that individuals often acquire knowledge, skills, and new forms of behavior in this way (i.e., vicariously); moreover, such learning is often highly efficient—more efficient, in fact, than direct, trial-by-trial (i.e., experiential) learning (see, e.g., excellent reviews by Bandura, 1977, 1986). Research on expert performance further reveals that expansions to cognitive resources can, in fact, be acquired in this manner. For instance, consider the actions of world-class chess masters. These individuals have been found to spend many hours contemplating *previous games between the very best players in the world* (Ericsson, 2006). Typically, they analyze these games in excruciating detail, playing through them move by move, to see how closely their own preferred actions match those of the skilled opponents. In other words, they spend many hours in careful analysis of highly relevant examples within their domain. Although they do, of course, engage in overt (experiential) deliberate practice by playing many actual games, their exceptional performance also seems to derive from their participation in *vicarious deliberate practice*—from observing and focusing, intently, on relevant examples and the information they provide.

Applying this general principle of vicarious learning to entrepreneurship, we suggest that an important route to building expert performance in situations where time pressures and other environmental conditions provide little opportunity for hours of overt focused practice is offered by *exposure to a large number of pertinent, realistic, and highly relevant examples*. By focusing carefully and intensely on

such examples, understanding the principles they illustrate, and assimilating this information into existing cognitive frameworks, individuals who engage in such vicarious deliberate practice can acquire the benefits conferred, in many other fields, by overt deliberate practice. Detailed examination of pertinent examples through cases has, of course, long been part of management education and is widely used in courses on entrepreneurship. Overall, basic research both on deliberate practice and entrepreneurial learning (e.g., Corbett, 2007) offers a strong rationale for adopting such methods; if the examples are carefully chosen so as to provide students with the information that will help them build accurate mental models and other cognitive resources, the benefits in terms of enhanced performance on key tasks can be substantial (e.g., Ericsson *et al.*, 2006).

Transferring (applying) the benefits of previous deliberate practice in other domains

Another—and very different—solution to the challenge posed by the fact that entrepreneurs cannot typically engage in deliberate practice in the same ways as individuals seeking to attain expertise in other domains is suggested by the nature of deliberate practice itself. As described earlier in this article, such practice involves several crucial ingredients: high levels of focus and concentration, persistence over time, a clear focus on improvements in performance, self-observation, and reflection. To the extent these conditions are met, expansions in cognitive resources often result. This suggests that in order to achieve such benefits (i.e., augmentations to memory, perception, metacognition, etc.), it is not essential for entrepreneurs to focus on the specific tasks they perform while enacting this role (although, as noted above, this is certainly feasible in some instances). Rather, the benefits of deliberate practice gained in other domains may be transferred into entrepreneurship and applied to current tasks related to new venture creation and growth. To the extent entrepreneurs have engaged in effortful, persistent deliberate practice with respect to other activities before becoming entrepreneurs (e.g., while learning to play a musical instrument, training in a sports activity, completing advanced education in science, engineering, or other fields, etc.), they may have acquired the expanded cognitive resources that result from prolonged deliberate practice. Entrepreneurs can then put these expanded cognitive resources to use in meeting the challenges that arise during the

launch and operation of new ventures. As will be noted later in the article, these resources may be extremely helpful to them in several important respects. Before explicating such uses, however, the following point should be emphasized: domain-related knowledge is indeed specific to a given field. For example, skilled physicians cannot apply the medical knowledge gained through intense training and years of practice to architecture or music. The enhanced cognitive resources resulting from deliberate practice, however, are *general in nature, and can be applied to situations outside the ones in which they were acquired*. For instance, being able to recognize which information in a given situation is most important and which is irrelevant can be useful across a wide range of contexts and tasks. Similarly, enhanced access to information stored in memory and improved understanding of one's own cognition and performance can be helpful outside the domains in which these cognitive resources were first attained.

In sum, we suggest that entrepreneurs who have acquired expanded cognitive resources as a result of deliberate practice in other domains can apply these resources to the challenging tasks they must now perform in launching and running new ventures. Since deliberate practice must continue for long periods of time (years rather than weeks) to generate expert performance (Ericsson, 2006), this suggests that such individuals would, on average, tend to be somewhat older and more mature than entrepreneurs generally. Because deliberate practice often occurs during childhood or adolescence, however, the magnitude of such differences would not necessarily be great. It should also be noted that regardless of expansions of cognitive resources, entrepreneurs still need knowledge related to the industry or domain in which their new venture is focused; such knowledge is necessary to apply and fully utilize the enhanced resources imported from previous deliberate practice in other fields. Several ways in which such beneficial transfer or application of cognitive resources can occur are described later.

