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How Do You Find an Expert? Identifying Blind Spots and Complex Mental Models Among Key Organizational Decision Makers Using a Unique Profiling Tool

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The decisive shift from a production-based economy to a knowledge economy over the past half century has forced businesses and management to confront new models of economic success. This knowledge economy, typified by global information and communication technologies, has created a new kind of market volatility. Successful enterprises now prioritize speed and flexibility over the old standards of size and access to resources. Companies now seemingly grow overnight, but they also implode much faster than before when they are not able to maintain their value proposition. For those of us focused on changes in cognition and decision making in business, these conditions require the development of new models of expertise, decision making, and leadership.

Traditionally, studies of leadership have focused on top management as the central organizing force of an organization. Numerous efforts to pinpoint the relevant characteristics of successful leaders were carried out in the hopes that the expertise of effective leadership could be harnessed and reproduced to enhance organizational performance (Hunt, 1999). Leadership studies, particularly those in social and organizational psychology, focused heavily on optimal leader traits, such as charisma, esteem, assertiveness, and type A personality structures (Hollander, 1978; House, Spangler, & Woycke, 1991). However, scores of inquiries showed these models of leadership have little utility in the real world. As early as 1985, Meindl, Erlich, and Dukerich (1985) attributed the fervor around top-down trait approaches to leadership as a “romance” and a “myth” we perpetuate to keep faith in the capabilities of top-level decision makers.

The assumptions we create around leadership most likely have their roots in director-centric, rationalistic Cartesian models of decision making and expertise. These classic models of decision making assume that the expertise (of a business, for example) resides *within* the individuals who control and direct the major decisions.

As an alternative perspective, our work on decision making and expertise is highly influenced by the Vygotskian tradition, including critical psychology and activity theory. This broad framework reverses the classical view of mind and decision making (Cole, Engestrom, & Vasquez, 1977; Vygotsky, 1986). In this view, the mind is not conceived as an internal entity that imposes itself on the world. Rather, cognition is shaped through individuals' participation and performance in the social and physical environment in an ongoing manner. As individuals participate in goal-oriented group activities, they get social feedback as to the appropriateness and the contributory value of their behavior; over time, this kind of reinforcement influences cognitive abilities, and to some extent cognitive development itself (Scribner, 1987).

Newer perspectives, such as distributed cognition (Hutchins, 1996), naturalistic decision making (Klein, 1999), transactive memory systems (Wegner, 1987), and complexity science (Marion & Uhl-Bien, 2001), support a similar view. In the emerging field of naturalistic decision making (NDM), for example, researchers focus on how people make decisions in real-world, real-time settings and perform cognitively complex functions in situations defined by "ill-structured problems; uncertain, dynamic environments; shifting, ill-defined or competing goals; action/feedback loops; time stress and high stakes" (Gore, Banks, Millward, & Kyriakidou, 2006, p. 928). The kinds of volatile environments that require critical decision-making expertise often present unpredictable scenarios and do not allow time for planning, modeling, and optimization (Klein, 1999). Expert decision makers under these conditions cannot rely on deductive processes toward a best course of action; rather, they use heuristics, intuition, and satisficing strategies to make rapid, high-stakes decisions that can be rapidly modified to changing conditions. Similarly, work on distributed cognition, pioneered by Hutchins (1996), argues that, when studying leadership and expert decision making, the unit of analysis is not simply one individual at the top, but rather leadership should be understood as a distributed enterprise embedded within the social relationships and organizational norms and constraints guiding decision-making activity.

New insights from the fields of complexity science and emergence also indicate a need for models of business leadership that are more in line with new economic realities and are providing new ways of understanding the role of leadership in organizational performance. Marion and Uhl-Bien (2001), for example, conceptualize leadership as the ability of top management to *enable*, rather than *control*, the outcomes of organizational interactions. These theoretical models suggest the new "expertise" of top management may be *an ability to anticipate future states of change*, rather than the ability to design and carry out strict objectives and directives. In line with these new theories of cognition and leadership, assuming a well-coordinated team, the "expert" at the helm of a successful profit-oriented company may not be any one person. Rather, running a company may be more of a finely tuned coordination among a leadership team, especially in large companies or in particularly volatile industries.

