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Collective Cognition: When Entrepreneurial Teams, Not Individuals, Make Decisions

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New venture success often depends on how the founding team collectively understands its world, estimates effects of possible actions, makes decisions, and allocates appropriate resources. Drawing on recent work in managerial cognition and entrepreneurship, this article argues for the importance of examining cognition at the team level. New venture strategy is used as a springboard to discuss collective cognition, although other important critical decision domains in new ventures may also be used to illustrate the arguments. In this and other such decision domains, collective cognition mediates between individual cognitions and firm actions and performance. A method for assessing entrepreneurial top management team cognition is developed and then tested in an exploratory study of technology-based new ventures. Two structural characteristics of collective cognition (differentiation and integration) are strongly related to firm performance, suggesting interesting opportunities for future entrepreneurship research in cognition.

Introduction

Gartner, Shaver, Gatewood, and Katz (1994, p. 6) observe that the field of entrepreneurship needs to account for the reality that “the entrepreneur in entrepreneurship is more likely to be plural,” and that “those individuals who might have a significant involvement in the venture” be included in theory development and research. On a practical level, academics who teach entrepreneurship often stress the importance of the team in the start-up process (Timmons, 1994), an emphasis that is also prominent in venture capitalists’ assessments of a new venture’s potential (Cyr, Johnson, & Welbourne, 2000; Zacharakis & Meyer, 1998). For these reasons, a growing body of research is examining the influence of the founding or top management team on a new venture’s survival and performance.

Research on founding teams often examines whether and how such teams understand the nature of the venture opportunity, spot new or emerging opportunities, and come to agreement on what to do. Other research on founding teams proposes frameworks linking the size and composition of the team to the presence of the different types of knowledge that will help the new venture succeed, and to the integration of perspectives among team members that will lead to consistency of actions in the marketplace (Eisenhardt &

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Schoonhoven, 1990; Ucbasaran, Lockett, Wright, & Westhead, 2003). The results indicate that the presence of idea and knowledge diversity within such teams contributes to team learning (Clarysse & Moray, 2004) and the venture's ability to acquire additional resources necessary for its growth (Brush, Greene, & Hart, 2001; Hayton & Zahra, 2005). Furthermore, members of these teams appear to differ behaviorally in their propensities for external networking (Neergaard, 2005); such networking serves to gather useful new information about markets and customers, making it more likely that the new venture will start up successfully (Grandi & Grimaldi, 2003). These and other studies support the premise that there are synergistic gains to be developed from a *team* of founders that enhances the potential of the new venture (Colombo & Grilli, 2005) through its collective efforts.

Although valuable and desirable, it appears that team synergy is not naturally occurring or effortless; research points to a significant tension that exists between the presence of multiple perspectives in a founding team and the development of a cohesive point of view across the team. On the one hand, founder team composition often results in a relatively homogeneous group that can limit the fresh perspectives and new ideas brought to the founding process (Ruef, Aldrich, & Carter, 2003). Thus, Boeker (1989) concludes that conditions at founding—including the size of the team and the extent to which a firm is owned by its founding managers—can imprint an initial strategy on the new venture that resists change, and can limit the range of options subsequently considered by the team. On the other hand, founding teams do not remain static over time. While departures from founding teams often reflect the difficulty teams have in coming to agreement when differing points of view are present (Ucbasaran et al., 2003), the addition of team members can inject novel experience and new understandings into the team's collective deliberations.

The tension between the propensity to surface new ideas in order to adapt the venture to changing circumstances and the inertia of the venture's initial direction also characterizes the thrust of much research on top management teams in new ventures after the founding event. This body of research often examines entrepreneurial firm performance based upon top management team characteristics that can affect team understanding and decisions (Busenitz et al., 2003), using dimensions such as previous experience (Eisenhardt & Schoonhoven, 1990), networking activity (West & Meyer, 1997) and entrepreneurial orientation (Covin & Slevin, 1991; Lumpkin & Dess, 1996), or based upon differences among team members such as consensus and conflict (Ensley, Pearson, & Amason, 2002; West & Meyer, 1998).

Thus, in many new ventures, the key decisions affecting the venture's ability to embrace present opportunity and to persist over time are made by a team, not by an individual. The tensions that exist in team deliberations—new possibilities versus existing direction, cohesion versus conflict—demonstrate that similarities and differences of opinion often exist among members of a founder team. These similarities and differences of opinion reflect similarities and differences in team members' underlying belief structures about the nature of emerging opportunities and about the relationship between present actions and sustainable performance in the marketplace.

While the founders and each top manager will have individual perspectives and cognitions about their new venture, it is a collective perspective or a collective knowledge structure at the team level that guides the direction of the venture. Collective cognition in new ventures is therefore an important domain to explore, and it is fundamentally different from individual cognition or from the aggregation of individual cognitions. There is a strong parallel between team-level collective perspective and cognition at the individual level of analysis. As a collective cause-effect understanding of the venture in the

marketplace, team-level perspective (like a schema) may facilitate or impede organizational alertness, intentions, transactions, and other dimensions important in successfully carrying out the work of the venture, or may instantiate scripts and other automatic behaviors. For this reason, we refer to the collective perspective as entrepreneurial team collective cognition (ETCC).

The attention to ETCC is uncommon in the field of entrepreneurship research. Previous entrepreneurship research has largely explored cognition at the individual level, for example, examining opportunity recognition (Gaglio, 2004; McMullen & Shepherd, 2003), fit with the entrepreneurship role (Markman & Baron, 2002), the propensity to start new ventures (Busenitz & Barney, 1997; Gatewood, Shaver, & Gartner, 1995; Shaver & Scott, 1991), biases and heuristics in individual decision making (Busenitz & Barney, 1997; Simon & Houghton, 2002), and individuals' decision policies (Shepherd & Zacharakis, 1997). While important in understanding the antecedents to individual entrepreneurial behavior, these studies shed no light on the nature, measurement, or impact of beliefs and representations at the team level of analysis, which is where decisions are made and actions are taken. Nor can a focus on individual cognition account for the cognitive variety or interpretations apparent at a team level. And the methodologies used to examine individual-level cognition have significant limitations when applied to teams.

A review of the founding team literature reveals that only two published studies have dealt with the cognitive characteristics of the collection of top managers who run new ventures. Shepherd and Krueger (2002) researched intentions and desirability with respect to engaging in corporate entrepreneurship, while Ensley and Pearce (2001) included a "shared cognition" variable in a study relating group process to new venture performance. The shared cognition variable used in this study served as an imperfect proxy for strategy content. It was based on a simplistic measure of variation across managers, a method which is problematic for capturing the richness of ideas and the variation among top managers (West & Meyer, 1998). Neither of these studies truly address what Weick and Roberts (1993) term the "collective mind," i.e., the comprehension of unfolding events by teams of interacting individuals. In addition, no research has examined the collective top management team cognitive *structure* of cause-effect knowledge that manifests itself in the kinds of decisions and outcomes associated with new venture strategy.