ENHANCED COGNITIVE RESOURCES: THEIR POTENTIAL IMPACT ON TASKS RELATED TO NEW VENTURE PERFORMANCE

As noted earlier, a large body of evidence indicates that participation in deliberate practice—either directly or symbolically—has beneficial effects on

basic cognitive processes (perception, memory, metacognition). Extending this principle, we suggest that these effects may contribute to enhanced performance of key entrepreneurial tasks—ones that are closely related to new venture success. Although entrepreneurs engage in a very wide range of activities, we focus here on tasks that must be performed during early phases of the process when, perhaps, entrepreneurs' cognitive resources are especially important (e.g., Shane, 2003).

The role of enhanced cognitive resources in the identification, creation, and evaluation of opportunities

In a sense, *recognizing and evaluating business opportunities* represents the start of the entrepreneurial process. Although, as noted by Sarasvathy (2001), entrepreneurs sometimes identify opportunities after starting new ventures, the pattern of identifying an opportunity and then proceeding to develop it appears to be more common. Highly successful entrepreneurs often become very adept at these crucial activities and, as a result, are able to notice and select those opportunities that offer the best combination of high potential benefits and low potential risks (e.g., McMullen and Shepherd, 2006). As noted by Ucbasaran *et al.* (2009), they do not appear to attain high levels of performance in this regard simply as a result of increasing experience; on the contrary, these authors present data suggesting that beyond some point, increasing experience in starting new ventures may actually lead to decrements in performing this key task.

Research on expert performance suggests, instead, that entrepreneurs become increasingly proficient at opportunity recognition and evaluation as a result of having engaged in various forms of deliberate practice. Such practice, and the enhanced cognitive resources it generates, can contribute to opportunity recognition in several ways.

First, participation in deliberate practice (again, either directly or vicariously, through careful study of examples and cases) enhances perceptual abilities so that persons who have engaged in such practice demonstrate enhanced capacity to accurately recognize complex patterns (Dane and Pratt, 2007; Simon and Chase, 1973). To the degree that recognizing such patterns underlies opportunity recognition (Baron, 2006), expanded perceptual resources generated by deliberate practice may be highly beneficial for entrepreneurs.

Second, recognizing opportunities and distinguishing between ones that are potentially profitable and ones that are more likely to be dead ends often involves comparing current opportunities with representations of previously encountered opportunities stored in memory. Participation in deliberate practice enhances access to information stored in long-term memory, increasing the speed with which it can be retrieved and introduced into working memory. This, too, may increase an entrepreneur's ability to accurately identify potentially valuable business opportunities. To a degree, these enhanced capacities may underlie what Kirzner (1985) described as alertness—a capacity to recognize opportunities that exist in the external environment.

Third, evaluating opportunities quickly and accurately often involves *intuition*—making judgments rapidly and holistically, without detailed, time-consuming analysis. Deliberate practice facilitates the development of highly effective intuition, and such intuition, in turn, encourages information processing that yields accurate decisions quickly and with minimal cognitive effort. Such enhanced intuition may contribute to rapid and effective evaluation of potential opportunities.

We should note that these proposals concerning the role of active deliberate practice in enhancing entrepreneurs' ability to both recognize and evaluate potential opportunities are consistent with findings reported by Corbett (2007). Corbett found that opportunity recognition by entrepreneurs is facilitated by a preference for acquiring information through *comprehension*—actively thinking about and reinterpreting available information. Specifically, entrepreneurs who show a preference for comprehension identify more opportunities than ones who show a preference for other modes of information acquisition. A preference for comprehension may reflect the tendency to engage in deliberate practice—to think intensely and actively about available information. This, in turn, can enhance cognitive resources relating to perception, memory, and intuition.

In addition to simply recognizing opportunities that exist, entrepreneurs also sometimes *create* opportunities (Alvarez and Barney, 2007). Their actions produce effects that generate opportunities that did not previously exist. Basically, entrepreneurs act, observe the effects of their actions, make adjustment, and act again. Ultimately, it is their actions, not externally generated shocks to markets or economic systems alone, that produce

opportunities. Thus, in this sense, entrepreneurs create, rather than simply identify, opportunities. Enhanced cognitive resources gained through deliberate practice may prove very helpful in this context. For instance, increased capacity to notice what is and is not important in a given situation helps entrepreneurs accurately gauge the impact of their actions on markets, and this can guide their further actions and facilitate the emergence of new opportunities. Thus, enhanced cognitive sources gained from deliberate practice can facilitate opportunity creation as well as opportunity recognition.

