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Entrepreneurial expertise and the use of control

Nicholas Dew [a], Stuart Read [b,*], Saras D. Sarasvathy [c], Robert Wiltbank [b]

[a] Naval Postgraduate School, United States
[b] Willamette University Atkinson Graduate School of Management, United States
[c] Darden Graduate School of Business Administration, United States

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ABSTRACT

Significant evidence has accumulated describing the importance of expertise. As this knowledge is extended, it is critical to understand when expertise matters and how. We unpack expertise in entrepreneurial decision making by presenting 412 founder/entrepreneur subjects with a unique tool involving four scenarios so we can measure an element of theoretical relevance to expertise in the entrepreneurial domain, efficacy at applying control and prediction strategies to situations which vary in environmental predictability and controllability. Results show that entrepreneurial expertise yields significant decision-making improvements in the situational use of control strategies – those strategies conceptually associated with uncertain new ventures, products and markets.

1. Introduction

A role for entrepreneurial expertise has begun emerging through scholarly work integrating literature from cognitive psychology (Ericsson, 2006a; Glaser, 1984) with that of entrepreneurship (Mitchell, 1994; Dew et al., 2009). In this research, we seek to advance the conversation beyond the bromide that 'expertise matters' into questions of what matters about expertise – specifically what decision making task(s) do entrepreneurs become better at through the accumulation of expertise? Drawing on effectuation, posited as one logic of entrepreneurial expertise (Sarasvathy, 2001; Gabrielsson and Politis, 2011), we investigate the use of control-based strategies (Wiltbank et al., 2009) as a function of expertise and characteristics of the environment.

2. Literature

2.1. The study of expertise in psychology

The investigation of expert heuristics using modern approaches began in earnest about 40 years ago, focusing on understanding the nature of chess masters. One of the earliest expert studies (de Groot, 1946, 1978), found that contrary to received wisdom, expert chess players identify the best moves in their initial perception of the game rather than through

* Corresponding author.
E-mail addresses: ndew@nps.edu (N. Dew), sread@Willamette.edu (S. Read), sarasvathys@darden.edu (S.D. Sarasvathy), wiltbank@Willamette.edu (R. Wiltbank).

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detailed analysis and thought. In their study of expert chess players, Chase and Simon (1973) further concluded that intelligence alone had no correlation with expertise in chess. More complex factors accounted for differences in performance such as how players store information, perceive problems and generate solutions (Glaser, 1984). How these factors connect with outcomes is now better known within the psychology literature (Ericsson, 2006a) where a body of research reports that, via experience and deliberate practice in a domain, experts develop higher level skills and knowledge which are a visible artifact of a change in underlying cognitive systems, a change that leads to superior performance in a domain (Unger et al., 2009).

2.2. *What experts are good at, and why*

A primary outcome reported in the expertise literature is that experts display quicker and more accurate problem solving in their domain owing to superior decision-making skills and knowledge (Ericsson, 2006b). Expert decision-making skills and knowledge may manifest in several different ways, sometimes as declarative (factual) knowledge, but often in the form of expert scripts (highly developed, sequentially ordered knowledge: Mitchell et al. (2000)), heuristics (short-cut rules of thumb used in decision making: Dew et al. (2009)) and pattern recognition capabilities (Gobet and Simon, 1996). Based on extensive research on chess experts, Gobet and Simon argue that pattern recognition is a generalizable capability at the root of expertise. Pattern recognition provides individuals with prototype frameworks that represent typical members of a category and serve as templates for comparing against perceived phenomena. This allows for rapid sense making and problem solving (Klein, 2009). As individuals accumulate expertise, their prototypes become better developed in terms of clarity, richness of content and sharper focus on key attributes (Baron and Ensley, 2006). Klein (2009) argues that experts look at a situation, recognize what to do, and typically make decisions based on their first judgment of the circumstances. For highly expert individuals, this can be very fast. Under “blitz” conditions (5 min games) chess experts have to rely heavily on recognition processes, yet they solve one third to half of all moves within 10 seconds (Campitelli and Gobet, 2004). This highlights that experts very quickly search for good alternatives based on their experience, typically testing them in a flash using mental simulation (rather than consciously deliberating over and simultaneously comparing several alternatives) (Gobet and Simon, 1996).