This article concentrates on collective cognition in entrepreneurial teams and its important structural characteristics. New venture strategy is used as a springboard to discuss collective cognition, although other important critical decision domains in new ventures (e.g., alliance partner selection, venture capital firm or underwriter selection, and manufacturing decisions) may also be used to illustrate the arguments. The focus on strategy is appropriate because strategy is essentially perspective, a cause-effect knowledge structure of the new venture's relationship with the environment in which it operates. Furthermore, strategy is collective because it involves the consideration of multiple issues by multiple top managers, and because critical decisions and practices result from that collective consideration. Strategy is thus an example of a decision domain of teams that invokes ETCC as a sociocognitive concept involving the simultaneous relations between different people and between different ideas. Two important structural properties of ETCC are identified (differentiation and integration) that parallel the dual strategic challenges confronted by new ventures, as noted earlier, of surfacing new ideas versus staying the course and of balancing cohesion versus conflict.

The next section briefly draws parallels between traditional individual level cognition and cognition at a team level of analysis. A brief review of other methods for examining cognitions reveals limitations when extended to the collective level. The use of sociocognitive grid analysis is proposed and described as an approach that overcomes such

limitations. An exploratory field study example is presented, and the results suggest interesting new directions for future cognition research in entrepreneurship.

Cognitive Parallels at the Team Level

New venture teams confront the same kinds of strategic decision dynamics that individual founders face. This is because the strategy issues facing teams “rarely present themselves as tidy, discrete bundles . . . and executives are not confronted with decisions so much as they create decision opportunities through their insight or ingenuity” (Hambrick, Finkelstein, & Mooney, 2005, p. 504).

Both venture teams and individual venture founders need information to make strategic decisions, so one would expect both to engage in the same information-seeking behavior in order to better define future direction and generate enhanced firm performance (West & Meyer, 1997). Both use the knowledge gleaned from information seeking to create mental models or schema, which organize beliefs and rules in ways that allow the entrepreneur to make sense out of an uncertain landscape (Busenitz & Lau, 1996) and help identify new commercial opportunities (Shane & Venkataraman, 2000). This mental model can guide attention to new information and emerging trends, invoke memory of other similar past events and conditions, and specify cause–effect and means–ends relationships in the physical and social worlds. It serves as a basis for making predictions and inferences about how to act, the likely probability of success, and how best to allocate resources (Busenitz & Lau, 1996; Gaglio & Katz, 2001), or in other words, what strategy to pursue and how to implement that strategy. This notion of interpretation system at the firm level parallels the enactment perspective at the individual level (Gartner, Carter, & Hills, 2003), through which new opportunities become a reality. Finally, venture teams are not immune from the problems caused by uncertainty, information overload, high novelty, time pressure, and strong emotions (Baron, 1998; Busenitz & Lau, 1996; Shaver & Scott, 1991) as also found with individual venture founders. So one would expect teams, like individuals, to rely on mental models or schema as a heuristic aid to interpretation and decision making.

Given the number of similarities, it is tempting to assume that, although a team does not think or cognize *per se*, the cognitive dynamics driving individual processes are immediately transferable to teams. In this view, the team is simply an aggregation of individual team member schema. However, Bougon (1992) rather convincingly demonstrates that a team perspective represents considerably more than the compilation of individual perspectives. He finds that while an aggregate cognitive map can be seen as the merger of ideas and concepts from a group of individuals, it really reflects the researchers’ assumptions about “similarity of meaning” and whether concepts “ought to have been linked”(Bougon 1992, p. 371). Congregate maps, on the other hand, include only the concepts and relationships that have relevance for *all* individuals in a team. Thus, each individual has his or her own cognitive map, but what actually informs and motivates the strategy of the team is the congregate or collective map (Cossette & Audet, 1992).

Cognitive Nature of New Venture Strategy

A variety of critical new venture team decisions can illustrate properties of collective cognition, but perhaps venture strategy is the most illustrative and most compelling

because of the significant body of work amassed over the years about the importance of strategy in entrepreneurial firms. These studies examine the usefulness of various strategic approaches (Feeser & Willard, 1990; McDougall & Robinson, 1990; Sandberg & Hofer, 1987) and the influence of industry structure (McDougall, Robinson, & DeNisi, 1992), as well as broader perspectives that describe the essential nature and characteristics of strategy in new ventures (Gartner, 1985; Slevin & Covin, 1995). Studies have also concluded that new ventures must often change strategically in order to achieve continued growth and success after the start-up (Moore, 1995). As the interface between the firm and the market, strategy thus takes on a central role in the growth and survival of new ventures.

Perspective

In order to delineate and examine the cognitive nature of new venture strategy, it is important to distinguish between strategy as *position* and strategy as *perspective* (Ginsberg, 1988; Mintzberg, 1987). Whereas position conceptualizes strategy as a location in a product/market domain, perspective conceptualizes strategy as “reflected in the integrated sets of ideas through which problems are spotted and interpreted and from which streams of decisions flow” (Ginsberg, 1988, p. 561). Perspective speaks to the sensemaking which new ventures make of their internal and external environments (Daft & Weick, 1984), as they seek to develop an understanding of new means–ends relationships for pursuing opportunities. A venture’s strategy—its recognition of opportunities, its decisions and resource allocations, its activities, and its performance—reflects perspective.

Perspective arises from the information seeking and knowledge structuring behaviors of entrepreneurs. Neoclassical economists do not allow the existence of entrepreneurs in an economic system, in large part, because informational asymmetries are assumed away in their economic models. Others argue that the fragmentation of knowledge in society (Hayek, 1945) enables entrepreneurs to accrue different stocks of experience-based knowledge, which leads to different abilities to recognize new opportunities (Shane, 2000). In addition, the idiosyncratic nature of information seeking and knowledge building behaviors enables entrepreneurs to define new opportunities where none had existed before (Gartner et al., 2003; West, 2003). Entrepreneurial insights thus depend on the development of cognitive structure that captures new information and creates meaning in novel ways.