These insights have not only theoretical but also methodological implications. Three important realities of everyday life in business have methodological significance for assessing enterprise executive-level decision makers: (1) Organizations are composed of distributed cognitive systems, (2) organizations rely on well-coordinated mental models, and (3) expensive mistakes can result from complex blind spots

within a distributed team mental model. Researchers must not overlook the fact that decision making at the top is a distributed enterprise, requiring a great deal of coordination within the organization to achieve performance objectives. Assessments of executive decision making may be more effective when we are able to tap into the mental model guiding decisions that evolve over time, rather than looking into specific traits or attributes of the decision makers themselves. The term *mental model* refers to mental structures that instantiate long-term domain knowledge and that are used to reason through a specific task. Mental models develop as a function of experience, and are not based on pure logical deduction. Mental models enable simulation; that is, decision makers mentally “run” the model to make predictions about possible events in the environment or in a system and to prepare for future outcomes (Gentner & Stevens, 1983). In the present discussion, moreover, mental model is understood to be embedded within emergent complexities of an organization, and to be distributed across organizational members.

Furthermore, decision-making expertise may be best understood as a developmental process. Given the volatility of markets and the complexity of team decision making in large organizations, we need not be as concerned with the general cognitive ability of today’s executive so much as his or her domain-specific expertise and cognitive agility, which is often associated with the kind of intuitive expertise developed through experience. Cognitive agility is what allows executives to rapidly respond to changing situations and revise guiding mental models to meet performance demands. In sum, these insights require us to shift away from thinking of the cognitive ability of business leaders as fixed and static, and instead to focus on the way in which expertise evolves over time in response to dynamic environments. It also requires us to discard attempts to locate decision-making expertise as a fixed capacity that resides within the individual decision maker.

For this chapter, we present preliminary results of a leadership team assessment using our FutureView™ Profiler. Specifically, this case involves the top eight managers and the CEO of a global biodevice company. The participants were the CEO, and the division presidents from around the world. The Profiler is a tool that assesses expert decision making of executives and top management. In its most basic form, the Profiler allows one to (1) assess the extent to which an individual’s guiding mental model can be revised to accommodate novel sources of information relevant to key decisions, (2) identify domain-specific blind spots in key decision makers’ mental models of their industry, (3) identify the extent to which a mental model of the business is shared among leaders on the same team, and (4) identify the extent to which a comprehensive mental model of the business exists among members of a leadership team; that is, are all the individual blind spots “covered” by the members of the team collectively? The Profiler is meant only to profile leaders’ mental models regarding the major elements of their business sector and examines how they solve real business problems using online tasks similar to those of their actual jobs. It does not evaluate personality traits, the ability to communicate, charisma, or ethics. In contrast, it does address questions such as: How do decision makers approach complex sources of information to make judgments about appropriate courses of action? Exploring the utility of our tool and its implications for executive assessment, this chapter highlights some of our insights, the pitfalls, and some remaining

questions from a field test of the Profiler among key decision makers in a medical device firm.

Expertise and Cognitive Agility

Researchers studying highly skilled people have begun to focus on what has been called intuitive expertise, which is the kind of expert knowledge that resides below the threshold of conscious awareness (Klein, 1999; Polanyi, 1967). In general, experts tend to organize their knowledge within a holistic framework that allows them to quickly perceive the significance of events or situations and mentally simulate possible courses of action and the consequences of actions. From their point of view, experts are acting from “the gut,” but in fact, a complex framework (or mental model) is guiding their behavior and can be specified by a systematic analysis of their behavior (Dreyfus, 1997). Experts in the same domain easily identify each other. Even if they don’t agree with another expert’s choices, they easily recognize that they share a common perceptual experience within their area of expertise.