2.3. *The limits of expertise, and the reasons thereof*

Of course the scope of expertise to generate superior performance has limits. Researchers learned quickly that expertise is highly domain-specific (Ericsson and Smith, 1991) and that experience is a necessary but not sufficient condition for the accumulation of expertise. The repeatability of specialist tasks and the availability of unambiguous feedback are both crucial to the development of reliable expertise because these allow individuals to deliberately practice (Ericsson et al., 1993). Deliberate practice involves effortful, individualized, self-regulated activities with feedback aimed at improving performance. Work by Tetlock (2005) highlights the inapplicability of expertise to one important domain: prediction. Tetlock studied 284 expert forecasters of world political and economic trends between 1988 and 1992. His results showed expert predictions only slightly better than chance. Furthermore, he found that experts did not predict any better in their specialty than in domains unfamiliar to them. Worse still, they refused to update their beliefs when shown contrary evidence, indicating a lack of adaptation. Tetlock's studies illustrate that expertise is difficult to develop when: (i) problems are unique and unrepeatable; (ii) past data aren't necessarily relevant; (iii) probabilities change; (iv) the relative importance of variables changes; (v) new variables of relevance may appear (Black swans); (vi) other humans act strategically and creatively to thwart predictions; and (vii) feedback is imprecise. In short, the very nature of political and economic trends mitigate against the effectiveness of deliberate practice and learning to develop expertise in prediction in this domain.

2.4. *The specific content of entrepreneurial expertise: situational application of control*

The limits of expertise in the domain of prediction are highly germane to debates among scholars regarding the domain of entrepreneurial expertise. Some researchers have argued and presented data indicating that aspects of entrepreneurship can be mastered to an expert level (Unger et al., 2009) whereas others have made the opposite case that learning in the entrepreneurship domain is too difficult to generate expertise, and that instead entrepreneurship is largely a matter of innate talent or luck (Frankish et al., 2012). Effectuation research offers the insight that one aspect of entrepreneurial expertise lies precisely in recognizing the innate unpredictability of the environment and adapting one's decision making heuristics to that situation (Gustafsson, 2006; Dew et al., 2009; Read et al., 2009; Wiltbank et al., 2009; Chandler et al., 2010; Brettel et al., 2011; Mauer et al., 2011; Fischer and Reuber, 2011). Wiltbank et al. (2006) develop this insight into a framework that suggests analyzing situations along the dimensions of predictive and non-predictive control and Wiltbank et al. (2009) provide early evidence of the usefulness of this framework in private equity decision making. This framework provides a basis for examining differences between novice and expert approaches. Wiltbank et al. (2006) argue that the entrepreneurial (transformative) quadrant has been least explored in extant research compared with adaptation, planning and visionary approaches, yet it is precisely this space that characterizes new ventures (McMullen and Shepherd, 2006:133). Since they are highly practiced in this domain, expert entrepreneurs should develop appropriate decision making heuristics in this space.

Research on pattern recognition as one aspect of expertise raises the possibility of also testing whether expert entrepreneurs are more responsive than novices to contextual cues. We define responsiveness as the extent or magnitude of change in one's strategic approach in different contexts. We expect heightened responsiveness from expert entrepreneurs for two reasons. First, expert entrepreneurs draw on more lucid prototypes to evaluate and discriminate between different situations with less ambiguity than novices (Schunn et al., 2005). Second, expert subjects have more exposure to feedback and post-hoc analysis of results from decisions and therefore develop stronger patterns of association between situations and appropriate responses (Gustafsson, 2006; Gobet and Simon, 1996). We expect the cognitive patterns of expert subjects to provide a stronger basis for adjusting decision making approach to different contexts. Novices do not benefit from an extensive acquired store of patterns and appropriate responses, and consequently may be less adept at the metacognitive task of 'switching cognitive gears' in response to the demands of different contexts (Haynie et al., 2010; Louis and Sutton, 1991). Therefore we propose:

Central Proposition: Expert entrepreneur subjects will outperform novices in responding to scenarios within their specific domain of expertise (non-predictive control).