Enhanced cognitive resources and accurate identification of essential resources

The enhanced cognitive resources generated by deliberate practice may also contribute to performance of another crucial task performed by entrepreneurs early during the process of new venture creation—identification of specific resources needed to exploit an identified opportunity (human, financial, etc.). Completing this task effectively is an essential initial step toward acquiring such resources, since efforts invested in obtaining nonessential resources may divert entrepreneurs from acquiring ones that are, in fact, essential for effectively exploiting available opportunities. In this respect, enhanced cognitive resources relating to perception (e.g., being able to quickly identify the

most pertinent and important information in a situation) and memory (being able to draw rapidly and efficiently on large stores of previously acquired information) may assist entrepreneurs in their efforts to target essential resources.

In sum, although entrepreneurs cannot generally engage in deliberate practice in precisely the same manner as developing experts in other fields (e.g., music, sports), they can acquire the benefits conferred by such practice in several ways: (1) by engaging in it with respect to certain tasks (e.g., practicing their *elevator pitches* to potential sources of financing); (2) by engaging in it vicariously (through detailed and effortful study of appropriate examples and cases); or (3) by drawing on the cognitive resources generated by deliberate practice performed in other life domains. Such prior experience may, in short, equip them with the tools they need to excel in the role of entrepreneur, even though these resources were developed in other contexts. These suggestions are summarized in Figure 1, which represents the potential role of enhanced cognitive resources in early phases of the new venture creation process.

Expert teams

Although the focus throughout this discussion has been on individual entrepreneurs and the cognitive resources they acquire and use, it is important to

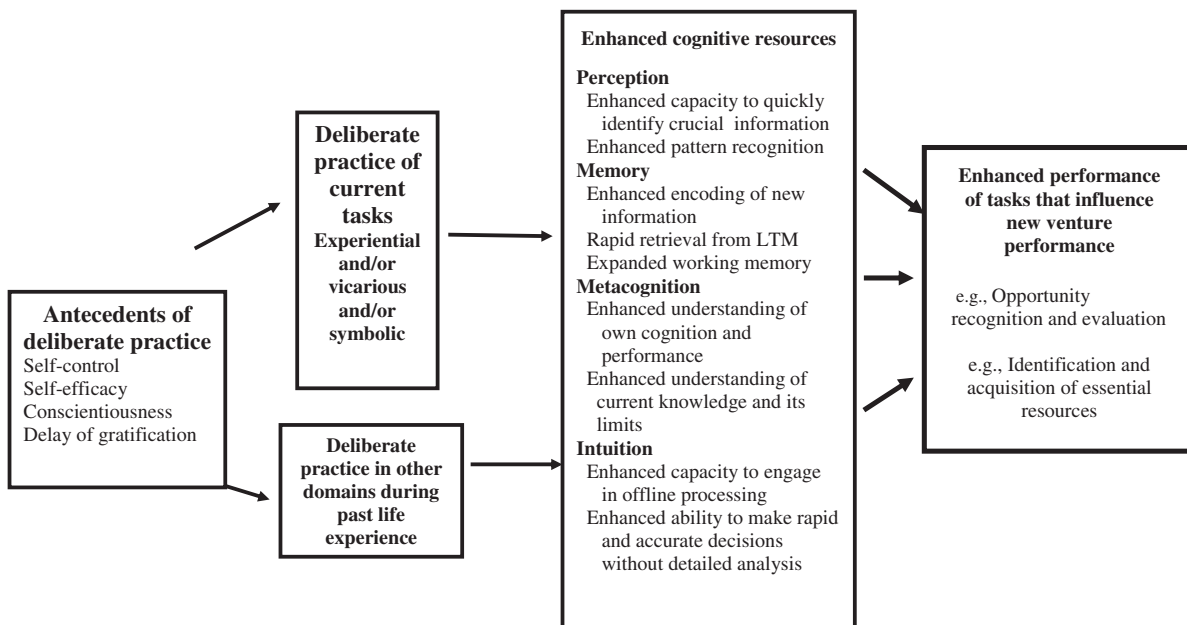


Figure 1. The role of deliberate practice and enhanced cognitive resources in new venture performance