The early expertise literature isolated characteristics of experts by comparing their performance to that of novices, but did not address the development of expertise (e.g., Chase & Simon, 1973; Chi, Glaser, & Farr, 1988). Hubert Dreyfus (Dreyfus & Dreyfus, 1986) advanced the view that expertise is a developmental process. His five-stage model of expertise ranges from *novice* to *expert*, with *advanced beginner*, *competent*, and *proficient* filling the interim stages. Dreyfus introduced the idea that as individuals become more expert, their thinking evolves from rule based to intuitive. In other words, their thinking gets increasingly organized around a core of organizing principles that comprise an underlying mental model of the domain as opposed to a set of recipes for action. Consequently, with increased expertise in a domain, individuals’ thinking gets increasingly agile and responsive to situational cues, rather than being governed by abstract rules. We use Dreyfus’s five stages in the Profiler to frame how we look at managers’ patterns of decision making (see Table 17.1).

Because expertise is not consciously accessible, it is normally assessed using highly designed work sampling methods, performance in simulators (such as those used with aircraft pilots), or cognitive probes, which require a person to perceive, process, and act on a data set. These kinds of methods have been shown to be more reliable than surveys or self-reports in revealing the underlying mental models or operating heuristics that drive the thinking, holistic situation assessment, perceptual processing, and “gut feel” decision-making characteristic of intuitive expertise (Roth, Bobko, & McFarland, 2005). In contrast, verbal methods, such as tests, surveys, or interviews, rely on conscious awareness and productive verbal skills, and thus risk tapping into only surface dimensions of mental processing.

Dreyfus’s developmental model of expertise is most useful for our purposes. In particular, it suggests two features that seem highly pertinent to a characterization of business experts. One is a deep understanding of the underlying forces of business and the ways that they can tip out of balance, or tip each other out of balance. Good examples of this would be the tension between supply and demand, or the changing status and availability of capital. The other characteristic—which may underlie all kinds of expertise—is cognitive agility (DiBello, 1997). While the business landscape

TABLE 17.1 Outline and Description of the Dreyfuses' Five-Stage Model of Expertise

Stage 1: Novice: During the first stage of acquiring a new skill, the novice learns to recognize various objective facts and features relevant to the skill as well as rules for deciding how to act on these facts and features. At this stage, the facts and rules are context-free. That is, they are clearly and objectively defined so the novice can recognize and apply them regardless of the situation or context in which they occur. Novices are usually so caught up in following the rules that they have no coherent sense of the overall task.

Stage 2: Advanced beginner: As the novice gains experience in real situations, performance improves to a marginally acceptable level. This encourages the learner to consider more than context-free facts and fosters an enlarged vision of the world of the skill. Through practical experience in concrete situations, and by noting the similarities between novel situations, the advanced beginner learns to recognize and deal with previously undefined facts and elements. The person also learns to apply more sophisticated rules, to both context-free and situational factors. The rules can offer a sort of framework for storing and shaping experience, so that learning from experience becomes possible. The advanced beginner learns to deal with situational elements but still applies learned rules and procedures.

Stage 3: Competence: With experience, the learner begins to recognize more and more context-free and situational elements. To avoid being overwhelmed by this information explosion, the future expert is taught to adopt a hierarchical view of decision making. By choosing a plan to organize the situation and then concentrating on only the most important elements, the person both simplifies and improves performance and gradually grows in competence. At this stage of the game, objectivity often goes out the door. The competent person appraises the situation, sets a goal, and then chooses a plan, which may or may not involve following the rules, but also has some risk of not succeeding. Whether the plan succeeds or fails, the situation and its outcome are likely to be vividly recalled—an important resource for future expertise.