3. Method

3.1. Data and sample

We test our central proposition using a sample of new venture founder-CEOs from two large entrepreneur networks. Interested in how entrepreneurs make decisions, we approached these networks and invited all 1,120 members to participate. Using standard practices for contacting subjects, following up and designing survey data collection (Dillman, 2000), we obtained responses from 412 entrepreneurs, representing a 37% response rate. The advantage of such a sampling strategy is that it provides sufficient population diversity so we can compare subsamples within our population that differ only on expertise, our dimension of interest, without having to compare two different samples which might vary on other dimensions than that of our research question.

Scholars who study expertise from the psychology perspective argue for a threshold that defines expertise. While there is variation across different forms of expertise, that threshold can be generally summarized by describing experts as having conducted at least 10,000 hours of deliberate practice within a specific domain (Ericsson, 2006b). Within our 412 respondents, we sought to cleanly identify individuals with only entrepreneurial expertise, novices, and a control sample of individuals with only corporate expertise. We first set aside 51 individuals who met the criteria of having both entrepreneurial expertise (at least 10 years of experience within the domain, or having been involved with more than 2 new ventures or both) and corporate expertise (at least 10 years of experience within the domain). Next we coded a second group as reporting experience data that could not conclusively be classified into either or both categories of expertise, or as novices (155 individuals)[1]. The remaining subset we distinctly classified as expert entrepreneurs (at least 10 years of experience within the domain, and/or involvement with more than 2 new ventures), novices (less than 10 years' experience in either the entrepreneurial or corporate domains, and had worked with two or fewer ventures), and our control group of corporate experts (at least 10 years' experience within their domain of large organizations).

Expert entrepreneurs had more than 10 years (average 16.83 years) of the domain-specific experience that provides the necessary conditions for deliberate practice. And the 65 individuals who met that specific criteria demonstrated superior performance: 100% had started their own ventures (2.52 on average), only 28% of those ventures had failed, and at the time of our data collection, more than half of the ventures in the expert sample had generated more than $1 million in sales. In contrast, the 63 novice respondents averaged only 2.33 years' experience in a startup and 2.42 years' experience in large organizations. Our control sample of individuals with corporate expertise was equally distinct. The 78 respondents that cleanly met this criteria averaged 17.85 years of experience in large organizations and only 1.83 years in startups. As prior theory leads us to expect wide decision-making variance along the journey of expertise acquisition and that expertise is domain-specific (Read and Sarasvathy, 2005), we operationalize expertise for this investigation by contrasting expert (entrepreneur and corporate) and novice subjects within our sample, though in a posthoc test, we compare those results with the 51 individuals that meet the criteria for both corporate and entrepreneurial expertise.

A unique scenario-based survey, validated in prior published work (Wiltbank et al., 2009), formed the basis for our data collection. This survey was developed through four iterations of discussions and pilot testing with more than 200 entrepreneurs and angel investors. It was then used in large-scale data collection across the United States. The instrument walks respondents through a set of questions designed to evaluate their strategic approach to decision making in each of four different venture scenarios, employing a design similar to Baum et al. (2003) and Fredrickson and Mitchell (1984). Each scenario briefly describes an opportunity and situation and presents a set of questions characterizing what the subject would do next to develop that opportunity. Each scenario is followed by the same 7 questions, with 2 response items per

[1] Generally, responses that could not be classified were characterized by individuals who reported a birth year that indicated that they had been somewhere in the workforce for more than 10 years, but did not supply sufficient detail on that experience to classify it as either entrepreneurial or corporate.

question where respondents rated their agreement or disagreement on a 7-point Likert scale. We created scenarios consistent with the dimensions of prediction and non-predictive control (henceforth we will use prediction and control for simplicity), which permitted us to separately measure the use of prediction and control in the respondents' strategic approach (Wiltbank et al., 2006) to each unique scenario.