Strategy as perspective explains why different strategies can emerge from ventures facing identical circumstances. The schema-like structure of team cognition will produce this result for a number of reasons. For example, differences in the team cognitive structure among two competing ventures may prompt one team to notice and attend to certain industry information while the other does not. In 1980, Celestial Seasonings discontinued a line of bottled juice beverages because the management team believed there was a relatively small market opportunity for those types of products. At the same time, the Snapple company, with substantially similar channels of distribution, viewed the market opportunity as significant. Celestial Seasonings increased to \$75 million in annual revenue by the early 1990s, while Snapple’s business skyrocketed to \$674 million during the same period. Although confronting the same market, the two firms noticed different information, made different inferential projections, and engaged in very different responses.

On the other hand, teams may receive identical new information, but will interpret that information in different ways reflecting either differences in attributes of the teams’ schemas or differences in relationships among attributes of the schemas. Despite possessing the exact same information about the business, different venture capital (VC)

firms had widely divergent views of the market potential for Vermeer Technologies, whose algorithms for webpage creation have since become an industry standard. The differing perceptions led some VC firms, but not others, to want to invest. The same type of perceptual differences also led Microsoft to consider acquiring Vermeer, while Netscape passed on the opportunity (Ferguson, 1999). Different responses, or even similar responses executed on different timetables, result from the fact that organizations interpret the same stimuli in a different fashion and then draw different conclusions about the proper direction and pace to take in the future. Strategic perspective thus plays an important mediating role between the competitive environment and strategic actions initiated by a new venture.

Multidimensional

Research on strategy in new ventures tends to emphasize competitive strategy concepts originating from industrial/organization economics. These include industry conditions that encourage or forestall new entry such as barriers to entry and industry rivalry dynamics (Dean, Meyer, & DeCastro, 1993), type of strategy such as pursuing a low-cost or differentiated approach (Shepherd & Shanley, 1999), speed of strategy such as first-mover or rapid-follower approach, and scope of strategy such as whether a new venture should be broad or narrow (Jelinek & Schoonhoven, 1990).

But strategy for new ventures is significantly more complex than the customary array of competitive strategy dimensions. This is true for two reasons. First, new venture strategy is significantly more fine grained in the short term than the traditional broad strategy ideas might suggest. Teams in new ventures are as concerned with the translation of overall direction to practical, day-to-day implementation as they are with direction itself. This involves tactical thinking and attention to a myriad of details and minutiae. Teams focus on building customer, supplier, and financial relationships, and in organizing operations carefully as they start up to be consistent with an overall strategic approach. To accomplish this, they seek to build a resource base that effectively translates strategy to action (Brush et al., 2001) while conferring sustainable advantage (Alvarez & Busenitz, 2001).

Second, strategy for new ventures involves constant evolution and change. The progression through organizational life cycle stages ensures that new strategic challenges continually confront new ventures (Kazanjian, 1988). At the same time, teams must learn how to refine their existing approach and also seek new opportunities for the future (Lumpkin & Lichtenstein, 2005). Thus, at any given time, top managers in new ventures must be considering an array of problems, opportunities, threats, changes, and other substantive strategic issues (Dutton & Jackson, 1987), an agenda that continues to evolve as the venture evolves.

Collective

Differences in perspective within top management teams may have a profound effect on a new venture's strategy and in changes to a venture's strategy. Hambrick and Mason (1984) propose that cognitive properties of top managers affect the extent to which strategic issues are identified within teams and the interpretation of those issues by team members. An empirical analysis by Markoczy and Goldberg (1995) of causal maps, which are constructed to depict individual cognitive structure (see methodology section), finds that significant variance exists among managers at the same level within

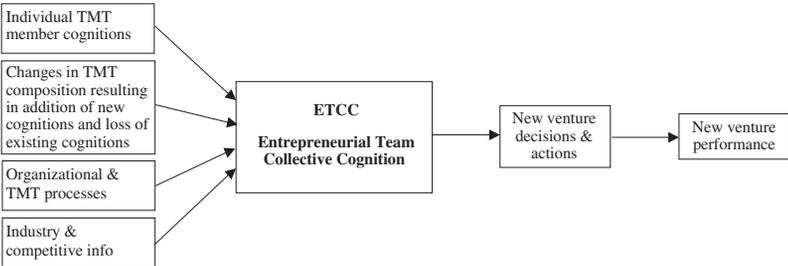
the same organization. Cognitive diversity, defined as differences in beliefs and preferences, is likewise found to exist among CEOs and members of their top management teams (Miller, Burke, & Glick, 1998). The result of such differences can affect the way an issue is interpreted or a problem is formulated. For example, in a study on team decision making based upon cognitive-based team composition, Volkema and Gorman (1998, p. 109) surmised that a problem “described or formulated in one way (e.g., as a personnel problem) when in fact another formulation is preferable (e.g., as a technology problem) is likely to obscure important dimensions of the problem and lead to an ineffective solution.” This study found support for an effect on performance of the interaction of cognitive team composition and problem formulation. The type of problem or issue that is identified can then affect organizational process that kicks in as a response, the method used or type of information gathered to inform the team further, and ultimately, the decisions made by the team. Team decisions, in turn, can affect the direction and performance of the venture. Team members might differ considerably in the way in which new information invokes memory or instantiates a schema, resulting in very different decisions and directions than if left up to an individual (Mohammed, Klimoski, & Rentsch, 2000).

However, in new ventures formed by teams decisions are not left up to the individual. Therefore, it is important to understand how the varying individual top manager perspectives about the range of strategic issues within a new venture translate into the new venture’s collective understanding of strategic issues and opportunities. Cognitive variance among top managers may result in a variety of competing or incompatible dominant logics within the same team (Ginsberg, 1989; Prahalad & Bettis, 1986). The collective level becomes especially important if a new venture is to be consistent and focused in its sets of activities, allocate limited resources without incurring waste, and be proactive to effectively meet the challenge of the changing circumstances it will continue to encounter. Although individuals regularly enter group settings with varying viewpoints, teams develop shared and idiosyncratic understandings (Eden, Jones, Sims, & Simthin, 1981; Mohammed & Ringseis, 2001) from which key decisions and actions flow. The collective perspective represents a bridge between individuals in a team and actions taken in respect of team decisions.

Because strategy is perspective, multidimensional, and collective, it is proposed that ETCC is a mediating variable between firm performance and both the environment and individual top managers (see Figure 1). In this view, ETCC is an antecedent to new venture performance because performance will be a byproduct of the cause–effect

Figure 1

Model of Entrepreneurial Collective Cognition



strategic understandings and actions embraced by the team. Antecedent to ETCC are not only the various individual cognitions of the founder and top management team members, but also other sources impacting collective perspective, such as the competitive external environment, the addition of new top managers to the team, and organizational process that serves to bring information and new perspectives to light at the team level.