Stage 4: Proficiency: Proficiency brings with it a new style: rapid, fluid action that does not always stem from detached reasoning. For the proficient performer, usually deeply involved in the task, important elements of the task will stand out clearly, and others will recede into the background and be ignored. As the situation changes, different features may take on importance and different plans may evolve. “No detached choice or deliberation occurs,” explain the Dreyfuses. “It just happens, apparently because the proficient performer has experienced similar situations in the past and memories of them trigger plans similar to those that worked in the past.” The Dreyfuses call this holistic similarity recognition. Klein calls this recognition-primed decision making.

Stage 5: Expertise: Experts don't apply rules, make decisions, or solve problems. They do what comes naturally, and it almost always works. When they fail, it often is because they are pitted against another expert, as in a world-title chess match. Experience-based holistic recognition of similarity produces the deep situational understanding that leads to the expert's fluid performance. Experts' skills have become so much a part of them that they are no more aware of them than they are of their own bodies. They are also able to innovate a solution to a problem they have not encountered. In a sense, they have a “first principles” understanding of their domain, so they don't actually need a similar prior experience to draw upon when they encounter a novel event.

Source: Adapted from Dreyfus and Dreyfus, 1986.

may look unpredictable and repeated success seems rare, some individuals have proven themselves continually adept at anticipating trends others missed and—when in leadership roles—steering their companies toward continued success.

Building on theories of emergence, adaptation, and flexibility from complexity science and NDM, we use the term *cognitive agility* to refer to the extent to which an individual revises his or her evaluation of a situation in response to data indicating that conditions have changed. The converse is *cognitive rigidity*, where the person is impervious to new data, being dominated by a rigid framework or

paradigm that acts to filter out new, possibly relevant, information, creating blind spots (DiBello, 1997).

Cognitive Agility and Assessment

We believe that an instrument that effectively assesses business expertise must (1) be able to draw on the intuitive expertise of organizational members; (2) tap into the specific mental models individuals use to approach problems, rather than basic problem solving or generalized decision making skills; (3) locate individuals within the distributed cognition of an organization, that is, specify the individual's role in the organization; (4) be able to identify strengths and blind spots of the organization's transactive memory system and, in so doing, highlight dimensions of expertise that contribute to high-level decision making; and lastly, (5) measure not only cognitive ability, but also cognitive agility, that is, the capacity to rapidly revise one's mental model in the face of dynamic feedback.

The Profiler is a knowledge elicitation instrument or cognitive probe that we have developed to specifically address these issues. The Profiler measures cognitive agility within business decision makers and renders detailed profiles, helping users locate themselves as decision makers and gain insight into where their organization's weaknesses and strengths may lie. The Profiler, which can be given in both pencil-and-paper and online formats, does not necessarily measure general cognitive ability, but rather profiles the framework, or heuristic, that an individual or team uses to approach problems in a given context, as well as the degree of agility present in the team or individual.

We built the Profiler based on research into how world-class experts approach and solve complex business problems in contrast to less experienced individuals. The instrument and scoring scheme was tested and refined using 48 data points from 10 very highly successful individuals who had repeat successes with large organizations in challenging markets and in highly varied conditions. From their responses we were able to distill the mental model of world-class business experts. The instrument was then retested with faculty from Vanderbilt University, the Rady School of Business at UCSD, and among executive MBA students at the University of Colorado Leeds School of Business. Each participant's results were consistent with his or her professional track record.

The Profiler falls into a category of assessment measures labeled work output sampling. Work output sampling consists of measures that simulate actual job tasks to assess context-relevant expertise without relying on self-report data. In fact, research on work output sampling showed that out of 48 methods used to ascertain or project "fit," only work output sampling resulted in a statistically significant improvement over measuring general mental ability (Schmidt & Hunter, 1998). In other words, it was the only measure that added to the correlation between general mental ability and success on the job. While work output sampling has been lauded as a technique that has high predictive validity and that reduces adverse impact, it traditionally has not been practical.

