CHAPTER 4

Attention and Entrepreneurial Cognition

While there are numerous possible reasons explaining why managers of incumbent firms have trouble recognizing and responding to strategically important discontinuous change (e.g., economic incentives (Christensen 1997), rigid routines (Levinthal and March 1993), and/or poor competitive analysis systems (Zahra and Chaples 1993; McMullen et al. 2009)), scholars have recently begun focusing on the role managerial attention plays in this context (Eggers and Kaplan 2009; Kaplan 2008; Maula et al. 2013). Attention refers to a non-specific and limited cognitive resource that is required for mental activities and differs across individuals and tasks (Kahneman 1973). What environmental stimuli direct individuals' attention toward or away from entrepreneurial tasks? How are knowledge and attention related? How do entrepreneurial individuals allocate attention across different entrepreneurial tasks, such as opportunity exploitation or poorly performing entrepreneurial projects, and how do cognitive processes impact entrepreneurs' attention allocation? This chapter tries to answer these questions.

Transient Attention and Opportunity Identification

How managers allocate attention guides their engagement with the firm's external context to identify changes that represent entrepreneurial opportunities. These processes can be more top down or more bottom up. Thus far, the majority of research has utilized top-down processes to explore the

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association between the allocation of attention (Cho and Hambrick 2006; Ocasio 1997) and the ability to recognize and make sense of new opportunities (Eisenhardt and Schoonhoven 1990; Tripsas and Gavetti 2000). Researchers have given these top-down processes different names, but each of these different conceptualizations generally outlines a set of knowledge structures that managers draw on to engage with their environment to recognize, make sense of, and respond to signals from the environment (Bogner and Barr 2000)—namely, signals that indicate potential opportunities. A knowledge structure is "a kind of mental template that individuals impose on an information environment to give it form and meaning" (Walsh 1995: 281). Top managers utilize knowledge structures as a foundation from which they can build subjective representations of the environment that can be used to shape decisions (Dutton and Jackson 1987; Starbuck and Milliken 1988).

Knowledge structures focus managerial attention on potentially relevant features of their organization's environment (Kaplan and Tripsas 2008). Researchers have shown that such focused attention can trigger strategic persistence and improved performance when industries are changing at a slow pace (Nadkarni and Narayanan 2007). For example, consistent with these top-down explanations, Polaroid's failure to profit from the commitment it made early to digital imaging technology stems from its top managers' inability to utilize the most appropriate structure of knowledge for changes that had occurred in the organizational environment. Consequently, Polaroid ultimately ended up with "quite limited technical strength in this emerging market" (Tripsas and Gavetti 2000: 1157).

More recent work investigating bottom-up attention-allocation processes—where prominent features of the environment grab people's attention whether or not they are anticipated (Ocasio 2011)—provides an alternative or possibly complementary mode to top-down processes. Rindova et al. (2010) showed that sequences of action with the gestalt characteristics of grouping, simplicity, and motif were connected to better evaluations received from potential investors for ventures trying to adjust to a radical change. They contended that rather than knowledge structures concentration attention on situational features that are projected to be important, managers use gestalt properties to look for and understand patterns within situations characterized by discontinuous change (Whitson and Galinsky 2008). These managers make sense of events as they occur (Ariely and Carmon 2000; Ariely and Zauberman 2000). In a similar vein, my (Dean) colleagues and I (Shepherd et al. 2007) investigated how a big-picture depiction of the environment (a gist) activates a bottom-up

process. In this process striking environmental changes that would have gone unnoticed in top-down processing capture top managers' attention. Research like this provides an alternative explanation to top-down processes for clarifying how managers discern the unanticipated while questing the comparative performance of top-down versus bottom-up processes in how individuals notice, make sense of, and use information to form opportunity beliefs.

High Levels of Top-Down Attention Allocation and Recognizing Environmental Change

Individuals learn core concepts from their prior experiences, which then become part of their knowledge structures (Nadkarni and Narayanan 2007; Walsh 1995). Core concepts generate particular environmental expectations that then guide how managers allocate attention in a top-down manner. Top-down attention allocation allows managers to attain predictability, efficiency, and reliability by focusing attention on environmental features that they believe to yield possible opportunities. In addition, these managers do attend less to features that are not believed to be important (Nadkarni and Barr 2008). *Incremental environmental changes* refer to changes in consumer preferences, design elements, competitive dynamics, and institutions that are in line with the firm's present trajectory and require few modifications in how product components are combined and connected into a "big picture" (Henderson and Clark 1990). Since incremental environmental changes generally take place where and when they are anticipated to do so (Sirmon et al. 2007), individuals are likely to notice such changes when they allocate transient attention to them by top-down processing. For these managers, the complexity of their knowledge structures additionally improves their ability to detect incremental change as they draw on knowledge of their firm's current situation to allocate attention to environmental features they expect to be important.

While high top-down attention allocation enables managers to detect incremental change, it also prevents them from noticing discontinuous change (cf., Rosenkopf and Nerkar 2001; Tripsas and Gavetti 2000). *Discontinuous environmental changes* entail new formations of consumer preferences, design components, and/or competitive dynamics that do not match the firm's present trajectory and could thus potentially disturb the present situation and initiate a new course of action (compare Gatignon et al. 2002).