The preceding discussion emphasizes that new venture strategy is a sociocognitive concept. It concerns itself with the social relations among top managers and with the cognitive relations of their individual, multidimensional perspectives about the competitive environment (Dunn & Ginsberg, 1986). This approach accounts for the set of individuals involved in strategic deliberations, as well as the set of strategy constructs that are in the “range of convenience” of these individuals. The sociocognitive frame of reference exhibits properties of communality and sociality, which provide a critical link between the content of individual and collective reference frames (Dunn & Ginsberg, 1986, p. 959). Thus, the collective perspective may provide evidence of a “dominant logic” used by the team.

Dimensions of Sociocognitive Structure

Properties of ETCC

Just as components of knowledge are believed to be organized in ways such as categories, schemas, and scripts at the individual level (Fiske & Taylor, 1991), the *organization* of cause–effect knowledge emanating from multiple individual perspectives to the team level has its own unique characteristics. Thus, the term “collective cognition” refers to the content of the combination of individual perspectives and the structural characteristics of that combination. Although content is mentioned briefly, this article focuses more on the structural dimensions of ETCC that specifically relate to entrepreneurial strategy and performance.

The content of ETCC refers to strategy constructs that guide the venture’s conduct and performance. These dimensions should reflect specific cause–effect understandings that top management teams collectively hold about the connections between new venture activity and new venture survival or performance. For example, the team managing a new venture in the PC software industry might collectively value “focused differentiation” (Porter, 1985) as a strategic rule that will produce superior performance. On the other hand, a team managing a new venture in the fragmented dry cleaning industry might collectively value “low cost” as a route to survival (Bhide, Rayzman, & Hackett, 1999). Or a new venture team may collectively embrace the strategy construct of “new product development” as a route to generate sales revenue growth in new markets (Wetlaufer, 1997).

The structure of ETCC will function for the team in much the same way as a structure of knowledge functions for an individual. An individual’s cognitive architecture for a particular domain will determine how new information is stored and evaluated, may bias interpretations and be used as a heuristic for decision making, and may contain stereotypes or scripts that precipitate automatic responses to received stimuli. Similarly, at the team level, the set of strategy constructs represents cause-and-effect knowledge about operating in the competitive environment, will serve to influence how new information is treated, may be resistant to change without significant unlearning, and like scripts or schemas would trigger a portfolio of organization actions.

Two structural dimensions of ETCC are particularly important: differentiation and integration of strategic perspectives in the top management team. Differentiation represents the extent to which each strategic construct is construed as different from every other strategic construct. It suggests what Ginsberg (1989) characterizes as the opposite of “frame uniformity.” Frame uniformity means that potentially viable strategic alternatives are not being identified or distinguished by top managers, whereas a deficit of uniform thinking connotes that top managers evaluate alternatives as being very different.

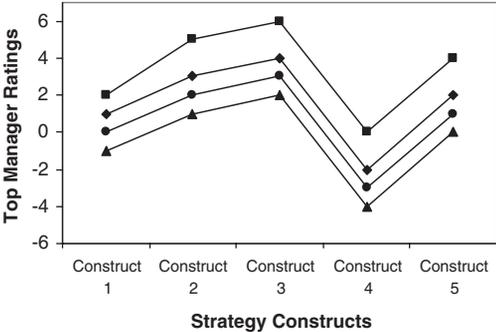
Integration represents the degree to which top managers think in a similar fashion about a set of strategy constructs. Integration within a new venture team suggests that members individually view both the relevance of strategic constructs and their relative importance in ways that are similar to other managers on their team. Ginsberg (1989) refers to this as sociocognitive integration, meaning that there is cognitive similarity across a social setting. In contrast, fragmented thinking among members of a new venture team would be evidenced by the use of different constructs by team members or by different levels of importance ascribed to a set of identified constructs.

Figure 2 graphically illustrates the dimensions of differentiation and integration. The data points in each box represent the hypothetical “ratings” of four top managers in a new venture on each of five important strategy constructs that have been identified. Reading up and down the chart in the top box, each strategy construct is rated at different levels from other constructs with construct 3 as the highest and construct 4 as the lowest. The wide

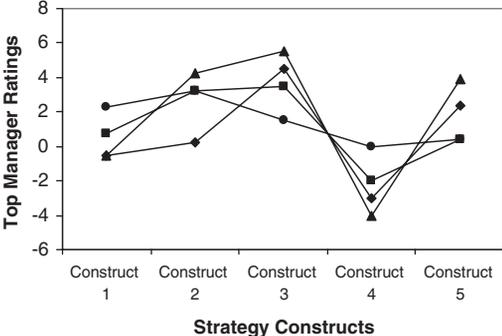
Figure 2

Illustration of Differentiation and Integration

Moderate differentiation, high integration:



Moderate differentiation, low integration:



range of ratings across the strategy constructs suggests that the top managers do effectively differentiate among the available strategy constructs. Reading across this same chart, it is apparent that the top managers are fairly uniform in their relative ratings of the five constructs, i.e., each manager tends to view the relationship among the set of constructs similarly. Collectively, therefore, they exhibit a fairly high level of integration. In the lower half of Figure 2, a different picture emerges. Here, the level of differentiation appears to be about the same as in the top chart. However, the top managers do not exhibit integration at the collective level since by reading across the same chart, it is apparent that the relative relationships among the set of constructs is not the same for each top manager.

Hypotheses

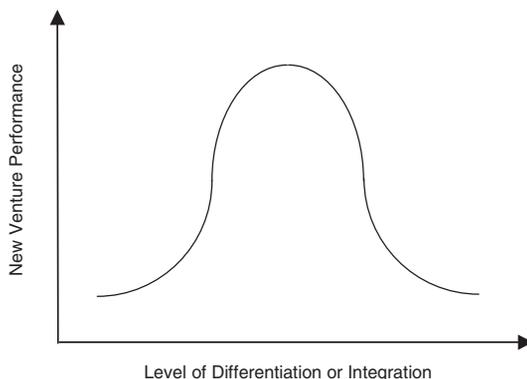
As described at the outset, strategy is a critical dimension in determining the success of new ventures. The presence of dynamic markets, evolving competitive threats, changing life cycle dynamics, and the basic nature of entrepreneurial orientation and proactive behavior all suggest that new ventures are constantly confronting evolving strategy issues and possible modifications to their strategies. On the one hand, where strategies and strategy change alternatives are not substantively considered by top managers, new venture performance or sustainability may suffer. Under these circumstances, new opportunities may not be surfaced, new competitive threats may not be appreciated, and changing organizational needs may not be identified. On the other hand, when top managers do effectively differentiate among strategic options, the team is presented with a greater probability of evaluating, selecting, and prioritizing among alternatives that will serve the venture well in the emerging competitive environment. The ability to differentiate alternatives thus increases adaptive generalization and improves survival potential (Chakravarthy, 1982). Previous research in entrepreneurship provides evidence that heterogeneity of ideas and information flow enhances performance (Ensley et al., 2002; West & Meyer, 1998).