Special attention was paid to make each item a viable and attractive alternative. Both confirmatory and exploratory factor analysis show the responses worked together statistically: Items loaded cleanly on separate constructs, with prediction and control items resulting in Cronbach's Alpha scores of 0.67 and 0.71, respectively, across the scenarios. In addition, we evaluated the manipulation in the scenarios directly, in order to verify that our design of the scenarios effectively articulates predictability and controllability in the eyes of the respondent. Pilot respondents consistently and significantly scored each combination of prediction and control correctly. That is, the transformative scenario was perceived to be very unpredictable and open to direct influence by the strategy maker, and the adaptive scenario was scored systematically lower on both of those dimensions, while the planning scenario was perceived to be relatively predictable but much less open to direct influence by the strategy maker to drive the situation in their direction. Appendix A details each scenario used in the data collection instrument and Appendix B details the questions which accompany each scenario.

3.2. Dependent variables

The dependent variables measure the use of prediction and control in the respondents' strategic approach relative to manipulations designed into the scenarios. We first compute a control score and a prediction score for each respondent for each scenario, averaging the control or prediction items for that scenario. The raw dependent variable data for each respondent is composed of eight differences, reflecting strategy choices against the design manipulation differences across scenarios:

Control
(Scenario 1 control strategy score) – (Scenario 2 control strategy score)
(Scenario 1 control strategy score) – (Scenario 3 control strategy score)
(Scenario 4 control strategy score) – (Scenario 2 control strategy score)
(Scenario 4 control strategy score) – (Scenario 3 control strategy score)
Prediction
(Scenario 2 prediction strategy score) – (Scenario 1 prediction strategy score)
(Scenario 2 prediction strategy score) – (Scenario 3 prediction strategy score)
(Scenario 4 prediction strategy score) – (Scenario 1 prediction strategy score)
(Scenario 4 prediction strategy score) – (Scenario 3 prediction strategy score)

We then computed six (three pairs of) dependent variables. The first pair (termed Score in the analyses) is a simple sum of all the control scores for an individual, and the simple sum of all the prediction scores for an individual. Then, to examine detail within those sums, we computed two additional pairs of dependent variables. The first pair (termed Matches in the analyses) which reflects the sum of matched responses, is an average of all the positive values within an individual's control scores or prediction scores. The second (termed Misses in the analyses) which reflects the sum of missed responses, is an average of all the negative values within an individual's control scores or prediction scores.

3.3. expertise control group

Our primary independent variable is expertise, operationalized against the criteria established from prior study into the phenomenon (Ericsson and Simon, 1993). In order to test whether our results are a function of business expertise in general

Table 1
Expert and novice scores, matches and misses.

		Entrepreneur	Novice	Corporate			
Age and expertise	Year Born	1966	1977	1963	$F=93.3$	$p<0.001$	Expert entre-preneurs, novices and expert corporates significantly different
	Ventures	2.52	0.9	0.6	$F=40.6$	$p<0.001$	
	Years in large firm	1.9	2.9	17.8	$F=88.1$	$p<0.001$	
	Years in small firm	16.8	2.2	1.8	$F=236.4$	$p<0.001$	
Control Analyses	Score	2.81	2.19	2.44	$F=3.3$	$p=0.038$	Significant difference attributable to strategy/ scenario mis-matching
	Matches	0.81	0.76	0.88	$F=0.4$	$p=0.721$	
	Misses	-0.50	−0.91	−0.58	$F=5.8$	$p=0.004$	
Prediction Analyses	Score	2.76	2.57	2.83	$F=0.6$	$p=0.562$	No difference in prediction
	Matches	0.95	1.26	1.08	$F=1.3$	$p=0.271$	
	Misses	-0.57	−0.63	−0.69	$F=0.3$	$p=0.708$	

*Reported values are the means for each variable for each group.

or of entrepreneurial expertise in specific, we contrast scores for novices, expert entrepreneurs and individuals with expertise in corporate settings.