Work on perception in the psychology literature has shown that when individuals put great emphasis on their knowledge structures when they allocate their attention, they are less likely to detect unanticipated stimuli. This is true even when stimuli are very striking. In numerous experiments, for instance, scholars have shown that individuals assigned a particular task often do not perceive information not relevant to that specific task regardless of how conspicuous the information is (e.g., Neisser 1976). Yet, when individuals are told that the task at hand is only slightly important, they will attend to the prominent stimulus, while individuals who are told the task is highly important are less likely to do so. Apparently, when individuals believe a task is only slightly important, they are more likely to ease up on top-down processing and engage in more bottom-up processing, which frees their transient attention to capture signals of unanticipated environmental change. On the other hand, when individuals believe a task is highly important, they are more likely to direct their attention to where change is anticipated, thereby tying up transient attention such that they do not perceive signals of unanticipated environmental change.

Strategy researchers have dedicated a great deal of energy toward investigating how top-down processing decreases managers' ability to detect discontinuous change. For instance, the top managers of Liz Claiborne effectively used top-down attention-allocation processes to respond to changes that matched their prevalent knowledge structures (i.e., incremental changes). However, these processes also blinded him to discontinuous changes:

> Environmental changes had decreased the value of a part of Liz Claiborne's set of choices (in particular, those concerning production and distribution). Small, incremental changes—exploring the local neighborhood of the current position—no longer sufficed. At the same time, larger, systematic changes lay outside the mental maps of existing management. Different mental maps of the changed performance landscape were required to move Liz Claiborne to a new performance peak. (Siggelkow 2001: 853)

Low Levels of Top-Down Attention Allocation (More Bottom-Up Processing) and Recognizing Environmental Change

When top managers engage in bottom-up processing, they enable the environment to capture their attention. Specifically, attention capture refers to how aspects inherent in a particular situation draw attention to

themselves in case people do not search for them actively (Pashler et al. 2001). In their study on the Challenger disaster, Starbuck and Milliken (1988) highlighted how individuals are more likely to pay attention to novel information than information that is less novel. Similarly, Rindova et al. (2010) showed that the most prominent elements of a situation are also the elements that will most likely capture managers' attention seemingly due to the particularly distinct nature of the signals. Thus, by allowing environmental changes to grab their attention, decision makers are more open to possible surprises (Wyble et al. 2013). Since the most prominent features of a situation (either alone or in relation to other environmental features) are those most likely to capture managers' attention (Shepherd et al. 2007), bottom-up processing can help managers pay more attention to unexpected indicators of changes in their environment.

On the other hand, bottom-up processing can also cause prominent environmental features to arouse and attract managers' attention even when those features are only marginally related to the firm's technologies, products, and markets (see Franconeri et al. 2005; Franconeri and Simons 2003). Researchers have shown that prominent environmental changes sometimes take people down the wrong path (Kruglanski and Boyatzi 2012) and can disrupt cognitive processing (Frey and Eagly 1993). In addition, bottom-up processing lessens people's use of trial-and-error knowledge from their previous experiences. In this case, they might "reinvent the wheel" and repeat past mistakes, leading them to allocate attention to environmental features that have already been established as not being strategically crucial or not matching the organization's range of actions (Katila and Ahuja 2002; Levinthal and Rerup 2006).

Thus, compared to bottom-up attention allocation, a high top-down process enables managers to detect incremental changes. At the same time, it obstructs the detection of discontinuous changes. This idea is in line with Eggers and Kaplan's (2009) discovery that firms grow slower in a market that is radically new when managers focus on current technologies (high top-down attention allocation) as compared to focusing on emerging technologies (bottom-up attention allocation). Similarly, my (Dean) colleagues and I (Shepherd et al. 2017) recently proposed that top managers' likelihood of detecting incremental change is greater when their attentional processing is more top down compared to when it is more bottom up. However, their probability of detecting discontinuous change is greater for attentional processing that is more bottom up compared to attentional processing that is more top down.

Managers' Task Demands and Top-Down Attention Allocation

The necessity to reach a specific level of performance is called *task demands*. Task demands grow as individuals take on greater *task challenges* (Hambrick et al. 2005: 476), which frequently arise from inside the firm. For instance, "large firms with technologically interdependent units that are geographically far-flung, with complex matrix structures, require significant co-ordination and integration" (Hambrick et al. 2005: 476), which in turn generates numerous challenges requiring top managers' attention. The external environment can also contribute task challenges for an organization. Hostile external environments, for example, can cause a variety of managerial challenges that necessitate attention. These challenges include ensuring resource conservation, understanding threat characteristics, and developing successful strategies in a competitive marketplace (Miller and Friesen 1983). Additionally, more complex environments can also pose challenges as managers must take into account many fluctuating parameters and potential contingencies (Aldrich 1979; Eisenhardt 1989), including competitors' actions and responses (Hambrick et al. 1996; McMullen et al. 2009). The task challenges arising from both of these environments constitute conflicting demands for managers' information processing.

There is also heterogeneity in the performance demands that owners and stakeholders from different organizations place on top managers. For instance, an attentive board of directors is likely to implement high managerial task demands. More specifically, a board of directors monitors the performance of top management. With increasing attention of the board's members, there is an increasing need for top managers to defend strategic decisions and moves through proposals to the board (Castaner and Kavadis 2013). Indeed, the vigilance of a board tends to increase when there is a higher percentage of external directors (Lim 2015), the CEO does not chair the board (Finkelstein and D'Aveni 1994; Kesner and Johnson 1990), the CEO does not appoint board members (Zajac and Westphal 1994), and ownership is very concentrated (Castaner and Kavadis 2013). In addition, top decision makers' task demands tend to increase when they are facing activist shareholders (Walls et al. 2012).