note that expert performance may also occur at the level of teams. As defined by Salas *et al.*, (2006), expert teams are ones that possess unique expert-level knowledge, skills, and experience and, through excellent coordination of these collective resources, generate sustainable, superior performance. Since most new ventures are started by two or more entrepreneurs (Shane, 2003), team-level effects are of considerable importance. To date, there has been relatively little research on the origins and nature of team expert performance. However, existing literature suggests that expert performance by teams involves not only enhanced cognitive resources on the part of individual team members, but also very high levels of coordination. Successful expert teams, it appears, have a clear, shared vision, operate on the basis of shared understanding of situations and goals, and seek to establish mechanisms for enhanced cooperation. In addition, they develop a strong sense of collective trust (Salas, *et al.*, 2006). As a result of these efforts, they often attain true *synergy*, in which the total effort—and the effects it produces—is greater than that which could be attained by individuals, no matter how skilled or expert with respect to specific tasks.

Clear examples of such coordinated, multiperson expert performance are provided by certain sports teams that have sometimes been described as *dream teams* in their particular domain. For instance, the New York Yankees of the 1950s and early 1960s won an unprecedented number of games, pennants, and World Series. Their play was so exceptional that players on rival teams sometimes admitted, candidly, that they felt severely discouraged as soon as the Yankees took the field. Some entrepreneurial teams may attain similar synergy, which then contributes significantly to truly impressive success.

The origins and nature of the complex mechanisms that generate team-based expert performance is beyond the scope of the present article, but it is clear that a full understanding of the role of expert performance in the domain of entrepreneurship will require a multilevel approach of the kind recommended so eloquently by Hitt *et al.*, 2007.

IMPLICATIONS FOR ENTREPRENEURSHIP THEORY AND RESEARCH

The framework developed in this article is based on two distinct but related bodies of knowledge: the

findings of basic research on the origins and nature of expert performance (Ericsson *et al.*, 2006) and extant research on entrepreneurial learning (e.g., Corbett, 2005; Holcomb *et al.*, 2009). Together, these areas of investigation converge on the following suggestions. First, one important factor in entrepreneurs' success—a factor that has not been the subject of detailed attention in past research—is the *cognitive resources* they possess and can apply to a wide range of tasks relevant to the launch and operation of new ventures. Second, the greater these cognitive resources, the more effectively entrepreneurs will be able to perform tasks closely related to the success of their new ventures (e.g., accurate identification and evaluation of potentially valuable opportunities). Third, and perhaps of greatest importance, both areas of research (but especially research on expert performance) suggest that entrepreneurs can develop enhanced cognitive resources in several ways: by engaging in highly focused forms of practice with respect to tasks they are performing as entrepreneurs (e.g., practicing their *elevator pitches*), by engaging in such practice vicariously (by carefully considering relevant cases or other information), or by transferring to the domain of entrepreneurship, cognitive resources developed in other life activities (e.g., through deliberate practice in, sports, music, creative writing, etc.)

Together, these suggestions have important theoretical and practical implications for the field of entrepreneurship. With respect to theory, they provide new insights into the factors that influence entrepreneurs' success—and the success of their new ventures. A very basic question in the field of entrepreneurship, one that has received continuing research attention for decades, is this: 'Why are some entrepreneurs so much more successful at starting and operating new companies than others?' The framework developed here suggests that part of the answer involves entrepreneurs' cognitive resources and the extent to which they have augmented these resources through any (or all) of the routes described above (essentially, overt or vicarious deliberate practice). In short, as suggested by many previous authors (e.g., Mitchell *et al.*, 2005, 2007), entrepreneurial cognition is, indeed, a key ingredient in entrepreneurs' success. The framework offered here, however, extends this basic suggestion by helping explain *why* and *how* this is so. To put it succinctly, the enhancements to perception, memory, metacognition, and intuition generated by various forms of deliberate practice provide entrepreneurs

with cognitive resources they can apply to a wide range of tasks and situations—versatile, flexible tools that can help them adapt successfully to the ever-changing, highly competitive environments they face.

In addition, the present framework offers new insights into another important issue identified in recent research and theory in the field of entrepreneurship: *What, specifically, highly successful (repeat) entrepreneurs gain from their experience in starting several new ventures.* One benefit repeat entrepreneurs may potentially gain from their persistent and highly focused efforts to launch new ventures is the enhanced cognitive resources described earlier. These expanded resources, in turn, may help them perform important tasks more effectively than novices who lack such expanded cognitive resources (e.g., Baron and Ensley, 2006).