4. Results

4.1. Main effect of the use of prediction and control strategies

Table 1 shows the results for overall control and prediction scores as well as match and breakouts, by expert entrepreneur, novice and expert corporate categories. *T*-test comparisons show that expert entrepreneurs significantly outperform novices and expert corporate individuals in their use of control strategies, but not prediction strategies. Examination of matches versus misses indicates that the bulk of the variance in this finding is due to expert corporates and novices who try more aggressively than expert entrepreneurs to use control when the situation is more predictable.

4.2. Validation tests

We validated our results by gradually relaxing the threshold for expertise, enabling us to re-classify some of the 155 individuals we initially set aside as unclassifiable, into one of our three categories. While this validation test violates the clear expertise threshold of 10 years' domain experience (and in our case, more than 2 ventures to be an expert entrepreneur) from the psychology literature (Ericsson 2006a), the test offered a robustness check that our results were not specific to our particular cutoff. The results above are robust down to an 8 year cut off of entrepreneurial experience,with an average of just under 2 ventures started.

4.3. Posthoc test with individuals that have both forms of expertise

While we have no theoretical expectation about the interaction of different domains of expertise, the richness of our dataset provided a subsample of individuals who met both the criteria of expert entrepreneurs and of experts in large firms ($N=45$). We ran a posthoc test comparing all four groups. The significance in our results was unchanged. All four groups are significantly different on only control score, and control misses. In those comparisons, the subset with both entrepreneurial and corporate expertise scored closest to their peers with only corporate expertise on the overall control score (expert corporate: 2.44; expert in both: 2.40), while individuals with expertise in both underperformed all but the novices in misses (expert entrepreneur: −0.50; novice: −0.91; expert corporate: −0.58; expert in both: −0.76) (Table 2).

On a purely speculative note, we infer that the proximity of the results for individuals with both forms of expertise to the results of those with only corporate expertise suggests that corporate expertise may be stronger or more dominant – that once corporate expertise is learned, it is hard to be flexible enough to swap strategies or employ expertise generated in other domains. We mark this open observation for future research.

5. Discussion

Our results add to a growing literature in entrepreneurship on the relationship between expertise and decision making, identifying a clear divergence between expert and novice entrepreneurs in their matching and responsiveness of control strategy to situation. We thus help identify when the content of entrepreneurial expertise matters, which is in less predictable situations. Upon reflection on prior literature, these results are not surprising. One root of performance differences between experts and novices is pattern recognition capability; indeed this is one of the most generalizable findings in the literature (Gobet and Simon, 1996). Our entrepreneurial subjects share this similarity with the chess masters in Simon's (many) studies and the firefighters, marines or store detectives studied by Klein (2009). They rely on patterns to size-up the situation, which they rapidly categorize: either this a risky fire or one that will be quickly extinguished; this is just a rowdy crowd or the prelude to an ambush; either you are a genuine shopper or a likely shoplifter. With many years of experience, experts recognize the situation and just know how to respond. Unsurprisingly then, our experts were more likely to detect a highly unpredictable situation and, when they did, they made bigger changes in the appropriate direction than novices did. Our experts moved more decisively to actions that suited the pattern they recognized since they know from years of

Table 2
Control analyses including individuals with both corporate and entepreneurial expertise.

		Entrepreneur	Novice	Corporate	Both Corporate and Entrepreneurial
Control Analyses	Score	2.81	2.19	2.44	2.40
	Matches	0.81	0.76	0.88	0.78
	Misses	−0.50	−0.91	−0.58	−0.76

experience which actions are more likely to work well.