Because top managers' attentional capability has its limits (Ocasio 1997; Simon 2013), high levels of demands for one task make it necessary that they dedicate more attention to detecting environmental signals

central to that task (e.g., collecting information regarding the efficiency of the firm). These types of tasks may compete for attention with the task of detecting signals of change in the external environment. In the face of competing multiple tasks and limited attention, managers will utilize their experience to determine how they should allocate their attention (Hambrick and Mason 1984). This experience may stem from their education (Carpenter 2002; Wiersema and Bantel 1992), functional backgrounds (Finkelstein and Hambrick 1990), and/or prior jobs (Beyer et al. 1997). As the demands that are competing between tasks—including the observation of the environment—increase, managers' attention is more likely to be divided (e.g., Han and Humphreys 2002; Rodriguez et al. 2002). They are likely to direct available transient attention toward central concepts of the task-related knowledge structure and away from concepts that are only peripheral. In turn, these peripheral concepts do not receive managers' transient attention, making it difficult for top managers to recognize changes in the environment that are novel or unfamiliar.

On the other hand, top managers with fewer task demands are less likely to depend on top-down attention-allocation processes. Such managers still focus on concepts that are at the core of their knowledge structures. However, these managers have higher levels of transient attention they can allocate to peripheral concepts and thus have a higher chance of noticing unanticipated environmental changes that signal opportunities. Based on this reasoning, my (Dean) colleagues and I (Shepherd et al. 2017) contended that higher levels of competing task demands cause decision makers to draw more heavily on top-down processing of attention to recognize changes in their environment.

Knowledge Structure Complexity and Recognizing Environmental Change

Unlike technology and market changes that are incremental and discontinuous (and thus consistent and inconsistent with a firm's current trajectory, respectively), architectural changes represent opportunities because they alter how product or service components are combined and connected to form a coherent whole (Henderson and Clark 1990). In the case of architectural changes, design features that are at the core and thus the primary components of the product are unaltered (Henderson

and Clark 1990). People frequently have more difficulties recognizing architectural changes than they have difficulties recognizing incremental changes because the former are concealed in the interactions and connections between components, thus leading to minimal observable surface change. To recognize architectural changes, individuals must have a complex knowledge structure (which entails connections that are rich and deep) that serves as the foundation for understanding the nature of such changes and how components are integrated and connected, although the components themselves are not modified. For instance, in the 1970s, Xerox—the plain-paper copiers pioneer—began seeing other firms pop up selling new copiers that were smaller in size and were more dependable than the existing products Xerox offered. Even though the new copiers did not incorporate significantly novel engineering or scientific knowledge, and although Xerox had come up with the core underlying technologies and had vast industry experience, the firm made mistakes and false starts for almost eight years before they had a viable product ready for entry (Henderson and Clark 1990).

Architectural modifications are frequently harder to detect since they are concealed in the exchanges and interconnections between components. Thus, managers need rich and deep knowledge structures. Nadkarni and Narayanan (2007) stressed that knowledge structures differ in *complexity*—namely, the scope and diversity of the concepts embedded in individuals' cognitive structures—*and* in the number, richness, and depth of these concepts' interconnections (Kiss and Barr 2015; Nadkarni and Narayanan 2007).[1] The complexity of knowledge structures may increase flexibility in strategic decision making (Nadkarni and Narayanan 2007) because it enhances managers' ability to detect more signals in their environment (Sutcliffe 1994; Walsh 1995). Therefore, managers who possess knowledge structures with greater complexity tend to be better at detecting incremental changes in the environment and then utilizing the knowledge they gain to make strategic decisions (Kiss and Barr 2015). Managers with knowledge structures that are more simple, on the other hand, not only have a smaller number of core concepts but also less rich and more shallow linkages between the concepts they possess, thus making them less able to detect architectural environmental changes. As such, my (Dean) colleagues and I (Shepherd et al. 2017) argued that managers' likelihood of detecting architectural change increases with the complexity of their knowledge structures.

Attention Toward Early-Stage Exploration and Opportunity Evaluation Speed

Decision speed is frequently conceived of as "how quickly organizations execute all aspects of the decision making process" (Forbes 2005: 355). High decision speed has been linked to exceptional performance (Bourgeois and Eisenhardt 1988; Bingham and Eisenhardt 2011; Eisenhardt 1989; for an exception, see Perlow et al. 2002). Managers who make quick decisions enable their firms to act on opportunities before they vanish (Baum and Wally 2003; Stevenson and Gumpert 1985). In addition, quick decisions associated with opportunity exploitation demonstrate to stakeholders that the firm is flexible and proactive (Langley 1995). Further, quick decision making improves organizational learning because it enables the firm to make more decisions in a limited period of time and therefore provides more experiences and a higher number of interactions that expose information that is salient for learning (Baum and Wally 2003; Eisenhardt 1989; Forbes 2005). Quick strategic decisions can also lead to a first-mover advantage (Lieberman and Montgomery 1988) or a set of transient advantages (McGrath 2013). Researchers have also shown that decision speed is particularly important as a response to environmental dynamism (Baum and Wally 2003; Eisenhardt and Martin 2000; Judge and Miller 1991). However, quick decisions in dynamic environments are rather difficult to make because dynamism makes it more difficult for firms to understand the market and then inform how to make decisions (Priem et al. 1995).[2] As such, a "central debate in the strategy, organization, and entrepreneurship literature surrounds how leaders effectively manage their organization and strategies in dynamic environments" (Eisenhardt et al. 2010: 1263).