The potential and the need for integration follow on the heels of differentiation (Bartunek, Gordon, & Weathersby, 1983; Chakravarthy, 1982; Gersick, 1991; Ginsberg, 1990; Hurst, Rush, & White, 1989). To the extent that top managers have very different sets of beliefs about the relative importance of considered strategic constructs, one wonders whether or not strategy implementation would be internally consistent. Although top managers may give their consent to certain strategic initiatives or direction in public forums, those who still fundamentally disagree at the basic level of cause-effect belief may use a different set of priorities in managing their own functional areas of the venture. On the one hand, where new opportunities have been identified, for example, poor integration across managers may relegate the pursuit of such opportunities to back-burner priority by some and precipitate the incremental (or even destructive) evolution of the venture as a result of fragmented attention and uncoordinated, unsupported actions across the firm. Meyer and Dean (1990) discovered precisely this dynamic in their study of founder CEOs who could not appreciate the strategic necessities recommended by the experienced top managers they had hired. On the other hand, the arrival of strategic decision makers on a shared perspective or area of mutual understanding enables the firm to move forward in a more focused and unified fashion with consistently applied strategic intentions and actions.

New venture performance, however, should depend on moderate levels of differentiation. On the one hand, in some new ventures, top management teams may be particularly facile in scanning the environment, gathering information, creating multiple new perspectives, and communicating these throughout for consideration. This may result in

Figure 3

Relationship between Performance and Differentiation or Integration



such a flow of new ideas that the team finds it difficult to coalesce around a subset for long enough, because the palette of available ideas is constantly shifting. On the other hand, too little differentiation would suggest too few strategic alternatives considered. This may have disastrous consequences in competitive environments that are constantly shifting.

New venture teams must also cultivate moderate levels of integration. Some teams may be particularly adept at synthesizing new perspectives developed and communicated throughout, and in expeditiously implementing actionable next steps arising out of a synthesis. Firms in these cases may then coalesce too quickly around new perspectives, without allowing for additional new interpretations and perspectives to be substantively considered. Similarly, firms which lack real integration capabilities at all might never be able to coalesce effectively around a subset of developed strategic alternatives. Too little integration suggests fragmented strategic thinking across team members, while too much integration suggests potential agreement on strategic alternatives without ample consideration of all alternatives.

Together, these ideas portray an inverted U-shaped relationship between new venture performance and both differentiation and integration. Greater differentiation and greater integration within founder teams or new venture top management teams are helpful, up to a point. However, higher levels of either differentiation or integration may be detrimental to the performance of the venture (see Figure 3).

Hypothesis 1: There is an inverted U-shaped relationship between the new venture performance and the degree of differentiation and integration of strategic constructs within the top management team.

Hypothesis 1a: New venture performance will be positively associated with moderate levels of differentiation and integration of strategic constructs within the top management team; however,

Hypothesis 1b: New venture performance will be negatively associated with low levels or high levels of differentiation and integration of strategic constructs within the top management team.

The previous discussion suggests that differentiation and integration are fundamentally related with one another, and that their interaction is also a critical variable. While

both may exist within a new venture, the strength or weakness of one may overcome the benefit inherent in the other. Strong differentiation abilities create difficulty for the integration component because there is simply more that is new and more to pull together by the team into a unified view across managers. While these teams may possess integration capabilities, the information load (Daft & Lengel, 1984) on these capabilities may be too great such that effective integration does not occur. Weak integrating capabilities in the face of only average differentiating capabilities would produce a similar problem for teams. In contrast, integration capabilities that are better developed than differentiating capabilities may create a different set of problems for new venture teams. Strong integration in the face of relatively weaker differentiation would result in the more rapid arrival on frame uniformity and suggest that top managers may not have adequately discussed the issues and ideas. Streufert and Swezey (1986), in fact, hold that there can be no effective integration without an accommodating level of differentiation.

Top management skills in both differentiation and integration, therefore, become critically important, especially in the type of dynamic environments faced by new ventures. Here, top management teams are challenged to not only surface a manageable set of new strategic options responding to shifting strategic demands, but also to achieve an appropriate level of integration in order to move forward with internal consistency.

Hypothesis 2: New venture performance will be positively associated with the interaction between differentiation and integration of strategic constructs within the top management team.

Methodological Considerations

In order to understand the basis upon which new venture management teams make important decisions impacting the future of their firms, one must confront research challenges in examining properties of collective cognition.

Methods for Examining Collective Cognition

The meaning of a representation of thought is not only a function of the representation itself, but also of the way in which the representation is developed (Markoczy & Goldberg, 1995). The method for developing any representation, therefore, is critical. With the advent of interest in exploring strategy as perspective, several research methods have been used recently to explore and measure aspects of strategic thought.

One method is the repertory grid technique (Fransella & Bannister, 1977; Kelly, 1955; Reger, 1990; Reger & Huff, 1993). Because interviews with managers reveal inconsistently used strategic dimensions, the method does not lend itself to aggregation to a collective level across managers within the same organization (Dunn, Cahill, Dukes, & Ginsberg, 1986) without unjustifiable assumptions made by the researcher. "Clearly the non-presence of a [dimension] in the causal map cannot be taken to mean that the subject believes the construct to be irrelevant, it only means that it is not [there]" (Markoczy & Goldberg, 1995, p. 311). The researcher must then either arbitrarily assign some value to the dimension for that manager in order to make comparisons with other managers who do identify it, treat it as a missing piece of data that results in loss of information and lowers statistical power, or refrain from using the manager at all in team compilations and cross-firm comparisons. Any decision the researcher makes among these alternatives will affect the resulting variable measurements and the final representation of thought used for

analysis. The time-consuming nature of the interview technique makes this method difficult to administer to a broad set of managers across many organizations.

Cognitive mapping (Barr, Stimpert, & Huff, 1992; Eden, 1992; Huff, 1990) aims to identify the cause-effect beliefs of individual managers. The method often relies on linguistic analysis of archival documents, such as letters to shareholders in annual reports. Whether these are *post hoc* explanations of corporate strategic actions, impression management (Salancik & Meindl, 1984), or truly underlying managers' cause-effect beliefs is unclear. The method also generally relies on one map as a representation of the entire organization. Integrating multiple cognitive maps into a collective organizational map would be difficult because of inconsistent dimensions surfaced and the overall complexity of individual maps.