From a practical point of view, the present model suggests that one important step entrepreneurs can take to increase their own chances of success is strengthening or expanding their cognitive resources. Doing so is *not* an easy task; rather it involves prolonged and highly focused efforts to improve one's performance on specific tasks or activities. However, a wealth of evidence provided by research on expert performance suggests that this is effort very well spent: the enhancements to memory, perception, metacognition, and other basic cognitive resources can then contribute to improved performance of a wide range of tasks and activities. For instance, as noted earlier, enhanced access to information stored in long-term memory may increase the effective capacity of working memory and so contribute to more rapid—and accurate—decision making (e.g., Ericsson, 2006).

These suggestions are entirely consistent with proposals by Corbett (2007), who noted that in opportunity recognition and other key tasks performed by entrepreneurs, it is not simply the *information* and *knowledge* entrepreneurs possess that matters—the underlying *capacity to use it effectively* is also crucial. We expand on these ideas by proposing that enhanced cognitive resources transcend specific domains and bodies of knowledge. Thus, once acquired, they can be applied by entrepreneurs to a wide range of new tasks and challenges.

It should be noted that these suggestions are all readily testable in future research. For instance, investigations designed to assess them can do so by comparing the cognitive resources of highly successful and less successful entrepreneurs. A wide

range of measures useful in assessing perceptual skills, working memory, long-term memory, metacognition, and intuition, have been developed by cognitive scientists. These measures can be readily adapted to research with entrepreneurs, in which it would be predicted that highly successful entrepreneurs possess cognitive resources that are measurably superior to those possessed by novice entrepreneurs or less successful ones.

Another contribution offered by the present framework relates to the fact that it helps to bridge an important gap in much current entrepreneurship research—a gap between the microlevel factors, such as entrepreneurs' cognition, and the macrolevel measures that are central to assessing new venture performance (e.g., growth in sales, earnings, employment, etc.). In the past, much excellent research has examined various aspects of entrepreneurial cognition—the ways in which entrepreneurs process information, the cognitive biases to which they are susceptible, their plans and intentions, and how they make decisions (e.g., Krueger, 2003; Mitchell *et al.*, 2007). While this research has been highly informative in many ways, it has not, to date, fully explained *how* entrepreneurs' cognitive processes ultimately influence new venture performance. The present model addresses this issue by suggesting that enhancements to basic cognitive resources gained through participation in either direct or vicarious deliberate practice may play a key role in entrepreneurs' performance of tasks that strongly influence the performance of their new ventures. In this way, it helps to connect key aspects of entrepreneurial cognition to the macrolevel outcomes that are often of primary concern to the field of entrepreneurship.

Finally, it is important to note that the model proposed here has implications for basic research on expert performance, as well as for the field of entrepreneurship. Such research has often focused on identifying the cognitive benefits resulting from deliberate practice, but has not, to date, focused on how these benefits (i.e., expanded cognitive resources) can be transferred or extended from one field to another. If deliberate practice does indeed generate enhanced perception, memory, metacognition, and intuition, such transfer across domains might well occur so that although the *content* of expertise acquired in one domain (specific knowledge and skills) does not transfer, the expanded cognitive resources do. This is, perhaps, one reason why once an individual has learned several foreign languages, learning yet another one requires less effort

because expanded cognitive resources useful in accomplishing this complex task have already been acquired. Thus, the present model suggests new and potentially fruitful avenues for research for the field of expert performance.

CONCLUDING THOUGHTS

In closing, we wish to emphasize two points—both of which are somewhat encouraging in nature. First, it is important to reiterate that the basic principles established by research on deliberate practice and expert performance apply to a remarkably wide range of fields and domains, ranging from sports and music to chess, science, and creative writing (e.g., Kellogg, 2006). Thus, there are empirical grounds for proposing that they are also applicable to the domain of entrepreneurship. Second, it is important to emphasize what is, perhaps, one of the most central findings of research on expert performance: *innate talents or aptitudes are far less crucial in attaining unusually high levels of performance than diligent and persistent application of the basic principles of deliberate practice.* This suggests that high levels of performance on many tasks can be attained by anyone willing to apply these principles to their own efforts to break free of *performance plateaus*. Excellence, it appears, is not the sole province of those who are especially talented; rather, it is potentially available to a much larger number of persons. The word *potentially* should be emphasized, however, because (as noted earlier) individuals differ greatly in their capacity for engaging in the intense and highly directed effort required by deliberate practice and, especially, in their capacity to focus such practice on those aspects of performance most in need of improvement. If they can succeed in meeting these challenges, however, individuals in many different domains—including entrepreneurship—can aspire to, and attain, levels of performance far above the *average* or *typical*. In a sense, therefore, success belongs not to those who are gifted, experienced, or lucky—but rather to those who are willing to work long and hard, in specific and carefully directed ways, to attain it.