Individuals may improve the speed of their decisions by using information that is real-time, developing and considering a greater number of alternatives, relying on intuition that is based on their experiences, and using techniques that actively resolve potential conflicts (Eisenhardt 1989). Moreover, the speed of making decisions increases when decision makers are younger (Forbes 2005), employ heuristics for opportunity recognition (Bingham and Eisenhardt 2011), utilize routines to guide their decision making (Helfat and Peteraf 2003), trust in their own intuition (Miller and Ireland 2005; Wally and Baum 1994), and rely on past experiences (Forbes 2005).

Extant studies thus shed light on how important it is to make decisions quickly to recognize transient opportunities and to achieve high firm performance. These studies have also explored the antecedents to organizations' decision speed. Yet, research in this area has generally considered the speed of a firm's decision making to be rather universal as opposed to being heterogeneous within a firm depending on the decisions at hand (e.g., Baum and Wally 2003; Eisenhardt 1989; Forbes 2005; Judge and Miller 1991). Therefore, this research stream does not yet provide a deep understanding of decision-making speed for different assessment decisions in the different stages of the opportunity progression process.

To begin to overcome this lack of understanding, my (Dean) colleague and I (Bakker and Shepherd 2017) explored the vital role of *attention* in this context (Ocasio 1997). As discussed earlier, when faced with large and complex option sets, individuals are unable to dedicate full attention to all matters simultaneously; rather, they are likely to focus their attention on a restricted set of issues (Lavie et al. 2010; Ocasio 2011). However, firms can develop methods to enhance their decision-making speed in areas of particular interest. My (Dean) colleague and I (Bakker and Shepherd 2017) built on Cho and Hambrick's (2006) notion of attentional orientation (which in turn drew on Ocasio's work on attention (1997, 2011)) to theorize on a firm's attention level toward specific opportunity-advancement stages. Attention ranged from higher attention levels focused on earlier-stage exploration activities and related assessment decisions to higher attention levels focused on later-stage exploitation activities and related assessment decisions. The study found that firms that focus their attention on earlier-stage exploration activities tend to confront different issues than firms that pay more attention to the exploitation of potential opportunities. Exploration focuses the attention of individuals on seeking something novel by constantly scanning the environment for indications of wealth-generating opportunities (Brown and Eisenhardt 1997; McGrath 1999). In contrast, exploitation focuses the attention of individuals on current opportunities and on the capabilities required to take advantage of them (Rothaermel and Deeds 2004). The degree of attention a manager focuses on specific opportunity-advancement stages affects the relative speed of decision making for a particular potential opportunity based on three characteristics: *experience* (Levitt and March 1988; Ocasio 1997), *standard operating procedures* (Cyert and March 1963; Gavetti et al. 2007; Ocasio 1997), and *confidence* (Levitt and March 1988; March and Shapira 1987).

Experience and Managers' Attention

Firms gain experience and learn by repeatedly executing certain tasks and activating routines (Levitt and March 1988). Because of differences in important activities, firms that focus more attention on earlier-stage exploration tend to have different experiences than those that focus their attention on later-stage development or exploitation. Early-stage exploration entails search, discovery, and experimentation; in contrast, exploitation entails refinement, implementation, and execution (March 1991). These domain-specific activities and the resulting experience are likely to affect decision-making speed. More specifically, managers with domain-specific experience will allocate less time collecting information; these managers already possess a strong knowledge base to draw from (Forbes 2005). Moreover, such managers are also likely to analyze information more quickly since they possess an organizing framework that "facilitates the storage, recall, and interpretation of data" (Forbes 2005: 358).

Standard Operating Procedures and Managers' Attention

Firms generally develop standard operating programs, practices, and routines over time (Cyert and March 1963; Gavetti et al. 2007), which can be viewed as a set of behavioral rules learned as the firm tries to adjust to operating conditions (Cyert and March 1963). Not only do we contend that different attentional orientations guide individuals toward diverse experiences, but we also argue these different orientations result in the development of different kinds of operating procedures. For example, practices and routines associated with prospecting deal with how to allot slack resources to explore possible opportunities (George 2005), how to normalize and learn from minor failures (Sitkin 1992), and how to effectively redistribute resources from one firm to another (Brown and Eisenhardt 1997). Routines and practices related to exploitation, on the other hand, entail the management of risk and preservation of strategic congruence (Greve 2007; March 1991), the refinement of current technologies and attainment of efficiency (Csaszar 2013; March 1991), and the ramping up of operations to reach economies of scale and scope (Lavie et al. 2010). As these examples illustrate, standard operating procedures influence and direct the decisions firms make (Cyert and March 1963) as well as affect their speed. These practices also enable the transmission of past learning, which can then be applied again in new situations

(Cyert and March 1963), and they can set rules for collecting, filtering, and processing information (Cyert and March 1963).