Markoczy and Goldberg (1995) suggest a causal mapping method which is sort of a hybrid and an extension of repertory grid and cognitive mapping. In order to make interviews manageable, respondents must select a limited number of strategic dimensions they believe to be important. Inconsistencies among managers also make comparisons and aggregations problematic, for which there is no readily available solution without assumptions by the researcher regarding values to assign to such inconsistencies (Markoczy & Goldberg, 1995). The recommendation to limit managers to 10 elements may result in the exclusion of elements that some managers believe are still important. This method also requires lengthy interviews with managers, who must sort through many elements and then make 90 comparisons between selected elements.

Policy capturing (Hobson & Gibson, 1983; Ireland, Hitt, Bettis, & De Porras, 1987) seeks to identify managers' theories-in-use by using their individual judgments on hypothesized case scenarios to create decision models. Aggregate predictive models may be developed by entering all of the individual judgments into one overall regression model. However, as noted earlier, combining all managers' individual judgments into one regression model is not representative of how a team actually makes important strategic decisions. In fact, regression models adopting this approach explain less variance than do individual models (Hitt, Ireland, Keats, & Vianna, 1983). In any case, the dependent variable in such models is the individual's overall assessment, not a group's decision or a firm's actions. The use of cases created by the researcher is a step removed from the real situations confronting top managers in their firms, and the use of direct item ratings by managers is also a step removed from the underlying cognitive structure that manifests itself in those ratings (Schneider & Angelmar, 1993).

Metric conjoint analysis (Louviere, 1988; Priem, 1992) also captures decision policies used by individual managers through a rating task. The conjoint task method involves "trade-offs concerning the number and levels of variables used versus the willingness of the subjects to participate and the sustained interest of the subjects in the task" (Priem, 1992, p. 146). Consequently, the nature of the conjoint method seems to require the researcher to *ex ante* identify "parsimonious, conceptually rich typologies" in lieu of allowing respondents to utilize their own underlying constructs. Aggregations of individual responses (e.g., Shepherd & Zacharakis, 1997) using regression models are still only predictive of individual judgments.

In summation, there are several issues that present themselves to researchers interested in measuring collective cognition in entrepreneurial top management teams. These include (1) the need to collect consistent data across managers within the same organization such that it can be coalesced in some fashion and evaluated at a collective level, thus facilitating comparisons between organizations; (2) the need to allow managers' own responses to both generate and indicate the importance of constructs each uses in considering firm strategy and related issues, avoiding researcher interpretation of the

relevance of any given dimension; (3) the desire to capture current strategic thinking, versus *ex ante* projections or *ex post* explanations; and (4) the ability to easily collect data from multiple managers in a broad set of companies. The combination of these objectives is designed to enhance both reliability and validity in research encompassing collective cognition.

Sociocognitive Grid Analysis

In order to meet the objectives of research wherein strategic perspective is a key variable, a sociocognitive grid approach builds upon and extends previous work in policy grid analysis. The policy grid evolved out of attempts in the public policy sciences to understand the underlying structure and content of systems of interpretation (Hecl, 1976). The approach is used to identify and measure the dimensions of frames of reference used by policy makers to interpret the meaning of events in a particular context and through which such “meanings are attached to policy choices” (Dunn et al., 1986, p. 355). Thus, the goal of policy grid is to understand aspects of perspective on issues or situations facing an organization that may necessitate actions or changes.

Sociocognitive grid involves both method and analysis. The goal of the data collection method is to create a matrix for subsequent analysis that captures dimensions considered relevant by individuals and the team to which the individuals belong. Seeking to overcome one limitation of the repertory grid (that of inconsistently identified dimensions), an enhancement is the inference of a collective frame of reference of an organization. Dunn and Ginsberg (1986) assume that managers are familiar with a set of dimensions related to their particular firm and industry, and then have each manager evaluate the importance of each dimension. Thus, the sociocognitive grid seeks to use a “frame of reference that incorporates the constructs of others within its range of convenience” (Dunn et al., 1986, p. 358). Figure 4 illustrates the result of such an approach, a sociocognitive grid that combines top managers and salient strategy constructs. What is captured in such a grid is a rating by each top manager of each important underlying strategic construct. Having made such an inference, the grid may be analyzed using measures that capture important properties of structure (see Figure 4).

Determination of the appropriate strategic constructs to use is a critical task. One limitation of other methods previously discussed, and of the original policy grid approach as outlined, is that the researcher cannot ensure that the selected dimensions reflect the full range of all managers’ underlying construct systems for thinking about

Figure 4

Example of Sociocognitive Grid

Strategic Construct	Construct A	Construct B	Construct C	Construct D	Construct E	Construct F
Manager 1	-0.2	2.1	0.4	0.0	-0.9	0.7
Manager 2	0.1	0.4	0.0	0.4	0.2	0.5
Manager 3	-1.8	0.0	-1.7	-1.1	-1.3	-0.9
Manager 4	-0.7	-0.6	0.4	-0.3	-1.1	0.4
Manager 5	-0.2	-1.9	0.5	2.9	-0.4	2.7
Manager 6	-0.4	1.1	-0.5	0.9	0.7	1.1

strategy and strategic issues. The issue for researchers is to describe individual data in a format that is consistent across all individuals, while still allowing for the variation between individuals in construct use and importance to be represented within that format.

Two theoretical approaches may be used to identify underlying construct systems: decomposition or composition methods (Arkes & Hammond, 1986). Decomposition methods, on the one hand, begin with a limited set of dimensions and observe respondents' use of those dimensions to identify systematic decision rules or approaches they use in confronting issues. Methods that rely on the use of an *a priori* limited set of dimensions assumed to be the relevant set for all managers fall into this category, such as conjoint analysis, causal mapping, and policy grid analysis as described earlier. These methods may identify decision rules, but such rules may not be fully reflective of the complexity of strategic thinking because they may exclude constructs believed to be important by some respondents. Composition methods, on the other hand, identify important constructs used by respondents built up out of a broader base of related item measures. A sample of managers might be asked to evaluate a comprehensive list of strategy-related items such as strategic goals and means (Bourgeois, 1980; West & Meyer, 1998), with a subsequent factor analysis performed in order to uncover the key strategic dimensions which best explain the observed variance. Such an approach questions managers on cause-effect elements and reveals underlying patterns connecting and explaining their responses. Rather than selecting a limited set of conceptually rich typologies to expose to managers, it is more reflective of reality to let managers speak for themselves. Factor analysis has been used in such a way to better identify underlying strategy-related belief structures of individuals (Bowman & Ambrosini, 1997; Houghton, Zeithaml, & Bateman, 1994; Miller et al., 1998). Factor scores may then be used as seeds into a sociocognitive grid. Positive scores for key constructs suggest that they are regarded as more important, while negative scores for key constructs imply that they are regarded as less important (Hair, Anderson, Tatham, & Black, 1990). Thus, a complete set of strategic constructs explaining variance across all managers is captured, as are individual managers' ratings of each construct whether important or unimportant.