ACKNOWLEDGEMENTS

The authors wish to express their sincere appreciation to Anders Ericsson, Michael Hitt, and two anonymous

reviewers for their insightful and constructive comments on earlier drafts of this article.

REFERENCES

- Alvarez SA, Barney JB. 2007. Discovery and creation: alternative theories of entrepreneurial action. *Strategic Entrepreneurship Journal* 1(1–2): 11–26.
- Baddeley A. 1997. *Human Memory: Theory and Practice (revised edn)*. Psychology Press, Taylor & Francis Group: New York.
- Bandura A. 1977. *Social Learning Theory*. Prentice-Hall: Englewood Cliffs, NJ.
- Bandura A. 1986. *Social Foundations of Thought and Action*. Prentice-Hall: Englewood Cliffs, NJ.
- Bandura A. 1997. *Self-efficacy: The Exercise of Control*. W.H. Freeman: New York.
- Baron RA. 1970. Attraction toward the model and model's competence as determinants of adult imitative behavior. *Journal of Personality and Social Psychology* 14: 345–351.
- Baron RA. 2006. Opportunity recognition as pattern recognition: how entrepreneurs 'connect the dots' to identify new business opportunities. *Academy of Management Perspectives* 20: 104–119.
- Baron RA, Ensley MD. 2006. Opportunity recognition as the detection of meaningful patterns: evidence from comparisons of novice and experienced entrepreneurs. *Management Science* 52: 1331–1344.
- Baron RA, Henry RA. 2006. The role of expert performance in entrepreneurship: how entrepreneurs acquire the capacity to excel. Paper presented at the Babson-Kaufmann Entrepreneurship Research Conference, Indiana University, Bloomington, IN.
- Barrick MR, Mount M. 1991. The big five personality dimensions and job performance: a meta-analysis. *Personnel Psychology* 44: 1–26.
- Baumeister R, Heatherton TF, Tice D. 1994. *Losing Control: How and Why People Fail at Self-Regulation*. Academic Press: San Diego, CA.
- Baumeister RF, Vohs KD, Tice DM. 2007. The strength model of self-control. *Current Directions in Psychological Science* 16: 351–355.
- Baumol W. 1968. Entrepreneurship in economic theory. *American Economic Review, Papers and Proceedings* 58(2): 64–71.
- Baylor A. 2001. A u-shaped model for the development of intuition by level of expertise. *New Ideas in Psychology* 15(2): 185–194.
- Chi MTH. 2006. Two approaches to the study of experts' characteristics. In *The Cambridge Handbook of Expertise and Expert Performance*, Ericsson KA, Charness N, Hoffman RR, Feltovich PJ (eds). Cambridge University Press: New York; 23–30.