Our results also help highlight important limits on entrepreneurial expertise. It is highly unlikely that entrepreneurial expertise involves skill in the domain of prediction or having "correct" expectations. Success itself is not a sufficient signal of expertise, since predicting the next big thing may be a signal of poor, rather than expert judgment (Denrell and Fang, 2010). Instead, our study highlights that more expert entrepreneurs are likely to switch cognitive gears when they perceive a highly uncertain situation and favor choices that rely less (not more) on prediction. Thus their experience with uncertainty makes them experts in non-predictive approaches that are better able to withstand unpredictability and instead may capitalize on it (Sarasvathy, 2001). Such results significantly differ from classic decision theory but have many precedents in behavioral research. For example, when Shapira (1995) studied hundreds of senior executives' attitudes towards risk-taking he also found they had little use for the predictive probabilities and calculations embedded in normative decision theory. This may explain why senior executives tend not to listen to decision researchers (Klein, 2009: 245).

It is fifteen years since Mitchell et al. (2000:988) suggested researchers need to spell out the specific content of expert entrepreneurial knowledge and how to measure it. Our study proposes one specific aspect of that content. Many other domains remain to be investigated, such as crafting deals with stakeholders, persuasive storytelling and discovering and creating opportunities (Venkataramen et al., 2012). Recent work by Unger et al. (2009) found many entrepreneurial tasks for which deliberate practice had a significant impact on learning, knowledge development and firm performance. Researchers should study what additional domains may be important. Furthermore, acquiring a careful understanding of how to learn within each domain could also provide valuable input to future entrepreneurship pedagogy (Raposo and do Paço, 2011).

Appendix A. : Scenarios

*Each of the following four scenarios was presented to the respondents. The same questions, shown in Appendix B, were asked after each of the scenario descriptions.

Wearable computing (low prediction high control)

During your 12-year tenure as an engineer at a major computer manufacturer, you work on your own time to invent a computer device that recognizes and responds to eye movements. You imagine it might make a great alternative to the computer mouse. You can make it rest on the user's head much like headphones and set it up so that point-and-click navigation is accomplished with even the most minor head and eye movements. You are convinced that there is a huge potential for change in the way things are currently done. But when you attempt to interest your current company in licensing the idea from you, they are uninterested. There are no firms currently offering anything close to this, and you possess all the technical skills to create the product effectively and efficiently. You quit your job to further develop this idea.

Export business (high prediction low control)

There is a contingent of the Japanese population that has an ongoing taste for authentic Southwestern Barbeque sauce. Demand over the last several years has been consistent, competition is limited and your product is successful in the niche. One issue looms. Japan's sagging economy has caused the government there to take deliberately protectionist initiatives against imported consumer products. Unfortunately, your sauce is only designed and approved for sale abroad, and Japan represents all of your substantial revenue.

Small recording label (low prediction low control)

You have always loved music, so when you got an offer to join a small recording label as a producer, you were thrilled. you were able to put several exciting indie bands on the map, release a few CDs and then along came the internet and MP3s. in the face of thriving music file-swapping services, many major labels continue to offer CDs, and some endorse new market channels such as apple's iTunes that sell individual digital tracks for $1. some of the artists your label represents are excited about the potential for wide distribution and immediate release of new material on the internet. Others are nervous about the ability to make money. you are asked to lead the firm into the new digital landscape.

General Electric (high prediction high control)

You started as a district sales representative in an undesirable geography, but after steadily moving up through the organization for almost 20 years, you recently got promoted to president of 'Brown Box' consumer appliances at General Electric. You are responsible for three brands and nearly $750 MM in annual sales of refrigerators, washing machines, dryers and dishwashers. The industry is accurately calibrated and your group has refined a model projecting sales, market share, and margins. Your brands dominate the market, except in the specialty and ultra-low price segments. You are chartered with aggressively growing net income.