Confidence and Manager's Attention

Focusing attention on particular tasks not only helps individuals build domain-specific experience and create operating procedures that are standardized, it also improves managers' confidence—or the "the strength of belief in the goodness, accuracy, and appropriateness of one's judgments" (Budescu and Yu 2007: 154)—in that particular domain (Levitt and March 1988; March and Shapira 1987). When managers focus on earlier-stage exploration activities, they are more likely to engage in collecting, analyzing, and assessing information about prospecting ventures. In this context, knowledge that is specific to a domain and the arrangement of this knowledge will improve individuals' confidence as they make decisions in their knowledge domain (cf. Einhorn and Hogarth 1985). In turn, confidence helps managers overcome the anxiety that frequently arises in uncertain situations (Eisenhardt 1989; Eisenhardt and Martin 2000) and helps them "act quickly and decisively" (Judge and Miller 1991: 450; Baum and Wally 2003).

A particularly important exploration-related activity is *terminating unpromising projects and ventures at an early stage* (McGrath 1999). Due to the higher unpredictability of potential results, exploration in ventures at an early stage is intrinsically more uncertain and more likely to end in failure than exploration of ventures that are at a later stage (Gupta et al. 2006; McGrath 1999). Consequently, firms that focus their attention on earlier-stage exploration activities often have to decide whether to terminate a venture at an early stage. In turn, these firms generally gain experience handling these types of ventures and thus develop more standard operating procedures to detect faults and terminate ventures early on (McGrath 1999) compared to firms that focus their attention on later-stage exploration or exploitation. Moreover, firms focusing on earlier-stage exploration are likely to collect and process domain-specific information more quickly (Forbes 2005) and more confidently use that information (Judge and Miller 1991) to make decisions on a focal venture's ultimate fate. Thus, these traits and behaviors enhance the speed with which managers terminate ventures during the prospecting stage.

Venture progression during the prospecting stage necessitates heterogeneous experiences, standard operating procedures, and confidence.

Venture progression is dissimilar to venture termination in numerous ways. First, the decision to advance a venture centers less on constraining downside risk, but more on the realization of upside potential (Bowman and Hurry 1993; McGrath 1999). Advancing a venture from prospecting to developing requires one to invest in a previously recognized opportunity—an early decision to pursue one venture over others. Advancing a venture therefore represents a move toward opportunity exploitation (Choi et al. 2008; Choi and Shepherd 2004). In contrast to firms that allocate attention toward later-stage development and exploitation, firms that focus more attention on earlier-stage exploration activities tend to heed information indicating the venture's upside potential or have the experience, operating procedures, or confidence needed to quickly advance a venture. My (Dean) colleague and I (Bakker and Shepherd 2017) showed that in the prospecting stage (i.e., the earliest venture-development stage), a greater orientation toward earlier-stage exploration activities enhances the speed by which managers decide about termination, but it diminishes the speed by which they make decisions about venture progression. Thus, having an attentional orientation toward earlier opportunity-advancement stages enables firms to make certain, but not necessarily all, decisions more rapidly.

Attention to Poorly Performing Entrepreneurial Projects

Research has also explored how managers and team members of entrepreneurial projects attend to the poor performance of these projects and how this attention influences project termination.

Team Members' Attention and Project Termination

Along with our co-authors, we (Shepherd et al. 2014) shed light on the connection between the timing of project termination and learning from failure from the standpoint of individuals working on the project. These insights in turn have implications for the management of entrepreneurial firms. First, team members are able to decrease negative emotions after the failure of their project by adopting an engineering mindset. An engineering mindset directs more of the individuals' attention toward the criticality of a firm's overall engineering challenge than toward any specific project.

With an engineering mindset directing people's attention, the failure of their project results in minimal negative emotion. In addition, there are fewer barriers to rapidly redeploying (human and other) resources to a subsequent project. Yet, in case project team members perceive the transition to a new project to be delayed, they tend to develop negative emotions. Interestingly, those with an engineering mindset also tend to develop more negative emotions when a project (especially one that performs poorly) is *not* terminated than when it is terminated. An engineering mindset represents a cognitive script for creative problem-solving; this mindset stresses the importance of the engineering process in terms of undertaking challenging tasks that are critical to the organization over and above remaining committed to a particular project the organization no more deems important.

Second, delayed termination gives team members time to contemplate personal errors (i.e., slipups in a specific process, wrong calculations, etc.), issues related to the organization as a whole (i.e., management choices that resulted in failure, problems with coordination between departments, etc.), technical issues (i.e., engineering-related problems), and issues related to industry or markets (i.e., influence of institutions or the government on product development, the inclusion of customers, etc.). These types of reflections often serve as a foundation for lessons learned that can be verbalized and documented when there is enough time left—two steps required for the organization to learn from its experiences (see Zollo and Winter 2002). On the other hand, team members involved in quick termination of projects have minimal time to learn from their project failure experiences. This minimal time for learning is especially troubling in an organizational environment that rapidly redeploys resources because after a project is terminated, there is no time for team members' reflection, verbalization, or documentation of the lessons they learned from the experience. Additionally, even if team members can engage in reflection, they are unlikely to find time to exchange their thoughts with others, which will hinder learning at the level of the team, nor are they likely to document the lessons they have learned, which hinders learning of the organization overall. Thus, in organizations that rapidly redeploy resources after project termination, team members, teams, and even the organizations themselves typically do not learn from the failures they experience after it has occurred but rather before the event.