The Profiler uses work output sampling in assessments for executives in a systematic and automated way, and is what has been called a high-fidelity simulation. The

names of the companies are removed in the simulation, but all relevant information needed to make a prediction is retained. Hence, the Profiler is considered a high-fidelity work output sampling design that reflects real decision-making processes. In contrast, many work output sampling techniques are of low fidelity, simulating job tasks that are less representative of actual conditions, and thus suffer from an inability to accurately capture real-life job tasks.

The User Experience of the Profiler

The Profiler requires the user (1) to examine and analyze the same material used by actual experts (e.g., annual reports, 10K's, analyst's reports, etc., from actual companies) to make business decisions, (2) to make predictions about the company with respect to a number of domains (e.g., revenues), and (3) to judge various aspects of the company (e.g., evaluate the management team).

Specifically, the Profiler asks users to answer several questions about the company to predict how its finances will develop over the next five years. Users' answers are evaluated in terms of Dreyfus's five-stage model of expertise (discussed above) to determine their business acumen and level of expertise within the domain of business strategy. The Profiler also helps us identify blind spots in users' thinking; that is, we can discern areas where users seem to miss aspects critical to the company's performance. Moreover, for each prediction or judgment users must indicate the specific materials they relied on, such as discrepancies in annual report statements or the general state of the company's finances. This aspect of the Profiler taps into the heuristics that are guiding users' decision making.

Our research revealed that people who have achieved a high level of business expertise have a deep understanding of the following three core areas: (1) factors involved in effective operations, (2) forces influencing the market, and (3) those driving business finance and economic climates. Consistently successful business leaders have been shown to intuitively understand these areas and their impact on each other, and to pay attention to this fundamental triad in a uniquely dynamic way within a guiding context of business strategy. For example, these experts are able to sense that market conditions change based on environmental indications that others may fail to notice. Further, they foresee the consequences to their business operations and finances, and thus make necessary adjustments proactively. Unlike most business professionals, they are attuned to the early indicators of widespread change. Beyond this, they are expert at keeping the triad in balance, or shifting the balance when external conditions are conducive to do so (e.g., focusing on marketing during favorable economic times). In contrast, competent managers (one level down from experts) tend to be very talented in only one or two of these areas; however, they often do not understand the dynamics between these areas as well as the "superstars" do. Competent managers are likely to be very successful when larger market or economic trends are favorable to their specific skills.

These three core areas are not directly addressed in the questions we ask in the Profiler. Rather, an individual's answers are rated and compared to those of the ideal expert. The questions are based on tangible outcomes and concern the company's performance. The questions ask users to evaluate their company with respect to its

strategy, leadership, and finances. These are areas that senior executives would be expected to make valid predictions about and are good ways to reveal their underlying business expertise. For example, a question about finances would be: As the senior manager for the business, which aspect of financial performance most urgently requires your attention? This question would then be followed by a series of options, such as “cost of goods sold,” “fixed assets,” “receivables,” or “R&D.” To answer this question—that is, to know what is troubling or of concern in the total context of the company at that time—the user must understand operations, finance, and market trends. Answer options reflect levels of expertise, 1 through 5, corresponding to the five stages in the Dreyfus model. The “correct” answer is empirically determined. Because these are actual cases, the outcomes are known and the root causes of problems have been identified.

In addition to these Dreyfus questions tapping their business expertise, users are asked to provide three predictions that refer to quantitative outcomes in the company’s performance. These questions can vary slightly, as the instrument is customized according to a company’s needs; however, they will ask about issues, such as profits and revenues, that are indicative of how well a user can synthesize information about the company to predict real-world outcomes. For example, we may ask: What is your prediction of the company’s profits for the next 12 months? Users then indicate their answers along a 5-point Likert scale whose points are labeled appropriately, for instance, in the preceding example, options may range from “down 20% or greater” to “up 20% or greater.”