- Cianciolo AT, Matthew C, Sternberg RJ, Wagner RK. 2006. Tacit knowledge, practical intelligence, and expertise. In *The Cambridge Handbook of Expertise and Expert Performance*, Ericsson KA, Charness N, Hoffman RR, Feltovich PJ (eds). Cambridge University Press: New York; 613–632.
- Ciavarella MA, Bucholtz AK, Riordan CM, Gatewood RD, Stokes GS. 2004. The big five and venture success: is there a linkage? *Journal of Business Venturing* **19**: 465–483.
- Colvin G. 2008. *Talent is Overrated: What Really Separates World-Class Performers from Everybody Else*. Penguin Books: New York.
- Corbett AC. 2005. Experiential learning within the process of opportunity identification and exploitation. *Journal of Business Venturing* **29**: 473–491.
- Corbett AC. 2007. Learning asymmetries and the discovery of entrepreneurial opportunities. *Journal of Business Venturing* **22**: 97–118.
- Dane E, Pratt MG. 2007. Exploring intuition and its role in managerial decision making. *Academy of Management Review* **32**(1): 33–54.
- Dunn TG, Shriver C. 1999. Deliberate practice in teaching: what teachers do for self improvement? *Teaching and Teacher Education* **15**: 631–651.
- Ericsson KA. 1996. The acquisition of expert performance: an introduction to some of the issues. In *The Road to Excellence: The Acquisition of Expert Performance in the Arts and Sciences, Sports, and Games*, Ericsson KA (ed). Erlbaum: Mahwah, NJ; 1–50.
- Ericsson KA. 2006. The influence of experience and deliberate practice on the development of superior expert performance. In *The Cambridge Handbook of Expertise and Expert Performance*, Ericsson KA, Charness N, Hoffman R, Feltovich J (eds). Cambridge University Press: New York; 683–703.
- Ericsson KA, Charness N, Hoffman R, Feltovich PJ (eds). 2006. *The Cambridge Handbook of Expertise and Expert Performance*. Cambridge University Press: New York.
- Ericsson KA, Kintsch W. 1995. Long-term working memory. *Psychological Review* **102**: 211–245.
- Ericsson KA, Krampe RT, Tesch-Römer C. 1993. The role of deliberate practice in the acquisition of expert performance. *Psychological Review* **100**: 363–406.
- Ericsson KA, Lehmann A. 1996. Expert and exceptional performance: evidence of maximal adaptation to task constraints. *Annual Review of Psychology* **47**: 273–305.
- Feltovich PJ, Prietula MJ, Ericsson KA. 2006. Studies of expertise from psychological perspectives. In *The Cambridge Handbook of Expertise and Expert Performance*, Ericsson KA, Charness N, Hoffman R, PJ Feltovich (eds). Cambridge University Press: New York; 41–68.
- Hacker W. 2003. Action regulation theory: a practical tool for the design of modern work processes? *European Journal of Work and Organizational Psychology* **12**(2): 105–130.
- Hayward MLA, Shepherd DA, Griffin D. 2006. A hubris theory of entrepreneurship. *Management Science* **52**(2): 160–172.
- Henry RA, Hulin CL. 1987. Stability of skilled performance across time: some generalizations and limitations on utilities. *Journal of Applied Psychology* **72**: 457–462.
- Hitt MA, Beamish PW, Jackson SE, Mathieu JE. 2007. Building theoretical and empirical bridges across levels: multilevel research in management. *Academy of Management Journal* **50**: 1385–1399.
- Hogarth RM. 2001. *Educating Intuition*. The University of Chicago Press: Chicago, IL.
- Holcomb TR, Ireland R, Holmes RM, Hitt M. 2009. Architecture of entrepreneurial learning: exploring the link among heuristics, knowledge, and action. *Entrepreneurship Theory and Practice* **33**: 167–192.
- Hulin CL, Henry RA, Noon SL. 1990. Adding a dimension: time as a factor in the generalizability of predictive relationships. *Psychological Bulletin* **107**: 328–340.
- Ireland RD, Webb JW. 2007. Strategic entrepreneurship: creating competitive advantage through streams of innovation. *Business Horizon* **50**: 49–59.
- Kellogg RT. 2006. Professional writing experience. In *The Cambridge Handbook of Expertise and Expert Performance*, Ericsson KA, Charness N, Hoffman R, Feltovich P (eds). Cambridge University Press: New York; 389–402.
- Kirzner IM. 1985. *Discovery and the Capitalist Process*. University of Chicago Press: Chicago, IL.
- Kolb AY, Kolb DA. 2005. Learning styles and learning spaces: enhancing experiential learning in higher education. *Academy of Management Learning and Education* **4**(2): 193–212.
- Kolb DA. 1984. *Experiential Learning: Experience as the Source of Learning and Development*. Prentice Hall: Englewood Cliffs, NJ.
- Krueger NF Jr. 2003. The cognitive psychology of entrepreneurship. In *Handbook of Entrepreneurial Research*, Acs ZA, Audretsch DB (eds). Kluwer Law International: London, U.K.; 105–140.
- Locke EA, Baum JR. 2006. Entrepreneurial motivation. In *The Psychology of Entrepreneurship*, Baum JR, Frese M, Baron RA (eds). Erlbaum: Mahwah, NJ; 67–92.
- McMullen JS, Shepherd DA. 2006. Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Academy of Management Review* **3**: 132–152.
- Mischel W, Ayduk O. 2004. Willpower in a cognitive-affective processing system: the dynamics of delay of gratification. In *Handbook of Self-regulation: Research, Theory, and Applications*. Baumeister RF, Vohs KD (eds). Guilford: New York; 99–129.
- Mitchell JR, Smith JB, Gustafsson V, Davidsson P, Mitchell RK. 2005. Thinking about thinking about thinking: exploring how entrepreneurial metacognition affects entrepreneurial expertise. In *Frontiers of*