Finally, members of teams often harness the negative emotions they feel from their project's "creeping death" to initiate learning from failure.

When negative emotions are used in this way, they can be very supportive for learning because such emotions indicate to the team members that something is not right, that the organization does not find the project worthwhile anymore, and that individuals' reassignment to a more salient engineering challenge is being delayed. As they wait for redeployment, team members can direct the negative emotions arising from their unfilled need for a prominent engineering challenge toward a new challenge—specifically capturing the learnings from failure. By refocusing attention away from the delay, team members can learn from the failure experience. Thus, the negative emotions arising from creeping death enable rather than impede learning from failure.

Overall, the team members' perspective emphasizes people's reactions to project-termination timing and the effects of these reactions on learning from the failure of a project. Namely, when it comes to creeping death, the project team members are able to (1) lessen negative emotions arising from failure by stressing the key role of the engineering challenge instead of a particular project; (2) have time to contemplate, verbalize, and document the lessons they have learned (in the case of rapid deployment, this time is available before the actual termination event); and (3) redirect negative emotions stemming from creeping death to learning from the failure.

Managers' Attention and Project Termination

My (Holger) colleague and I (Behrens and Patzelt 2016) built on the attention-based view of the firm (Ocasio 1997) to study how managers terminate corporate entrepreneurship projects considering the properties of the portfolio, their attentional focus (reflected by managers' past project failure experience), situated attention (reflected by the firm's growth rate), and attention's structural distribution within the organization (reflected by managers' hierarchical positions). The study yielded several insights. First, managers differ in their allocation of attention to different aspects of the project portfolio, more specifically in the attention they allocate to a project's fit with the firm's portfolio strategy and the portfolio's balance of incremental versus radical projects. Therefore, the study highlights that understanding managerial attention allocation in project terminations requires consideration of interactions between portfolio characteristics and effects at the level of the firm, the individual, and the organization.

Second, managers' prior failure experience influences how they allocate attention in future decisions about project terminations—an impact that goes beyond their emotions and learning from failure (McGrath 1999; Shepherd et al. 2009, 2011, 2013, 2014). Specifically, more prior failure experiences accelerate how an entrepreneurial project's low strategic fit enhances the probability that a project is terminated. Therefore, prior failure experience has far-reaching consequences on a firm's future composition of the project portfolio and therefore strategic entrepreneurship. Moreover, the study highlights that prior failure experiences are cumulative in nature (Shepherd et al. 2013) such that more prior failures have a stronger impact on attention allocation than fewer prior failures.

Finally, the negative impact of a project's contribution to portfolio balance on the propensity of termination is stronger for top managers than for middle managers, illustrating the divergent thinking among managers at different organizational levels (Floyd and Wooldridge 1997; Hornsby et al. 2009; Kuratko et al. 2005). The finding also shows that managers' attention allocation is different for project start and termination. While middle managers allocate more attention to the project's strategic context for project start decisions compared to top managers (Behrens et al. 2014), for termination decision, middle managers attend less to strategic aspects (e.g., a project's strategic fit and portfolio balance) than top managers. Top managers seem to be more prone to resource investments in the start of new projects that are exploratory than in these projects' continuation.

Metacognition to Focus Entrepreneurs' Attention

Researchers have argued that "successful future strategists will exploit an entrepreneurial mindset . . . [namely,] the ability to rapidly sense, act, and mobilize, even under uncertain conditions" (Ireland et al. 2003: 963–989). Such a notion implies that the ability to both notice and adapt to uncertainty is a key skill of successful managers (McGrath and McMillan 2000; Ireland et al. 2003). When conceptualizing the notion of an *entrepreneurial mindset*, Ireland et al. (2003) described cognitive tasks, such as interpreting opportunities as goal change, continually reflecting on and challenging one's "dominant logic" in changing environments, and reconsidering "deceptively simple questions" about what one believes to be true in regard to markets and the firm. The cognitive tasks associated with an

entrepreneurial mindset embody what we more generally call *cognitive adaptability*. Cognitive adaptability refers to the degree to which people are dynamic, flexible, self-regulating (Jost et al. 1998), and *engaged* in developing numerous decision frameworks aimed at sensing and processing environmental changes and then choosing from those various alternatives to successfully understand, plan, and implement an array of personal, social, and organizational objectives in a shifting world. Here, decision frameworks refer to organized prior knowledge about individuals and situations that are formed to actively build a meaningful reality (Fiske and Taylor 1991).

Metacognition can be a process that engages these decision frameworks. According to Schraw and Dennison (1994: 460), metacognition is "the ability to reflect upon, understand, and control one's learning." More specifically, metacognition is a higher-order cognitive process that helps organize people's knowledge and what they recognize about themselves, situations, tasks, and environments to enable effective and *adaptable* cognitive functioning when faced with input from environments that are dynamic and complex (Brown and Eisenhardt 1997). Metacognition is often seen as a conscious process (also known as metacognitive awareness (Flavell 1979)) that occurs in social contexts (Jost et al. 1998). Allen and Armour-Thomas (1993: 204) argued that it is "meaningless to ask a question about any type of thinking without asking concomitant questions about contextual forces in which such thinking is situated" (Allen and Armour-Thomas 1993: 204).