Field Study Illustration

Sample

The present study utilizes a sample of new ventures in three technology-based SIC codes (computers, microelectronics, and software). These industries were selected because the presumed rapid pace of change would result in the inclusion of companies in various stages of development and encountering strategic issues frequently. Longitudinal data were collected from CEOs and top managers in new ventures in one geographic area with a developed technology-based entrepreneurial community. CEOs in each of these firms were contacted personally by mail and were asked if they wished to participate in a research study on strategy. Interested CEOs designated the names of top managers in their companies who participate in strategy discussions and decisions. Surveys were sent to the CEOs and top managers at the inception of the study, and then again 2 years later. After 2 years, 22 sets of surveys from intact top management teams were available for analysis. At the beginning of the study, the median age of the responding firms was 3.3 years. The average firm size in the final year of the study was approximately \$40 million revenue with 165 employees; an average of 4.9 top managers per firm participated in this study.

Strategy Constructs and Ratings

The structure of top management strategic thinking is inductively identified using quantitative factor analysis of managers' ratings of a series of strategic goals and means gathered during both years. In each survey, the importance of strategic goals and competitive means was measured by two separate questions. Respondents were presented with a list of 20 possible strategic goals and 21 possible means. The list contains items originally used by Bourgeois (1980), and was supplemented with items based on a review of recent work on strategic goals and means that has sought to understand dimensions of strategic cause-and-effect used by top managers. For each item, respondents were asked to rate its importance on a "scale of importance" ranging from 0 to 100, where 100 represented "critically important" and 0 represented "not at all important."

Factor analysis was performed on the goals and means ratings data collected in both years. The same six key factors were identified from the factor analysis in each year; these were named after reviewing and interpreting rotated factor matrices. They include: (1) new products/growth, (2) innovative/differentiation, (3) low cost/competitive price, (4) customer relationship, (5) marketing/image, and (6) human resources. Factor scores for the key strategic constructs were calculated for every respondent. Sociocognitive grids for each company were created using the factors as strategy constructs and the factor scores as managers' construct ratings.

Differentiation and Integration

An index of differentiation is a modified version of the measure suggested by Ginsberg (1989), and is given by the expression:

$$1 - \frac{\sum_{j=1}^n \sum_{k=j+1}^{m-1} \sum_{j=1}^m r_{jk}^2}{m^2}$$

where r_{jk}^2 is the coefficient of determination for a manager on the j th pairs of strategic constructs; m is the number of strategic constructs; n is the number of managers. The higher this index as indicated by weak or zero correlations among all pairs of strategic constructs, the higher the level of differentiation among strategic constructs; the lower the index, the more the strategic constructs are not distinguishable from each other. The mean for all companies in this study is .622 within the 0–1 scale range, suggesting a moderate level of differentiation.

An index of integration is a slight modification to Ginsberg (1989) and is given by the expression:

$$\frac{\sum_{x=1}^m \sum_{y=x+1}^{n-1} \sum_{y=x+1}^n r_{xy}^2}{n^2}$$

where r_{xy}^2 is the coefficient of determination for a strategic factor on the x th pairs of managers; m is the number of strategic constructs; n is the number of managers. The lower this index as indicated by weak or zero correlations among all pairs of top managers, the less the management team views the entire set of strategic constructs similarly. The higher this index, the more the management team holds a shared view of the strategic constructs.

The mean for all companies in this study is .232 within the 0–1 scale range, suggesting a low level of integration occurring.

The earlier discussion regarding differentiation and integration proposes that they may bear an inverted U-shaped relationship to new venture performance. Differentiation and integration are therefore both operationalized as deviations from the mean indices of differentiation and integration across all companies in this sample. It is reasonable to expect that performance changes observed over the 2-year study period are related to the structure of collective cognition discovered at the beginning of the study. Therefore, the differentiation and integration variables are derived from the first year of the study.

New Venture Performance

Most participating companies were privately held; hence, detailed objective measures of financial performance are not available. Therefore, firm performance is derived from an average rating of perceived performance by managers in each company. A composite 3-item scale serves as the basis for the perceived performance measure. One item, based on Dess and Robinson (1984), asked for an assessment of the percent of ideal performance being achieved, where ideal performance equated to 100%. Two other items build on the tradition of strategy as competitive advantage leading to enhanced performance (Porter, 1980). These items, assessing growth relative to competitors and overall performance relative to competitors on 7-point agreement scales, were then interpolated into a 0–100 range equivalent. This method is similar to that used by Lumpkin and Dess (1995). The composite measure in the first-year study has a Cronbach alpha coefficient of .87; the composite measure in the second-year study has a Cronbach alpha coefficient of .78. The performance variable is operationalized as relative performance changes between the first and final years, using the composite scale measures. The mean level of relative performance change across the two years is +1.1% with a range of –37.2 to +35.6%.

Control Variable

Performance goals and levels may vary depending upon the stage of its life cycle that a new venture is in (Quinn & Cameron, 1983). Life cycle stage was measured by an average rating of responding managers in each company from the first survey, using Kazanjian's (1988) descriptions of five stages that firms experience. This scale is particularly appropriate for this sample of firms because it was developed using technology-based companies. The mean for all companies responding in the second-year survey was 3.1, which essentially represents the “growth” stage of Kazanjian's model.

Results

Hypothesis 1a predicted that new venture performance would be positively associated with differentiation and integration within top management teams. Table 1 presents three models regressing performance on these measures, while controlling for company life cycle stage. In model 1, differentiation of strategy constructs among top managers is significantly related to new venture performance ($p < .05$), and the overall regression model is significant ($F = 3.85, p < .05$). In model 2, integration of perspective among top managers is also significantly related to new venture performance ($p < .10$), and the overall regression model is also significant ($F = 3.24, p < .10$).

Table 1

Regression of Performance on
Differentiation and Integration

	Model 1	Model 2	Model 3
Control variable			
Life cycle stage	-.315 (-1.567)	-.377 (-1.809)*	-.253 (-1.263)
Independent variables			
Differentiation	-.459 (-2.281)**		
Integration		-.423 (-2.029)*	
Differentiation × integration			-.482 (-2.403)**
Adjusted R ²	.231	.191	.250
F (2, 18)	3.846**	3.243*	4.163**

* $p < .10$, ** $p < .05$.

Note: t -values in parentheses.