Appendix B. : Questions Accompanying Each Scenario

1. As you assemble information, you will:					
No	Somewhat	Yes			
1	2	3	4	5	Talk with people you know to enlist their support in making this become a reality.
1	2	3	4	5	Study expert predictions of where the market is "heading".
2. As you develop a marketing approach you will:					
1	2	3	4	5	Forecast which segments will be most valuable and focus on them.
1	2	3	4	5	Focus on customer segments you can reach through your existing relationships.
3. When you think about the uncertainty of the market, you move forward anyway because:					
1	2	3	4	5	Your expertise allows you to influence that uncertainty.
1	2	3	4	5	Your actions can create a future you value.
4. As you manage product development, you will measure success against:					
1	2	3	4	5	The performance of your competitor's products.
1	2	3	4	5	The vision that you and partner businesses create for the product.
5. Predictions of trends and demand in this market are:					
1	2	3	4	5	Useful to create forecasts of what your business might accomplish.
1	2	3	4	5	Misleading as they do not incorporate the impact of your firm.
6. In situations like this, it is important to base strategy on:					
1	2	3	4	5	Forecasts of customer demand.
1	2	3	4	5	What you are capable of.
7. As you learn about the expectations other people have for this industry, you:					
1	2	3	4	5	Discount their projections, as they have not accounted for the impact of your venture.
1	2	3	4	5	Form updated predictions of likely outcomes for the business.

References

Baum, J., Wally, R., Wally, S., 2003. Strategic decision speed and firm performance. Strateg. Manag. J. 24 (11), 1107.

Baron, R.A., Ensley, M.D., 2006. Opportunity recognition as the detection of meaningful patterns: evidence from comparisons of novice and experienced entrepreneurs. Manag. Sci. 52 (9), 1331–1344.

Brettel, M., Mauer, R., Engelen, A., Küpper, D., 2011. Corporate effectuation: entrepreneurial action and its impact on R&D project performance. J. Bus. Ventur. 27 (2), 167–184.

Campitelli, G., Gobet, F., 2004. Adaptive expert decision making: skilled chess players search more and deeper. ICGA J. 27, 210.

Chandler, G.N., DeTienne, D.R., McKelvie, A., Mumford, T.V., 2010. Causation and effectuation processes: a validation study. J. Bus. Ventur. 26, 375–390.

Chase, W.G., Simon, H.A., 1973. Perception in chess. Cogn. Psychol. 4 (1), 55–81.

de Groot, A., 1946, 1978. Thought and Choice in Chess. Mouton: The Hague.

Denrell, J., Fang, C., 2010. Predicting the next big thing: Success as a signal of poor judgment. Manag. Sci. 56 (10), 1653–1667.

Dew, N., Read, S., Sarasvathy, S.D., Wiltbank, R., 2009. Logical frames in entrepreneurial decision making: differences between experts and novices. J. Bus. Ventur. 24 (4), 287–309.

Dillman, D.A., 2000. Mail and Internet Survey: The Tailored Design Method, 2nd ed J. Wiley, New York.

Ericsson, K.A., Smith, J., 1991. In: Toward a general theory of expertise: Prospects and limitsCambridge University Press 347p!.

Ericsson, K.A., Krampe, R.T., Tesch-Römer, C., 1993. The role of deliberate practice in the acquisition of expert performance. Psychological review 100 (3), 363.

Ericsson, K.A., 2006a. An introduction to the Cambridge handbook of expertise and expert performance. In: Ericsson, K.A., Charness, N., Feltovich, P.J., Hoffman, R.R. (Eds.), The Cambridge Handbook of Expertise and Expert Performance, Cambridge University Press, Cambridge, UK, pp. 3–20.

Ericsson, K.A., 2006b. The influence of experience and deliberate practice on the development of superior expert performance. In: Ericsson, K.A., Charness, N., Feltovich, P.J., Hoffman, R.R. (Eds.), The Cambridge Handbook of Expertise and Expert Performance, Cambridge University Press, Cambridge, UK, pp. 683–703.

Ericsson, K.A., Simon, H.A., 1993. Protocol Analysis: Verbal Reports as Data. MIT Press, Cambridge, MA.

Fischer, E., Reuber, R., 2011. Social interaction via new social media: (how) can interactions on Twitter affect effectual thinking and behavior? J. Bus. Ventur. 26 (1), 1.

Frankish, J.S., Roberts, R.G., Coad, A., Spears, T.C., Storey, D.J., 2012. Do entrepreneurs really learn? Or do they just tell us that they do?. Ind. Corp. Change 22 (1), 73–106.