Using metacognition research as a foundation and integrating it with relevant social cognition work (selectively reviewed below), my (Dean) colleague and I (Haynie and Shepherd 2009) proposed the notion of cognitive adaptability, which occurs when individuals perceive and then ascribe meaning to environmental features in relation to their own goal orientation and then utilize their metacognitive knowledge and experiences to develop several alternative decision frameworks aimed at interpreting, planning, and implementing objectives to "manage" an environment that is mutable. Individuals then choose and employ a particular framework from the multiple alternatives and end up with some result (i.e., cognitive [understanding and comprehension] and/or behavioral [action]). Individuals then evaluate these outcomes in relation to their goal orientation, which in turn informs ensuing decision-framework generation and selection (Haynie and Shepherd 2009; Haynie et al. 2012).

Goal Orientation

Motives affect how individuals perceive and interpret context (Griffin and Ross 1991), and context can also define individuals' motives (Wyer and Srull 1989). As such, we propose that this relationship is the foundation for the development and use of metacognitive strategies. For instance, in entrepreneurship, these motivations could be to increase one's share in a specific market, improve manufacturing productivity, or achieve higher sales. In other words, the goals managers pursue are often seen as a function—or as a result—of the environment those goals originated in. Therefore, we argue that the *origins* of cognitive adaptability stem from the combined effects of (1) the setting the individual functions within and (2) his or her motivations whereby the person interprets context. To capture this relationship between context and motivation, my (Dean) colleague and I (Haynie and Shepherd 2009) proposed the term goal orientation, which specifically refers to *the degree to which a person interprets environmental changes in relation to a broad array of personal, social, and organizational goals.* Goal orientation engages metacognitive knowledge and metacognitive experience as metacognitive resources.

Metacognitive Knowledge

Metacognitive knowledge is one's conscious understanding of cognitive processing in relation to (1) people, (2) tasks, and (3) strategy (Flavell 1979). First, metacognitive knowledge of *people* has both an external and internal focus. Externally focused metacognitive knowledge refers to understanding what other individuals, such as potential customers, competitors, and investors, think about their firms and environments. Internally focused metacognitive knowledge refers to understanding and acknowledging one's own biases, values, and intellectual strengths and weaknesses. For instance, a manager may know that he or she is better at sensing external stakeholders' needs than those of employees or other mid-level managers. Second, metacognitive knowledge of *tasks* relates to understanding the nature of a particular challenge as well as having knowledge of solutions to similar tasks that could be implemented for the task at hand. Lastly, metacognitive knowledge of *strategy* entails the procedures one uses to ensure that a particular decision framework is suitable in light of one's goal orientation and metacognitive knowledge of people and tasks. More specifically, metacognitive knowledge of strategy is the process of referencing

previously learned strategies for functionally similar tasks and altering those strategies for the task at hand. Thus, my (Dean) colleague and I (Haynie and Shepherd 2009) established an overall definition for metacognitive knowledge as the *degree to which an individual depends on what he or she already knows about people, tasks, and strategy when generating multiple decision frameworks aimed at interpreting, planning, and implementing goals to "manage" a changing environment.*

Metacognitive Experience

Metacognitive experience refers to experiences that are affective, are based on cognitive activity, and serve as a channel through which prior *experiences, memories, intuitions, and emotions* may be used as resources in the process of making sense of a specific task, problem, or situation (Flavell 1979). For instance, an individual has a metacognitive experience if he or she feels that a specific task is challenging to undertake or understand. In the next step, he or she draws on that prior experience to yield the creation of a new decision framework for a new but similar task. Like past experiences, emotions and intuitions related to prior situations can shape the generation of decision frameworks for novel tasks. As an example, emotions like fear, anger, joy, or grief or that are connected to an event in the past may serve to influence—at a metacognitive level—the development of future decision frameworks aimed at novel events, tasks, or situations similar to those from which the experienced emotions stemmed. Intuitions serve a similar function in the metacognitive creation of decision frameworks: if the individual tends to draw on intuitions resulting from prior experiences, those intuitions will likely influence the development of future decision frameworks aimed at new tasks, events, or situations. A manager, for instance, may draw a decision based on a "hunch," which reflects his or her reliance on intuition (Miller and Ireland 2005). In simple terms, metacognitive experiences enable people to make sense of their social world more easily (Earley and Ang 2003) and thus, together with metacognitive knowledge, help individuals choose a decision framework. Therefore, my (Dean) colleague and I (Haynie and Shepherd 2009: 697) referred to metacognitive knowledge as the *degree to which the individual depends on idiosyncratic experiences, emotions, and intuitions when generating multiple decision frameworks aimed at interpreting, planning, and implementing goals to "manage" a changing environment.*

Metacognitive Choice

Thus, individuals select and use a particular decision framework (chosen among the set of available alternatives) in the context of their goal orientation to plan and implement objectives to "manage" dynamic environments. This selection among numerous decision frameworks is similar to a golfer choosing a particular club based on his or her goals for a specific shot. Each club in the golfer's bag can be seen as an alternative path to action and goal realization—getting the ball to the green and into the hole. Yet, depending on the nature of the specific shot at hand (e.g., in a sand trap versus on the fairway), there is a "most suitable" club for that shot—namely, the club that will help the golfer realize his or her goal. An individual who is cognitively adaptable and draws on his or her metacognitive knowledge and experience generates various alternative decision frameworks as possibilities (different clubs) to interpret an altered reality and then chooses the most suitable option from that set of possibilities in light of his or her goals to most effectively reach that goal. Thus, my (Dean) colleague and I (Haynie and Shepherd 2009: 700) defined metacognitive choice as the *degree to which the individual engages in the active process of choosing the most suitable option among multiple decision frameworks that helps him or her best interpret, plan, and implement a response in order to "manage" a changing environment.*