- Entrepreneurship Research*, Zahra S (ed). P&R Publications: Braintree, MA; 36.
- Mitchell RK. 1994. *The composition, classification, and creation of new venture formation expertise*. Unpublished Dissertation, University of Utah, Salt Lake City, UT.
- Mitchell RK, Busenitz L, Bird B, Gaglio CM, McMullen JS, Morse EA, Smith JB. 2007. The central question in entrepreneurial cognition research. *Entrepreneurship Theory and Practice* **31**(1): 1–27.
- Mitchell T, Hopper H, Daniels D, George-Falvy J, James LR. 1994. Predicting self-efficacy and performance during skill acquisition. *Journal of Applied Psychology* **79**: 506–507.
- Mount M, Barrick R. 1995. The big five personality dimensions: implications for research and practice in human resources management. In *Research in Personnel and Human Resources Management*, Rowland K, Ferris G (eds). JAI Press: Greenwich, CT; 153–200.
- Myers DG. 2002. *Intuition: Its Powers and Perils*. Yale University Press: New Haven, CT. PJ (eds). Cambridge University Press: New York; 339–354.
- Salas E, Rosen MA, Burke C, Goodwin GF, Fiore SM. 2006. The making of a dream team: when expert teams do best. In *The Cambridge Handbook of Expertise and Expert Performance*, Ericsson KA, Charness N, Hoffman R, Feltovich PJ (eds). Cambridge University Press: New York; 439–457.
- Sarasvathy S. 2001. Causation and effectuation: toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review* **26**(2): 243–288.
- Shane S. 2003. *A General Theory of Entrepreneurship: The Individual-Opportunity Nexus Approach to Entrepreneurship*. Edward Elgar: Cheltenham, U.K.
- Shane S, Locke EA, Collins CJ. 2003. Entrepreneurial motivation. *Human Resource Management Review* **13**(2): 257–279.
- Shepherd DA, Zacharakis A, Baron RA. 2003. Venture capitalists' decision policies: evidence suggesting more experience may not always be better. *Journal of Business Venturing* **14**: 381–401.
- Simon HA, Chase WG. 1973. Skill in chess. *American Scientist* **61**: 394–403.
- Sonnentag S, Kleine BM. 2000. Deliberate practice at work: a study with insurance agents. *Journal of Occupational and Organizational Psychology* **73**: 87–102.
- Starkes JL, Deakin J, Allard, Hodges NJ, Hayes A. 2006. Deliberate practice in sports: what is it anyway? In *The Cambridge Handbook of Expertise and Expert Performance*, Ericsson KA, Charness N, Hoffman R, Feltovich PJ (eds). Cambridge University Press: New York; 81–106.
- Tangney JP, Baumeister RF, Boone AL. 2004. High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality* **72**: 271–324.
- Tice DM, Baumeister RF, Shmueli D, Muraven M. 2007. Restoring the self: positive affect helps improve self-regulation following ego depletion. *Journal of Experimental Social Psychology* **43**: 379–384.
- Ucbasaran D, Westhead P, Wright M. 2009. The extent and nature of opportunity identification by experienced entrepreneurs. *Journal of Business Venturing* **24**: 99–115.
- Unger J, Keith, Hilling C, Gielnik MM, Frese M. Deliberate practice among South African small business owners: relationships with education, cognitive ability, knowledge, and success. *Journal of Occupational and Organizational Psychology*. Forthcoming.
- Wan EW, Sternthal B. 2008. Regulating the effects of depletion through monitoring. *Personality and Social Psychology Bulletin* **34**: 32–46.
- Winne PH. 1997. Experimenting to bootstrap self-regulated learning. *Journal of Educational Psychology* **89**: 397–410.
- Yates JF, Tschirhart MD. 2006. Decision-making expertise. In *The Cambridge Handbook of Expertise and Expert Performance*, Ericsson KA, Charness N, Hoffman R, Feltovich PJ (eds). Cambridge University Press: New York; 421–438.
- Zhao H, Seibert SE. 2006. The big five personality dimensions and entrepreneurial status: a meta-analytical review. *Journal of Applied Psychology* **91**: 29–271.
- Zhao H, Seibert SE, Hills GE. 2005. The mediating role of self-efficacy in the development of entrepreneurial intentions. *Journal of Applied Psychology* **90**: 1265–1272.
- Zimmerman BJ. 2006. Development and adaptation of expertise: the role of self-regulatory processes and beliefs. In *The Cambridge Handbook of Expertise and Expert Performance*, Ericsson KA, Charness N, Hoffman R, Feltovich PJ (eds). Cambridge University Press: New York; 705–722.