Fredrickson, J.W., Mitchell, T.R., 1984. Strategic decision processes: comprehensiveness and performance in an industry with an unstable environment. Acad. Manag. J. 27 (2), 399–423.

Gabrielsson, J., Politis, D., 2011. Motives and entrepreneurial decision-making: examining preferences for causal and effectual logics in the early stage of new ventures. Small Bus. Econ. 36 (3), 281–298.

Glaser, R., 1984. Education and thinking. Am. Psychol. 39, 93–104.

Gobet, F., Simon, H.A., 1996. The role of recognition processes and look-ahead search in time-constrained expert problem solving: Evidence from grand-master-level chess. Psychol. Sci. 7, 52–55.

Gustafsson, V., 2006. Entrepreneurial Decision-making: Individuals, Tasks and Cognitions. Edward Elgar, Cheltenham, UK.

Haynie, J.M., Shepherd, D., Mosakowski, E., Earley, P.C., 2010. A situated metacognitive model of the entrepreneurial mindset. J. Bus. Ventur. 25, 217–229.

Klein, G., 2009. Streetlights and Shadows: Searching for the Keys to Adaptive Decision Making. MIT Press.

Louis, M.R., Sutton, R.I., 1991. Switching cognitive gears: from habits of mind to active thinking. Hum. Relat. 44 (1), 55–76.

Mauer, R., Smit, W., Forster, W., York, J., 2011. Curry in a Hurry? New Firm Creation Acceleration by Nascent Entrepreneur Usage of Effectuation. RWTH Aachen University, Germany Working paper.

McMullen, J.S., Shepherd, D.A., 2006. Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. Acad. Manag. Rev. 31 (1), 132–152.

Mitchell, R.K., 1994. The Composition, Classification, and Creation of New Venture Formation Expertise. Management Department. University of Utah, United States.
Mitchell, R.K., Smith, B., Seawright, K.W., Morse, E.A., 2000. Cross-cultural cognitions and the venture creation decision. Acad. Manag. J. 43 (5), 974–993.
Raposo, M., do Paço, A., 2011. Special issue: entrepreneurship and education—links between education and entrepreneurial activity. Int. Entrep. Manag. J. 7 (2), 143–144.
Read, S., Dew, N., Sarasvathy, S.D., Song, M., Wiltbank, R., 2009. Marketing under uncertainty: a knock at the door. J. Mark. 73 (3), 1–18.
Read, S., Sarasvathy, S.D., 2005. Knowing what to do and doing what you know: effectuation as a form of entrepreneurial expertise. J. Priv. Equity 9 (1), 45–62.
Sarasvathy, S., 2001. Causation and effectuation: toward a theoretical shift from economic inevitability to entrepreneurial contingency. Acad. Manag. Rev. 26 (2), 243–263.
Schunn, C.D., McGregor, M.U., Saner, L.D., 2005. Expertise in ill-defined problem-solving domains as effective strategy use. Mem. Cogn. 33 (8), 1377–1387.
Shapira, Z., 1995. Risk Taking: A Managerial Perspective. Russell Sage Foundation, United States.
Tetlock, P., 2005. Expert Political Judgment: How Good Is It? How Can We Know?. Princeton University Press, United States.
Unger, J.M., Keith, N., Hilling, C., Gielnik, M.M., Frese, M., 2009. Deliberate practice among South African small business owners: relationships with education, cognitive ability, knowledge, and success. J. Occup. Organ. Psychol. 82 (1), 21–44.
Venkataramen, S., Sarasvathy, S.D., Dew, N., Forster, W., 2012. Whiter the promise? Moving forward with entrepreneurship as a science of the artificial. Acad. Manag. Rev. 37 (1), 21–33.
Wiltbank, R., Dew, N., Sarasvathy, S.D., Read, S., 2006. What to do next? The case for non-predictive strategies. Strateg. Manag. J. 27 (10), 981–998.
Wiltbank, R., Read, S., Dew, N., Sarasvathy, S.D., 2009. Prediction and control under uncertainty: Strategy in new venture investing. J. Bus. Ventur. 24 (2), 116–133.