Hypothesis 1b predicted that either low levels or high levels of differentiation and integration will be negatively associated with firm performance. In each of the models presented in Table 1, the relationship between performance and the independent variable differentiation and integration is significant but negative. Recall that the differentiation and integration variables were operationalized as deviations from medium levels of differentiation and integration indices observed across the entire sample of companies. The results indicate that deviations from average levels of differentiation and integration are, in fact, associated with poorer performance, while improved performance is associated with midrange levels of differentiation, integration, and their interaction. The combination of these results provides strong support for Hypothesis 1b.

Hypothesis 2 predicted that the interaction of differentiation and integration will be associated with new venture performance. In model 3, the interaction of differentiation and integration is significant ($p < .05$), and the overall model is also significant ($F = 4.16$, $p < .05$). Since the interaction variable is also operationalized using deviations from the sample's mean levels of differentiation and integration, the results also demonstrate that moderate levels of the interacting individual variables are associated with improved performance while deviations from moderate levels are associated with performance declines.

Discussion and Implications

This article has developed the argument that ETCC represents a critical, but poorly understood, link between individual cognitions and team decisions leading to new venture survival and growth. We have focused here on strategy as an example of a collective cognitive domain because it represents the cause-effect understanding or knowledge about how the new venture can or should operate in its competitive environment. ETCC

about strategy exhibits content properties and structural characteristics. Two structural characteristics—differentiation and integration—are particularly important in new ventures. This is because these characteristics describe the extent to which entrepreneurial top management teams consider new strategic alternatives in an environment where strategic demands are continually shifting, and the extent to which these teams share a unified view of the relative importance of available strategy choices.

An exploratory field study identifies these characteristics in a sample of technology-based new venture top management teams. The study finds that performance improvements are significantly associated with both differentiation and integration. Moreover, the significance found between performance and these measures provides strong support for the argument that an inverted U-shaped relationship exists. Among team members, too much integration (highly consistent views) or too much differentiation (constantly identifying different options and alternatives) adversely affects new venture performance; performance improvement is enhanced where new ventures deviate much less from midrange levels of each of these variables. That more complex new ventures—those where top management teams both differentiate and integrate at midrange levels—achieve higher levels of performance is also indicated by the significance of the regression containing the interaction term between differentiation and integration. Previous research has stressed the theoretical importance of the combination of differentiation and integration as elements of sociocognitive complexity in organizations (Driver & Streufert, 1969; Streufert & Swezey, 1986). The present study provides empirical support. The sample size of respondent new venture across 2 years is reasonably small in this exploratory study ($n = 22$), resulting in a loss of statistical power. Thus the significant results observed are quite likely very strong, practically.

The examination of ETCC holds exciting possibilities for future entrepreneurship research. ETCC can be used as a dependent variable in studies of new ventures. As suggested by Figure 1, ETCC mediates between new venture performance and several other variables of interest to entrepreneurship researchers. Cognition research in entrepreneurship, some of which is referenced earlier, tends to focus on the individual level of analysis. And yet, it remains unclear how individual level cognitions become, or at least impact, organizational level activities and performance. In fact, the varying levels of analysis in entrepreneurship research and theory development remains a significant challenge (Davidsson & Wiklund, 2001; West, 2003). The concept of ETCC presents an opportunity to better understand how the two levels are related.

The apparent interaction between differentiation and integration is one of the more interesting results of this study, and bears further examination. Given a level of integration capability within a team, what are the boundaries of effective differentiation effort or capability, above which and below which the team's effort and decision making becomes suboptimal? A goal for future research would be to identify the ranges of effective levels of each structural component of team cognition. It is possible that such ranges vary by industry and competitive context, reflecting variance in the dynamism and flows of information that new ventures may face.

New venture strategy can be viewed as a function of the composition of the top management team, and changes in new venture strategy may also result from changes in the team composition. Significant attention has always been paid to the role of the new venture's founder or CEO in determining overall direction or changes in direction (e.g., Brush et al., 2001; Johnson & Bishop, 2002; Meyer & Dean, 1990; Willard, Krueger, & Feeser, 1992). The approach outlined here implies that other individuals' perspectives also factor into what the venture does as an organization. Moreover, new individuals may inject new content into strategic discussions and may view existing content differently from

others in the team, resulting in changing collective cognition of the team itself. New top management team members may also forestall change. While CEOs in technology firms often value new colleagues with whom they have previously worked or who have significant within-industry experience (Eisenhardt & Schoonhoven, 1990), such new entrants to the top management team may serve to homogenize points of view rather than challenge conventional thinking. In dynamically changing environments where new ideas about strategy are important, this may diminish new venture performance (Ensley et al., 2002).

The sociocognitive grid, as a methodology to assess ETCC, may also be used to assess the efficacy of process within top management teams. Modifications in the organization of the team and in communication methods used by the team may enhance or diminish content of the grid and precipitate changes in the structure of the collective grid. Differentiation measures collected over time, for example, could be used as a metric to assess whether or not new venture top management teams are increasing the flow of new ideas and potential opportunities into strategic consideration. Integration measures collected over time could provide insight on the time it takes for teams to coalesce around new options previously proposed. To the extent that top management is aware of the trends within their own teams, they may wish to take actions to make adjustments in the desired direction (such as structuring new subcommittees to generate options or scheduling special meetings to focus on new ideas and future opportunities).

Focusing on collective cognition could also enhance the team's understanding of its position in the competitive environment. If an index of differentiation is significantly below an industry average, for example, it may suggest that the new venture should enhance its external scanning activity and develop internal communication processes which promote the expression of alternatives and new opportunities. If an index of integration is significantly lower than the industry average, it might suggest that top management concentrate increasingly on its collective understanding of its fundamental value proposition or organizational identity (Dutton & Dukerich, 1991). Industry metrics may be difficult for individual firms to develop, so the extension of this method and the development and validation of indices across industries might be fertile ground for future entrepreneurship research.

These latter ideas suggest that ETCC may also serve as an independent variable, in ways that are valuable other than as a variable leading to new venture performance. Here, we are suggesting an iterative relationship between ETCC as dependent variable and the kinds of variables that contribute to ETCC. While individual cognitions contribute to collective cognition, collective cognition can also serve as a stimulus to change in individual cognitions (Schneider & Angelmar, 1993). ETCC may thus serve as a stimulus to change in top management team process, as the recursive nature of this relationship is similar to that explored in learning models in entrepreneurial firms (Dess et al., 2003; Lant & Mezias, 1990; Lichtenstein, Lumpkin, & Shrader, 2003; Lumpkin & Lichtenstein, 2005). Further research focused on this relationship will help explicate how the individual and organization levels of analysis may be related.

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