Monitoring

Implementing the chosen decision framework will result in action that generates feedback to additional adaptive cognitions (Flavell 1979). According to Flavell (1979), the purpose of a metacognitive strategy is to feel confident that the goal has been accomplished. In line with Flavell's proposition, metacognition has mechanisms to evaluate the result of implementing a specific decision framework in relation to one's goal orientation, metacognitive knowledge, and metacognitive experience (Flavell 1979). Monitoring a person's own cognitions happens both during and after the process of interpreting, planning, and implementing a response to an altered reality. Depending on the particular characteristics of the association between current performance and a person's goal orientation, monitoring this relationship may prompt him or her to reassess their motivation (Locke et al. 1984; Locke and Latham 1990; Nelson and Narens 1994) and/or his or her metacognitive knowledge, metacognitive experience, and/or the particular decision framework chosen based on the setting at

hand (i.e., metacognitive choice). As such, monitoring refers to *looking for and utilizing feedback to reassess one's goal orientation, metacognitive knowledge, metacognitive experience, and metacognitive choice in order to "manage" a changing environment* (Haynie and Shepherd 2009: 700).

Learning to Think Metacognitively

Over the past decade, researchers have explored various instructional approaches that harness metacognition to improve reasoning (Kramarski et al. 2001). Mevarech and Kramarski (1997) created an instructional method to help students enhance their mathematical reasoning by developing their metacognitive skills through four types of questions based on (1) comprehension, (2) connection, (3) strategy, and (4) reflection (Mevarech and Kramarski 2003: 469). We refer to these questions as "metacognitive questions" as they are used to stimulate learners' metacognition.

First, *comprehension questions* are intended to encourage one to think about whether he or she really understands the nature of a particular problem before starting to address it. This understanding forms from carefully considering the situation such that one identifies a problem, its nature, and its implications. The following are examples of questions encouraging students to think about comprehension: What is the core of the problem? What is the key question asked? What meanings do the key concepts convey?

Second, *connection questions* are intended to encourage students to think about a particular problem in terms of its similarities and differences with problems he or she has faced and solved before. These questions urge students to draw on existing knowledge and experiences without generalizing from them too much. Questions like the following prompt learners to think about these connections: How can I relate this problem to problems I addressed previously? In what ways does this problem differ from those I worked on in the past, and how does it differ?

Third, *strategic questions* are intended to encourage students to think about which strategies are most suitable for solving a problem and why. These questions urge learners to contemplate the what, why, and how underlying their approach to a problem. The following are examples of strategic questions: What is the strategy/tactic/principle best suited for me to address this problem? Why is this strategy/tactic/principle so particularly appropriate? How can I put together information I need for solving the problem? How can I realize the plan?

Fourth, *reflection questions* are intended to encourage students to think about their understanding and feelings as they progress through the problem-solving process. These tasks help students generate their own feedback (i.e., develop a feedback loop in their solution process) to provide the chance to change. Examples of reflection questions include the following: What am I doing? It there any sense in what I am doing? Are there particular challenges I have to address? How do I feel about it? In what way can I verify the proposed solution to the problem? Is it possible to draw on a different approach to tackle this task?

Metacognitive training helps decision makers (1) develop and answer a set of self-addressed questions that are in line with those described above (Kramarski et al. 2002); (2) clarify why it is important to ask and answer these types of questions (Kramarski and Zeichner 2001); and (3) utilize these questions when contemplating or reflecting on new ideas (Kramarski et al. 2002), such as potential opportunities. A significant number of empirical studies have found that metacognitive skills (as represented by asking and answering the questions outlined above) enable learning (e.g., Kramarski and Zeichner 2001; Mevarech and Kramarski 2003). Overall, these questions prompt people to think about their learning, which can positively affect their subsequent task performance. For instance, metacognitive training improves individuals' (1) adaptability to new situations (i.e., it provides a foundation on which an individual's prior knowledge and experience influence his or her learning or problem-solving in a novel situation (Mayer and Wittrock 1996: 48)), (2) creativity (i.e., it can result in unique and flexible solutions, ideas, or perceptions (Runco and Chand 1995)), and (3) communication of the thinking underlying a specific response (Mevarech and Kramarski 2003). Each of these skills is very valuable for entrepreneurs.

Conclusion

Managers' attention is a limited resource, and where they allocate attention influences several aspects of the entrepreneurial process, including environmental changes and the recognition, evaluation, and exploitation of opportunities. Research has uncovered several factors at the individual, organizational, and environmental level that explain how entrepreneurs allocate attention. In this chapter, we illustrated that cognitive processes, particularly metacognition, impact individuals' attention allocation and thereby entrepreneurial outcomes. We now turn to the topic of entrepreneurial identity, which has attracted considerable scholarly interest over the last several years.

Notes

1. The different knowledge structure forms (e.g., categories, schemas, mental models, and logics) differ in complexity. For greater analytical and conceptual simplicity, we decided not to distinguish among the various knowledge structure forms but to instead characterize them based on complexity.
2. While environmental dynamism and velocity are different constructs, they are "closely related in practice" (Baum and Wally 2003: 1110).

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