Users then go on to Year 2. After reading through the Year 2 materials, they are able to see whether or not their predictions were validated by the company’s performance. In other words, they receive feedback as to the accuracy of the previous year’s predictions. They repeat this exercise for five years of material, making predictions and getting feedback as to whether or not their predictions have been validated. This iterative process taps into users’ cognitive agility, allowing us to assess the degree to which users are able to revise their thinking in the face of feedback about company performance and their own predictions. Cognitively agile individuals learn from their inaccurate predictions or judgments and improve as they go along.

Furthermore, we can see persistent blind spots that may exist and occur consistently across all five years. Thus, the Profiler can provide windows into the acumen, blind spots, mental models, and agility with which users approach complex decision making for a real company. It is important to keep in mind that all of the data provided are from real companies. We do not determine the outcomes, as they are taken from actual annual reports and actual finances over a given period of time.

In addition to evaluating users’ direct responses to the Dreyfus and Likert questions, we also ask users to point to sections of the material they reviewed (including statements in the annual reports and financial summaries) that informed their decision on a particular question. For example, the annual report might mention a recent acquisition. This may reflect a strategic turning point for the company. As such, after users respond to the question on strategy, they must indicate what sections of the material influenced their decision. Users are allowed to choose up to five reasons for their decision. In this case, users should be aware that the recent acquisition plays a major role in the company’s strategy going forward, even if this is not immediately

obvious. As such, when users answer this particular strategy question, they should be pointing to the acquisition as a basis for their decision. This not only allows us to evaluate the expertise and accuracy of their responses, but also gives us a window into the kinds of information they use to approach the decision-making process. Furthermore, this aspect of the Profiler allows us to determine whether users are utilizing information based on the three core areas listed above: supply, demand, and finance. Specifically, we can see whether users approach the questions in an expert manner by evaluating the degree to which they are paying attention to these core areas as they make decisions.

Case Study: Background of a Biodevice Company

For this chapter, we will present a case in which we used the Profiler to assess the senior management team of a medical device company. Our relationship with the company began when the chairman and acting CEO asked us to evaluate his senior staff for succession planning purposes. In particular, he wished to decide who, among the division presidents, would succeed him as the CEO. At the time, the company was growing very rapidly. During the four months we worked with the company between 2005 and 2006, we saw them grow from \$300 million to \$400 million. A pending acquisition was intended to increase the company's size to \$600 million by 2008.

The CEO of the company was aware that there is a qualitative difference between *competent* managers, who do very well in interviews or on personality tests, and *experts*, who can perform under challenging conditions. He wanted to protect himself from competence at a time when his industry was in a high growth phase. He was afraid that a favorable market might be masking a lack of skill—and cognitive agility in particular—among his senior staff.

For this case study, we built the Profiler using data from five consecutive years of a biotech company of similar size and with similar business challenges. The company had experienced rapid organic growth, doubling in size with a major acquisition, while considerable outside investor capital fueled expanded distribution. The company also had similar financial challenges. For example, the profit margins for biotech and biodevice products can be very high (sometimes north of 90%), but the cost of sales and distribution is very high compared to other industries. The managers of the biotech company were competent, but failed to anticipate events that—from our data—an expert would have foreseen. In real life, the end result for the large and successful biotech company was implosion due to poor management decisions. The rationale for using this company's data was to evaluate the biodevice managers' risk for the same lack of foresight.

We assessed eight of the company's top managers (division presidents) and the CEO, thus totaling nine participants in all. All of them took an online version of the instrument. All the managers who participated were highly experienced (15+ years in a senior management role in biotech or biodevice with more than one company). Many had obtained their MBAs from prestigious schools such as Harvard or Cornell. They were also knowledgeable in global business. Not surprisingly, they showed themselves to be at Dreyfus Level 4 or 5 (on a scale from 1 to 5) on some of the key dimensions, such as strategy and leadership (see Figures 17.1 to 17.3 for mean scores).

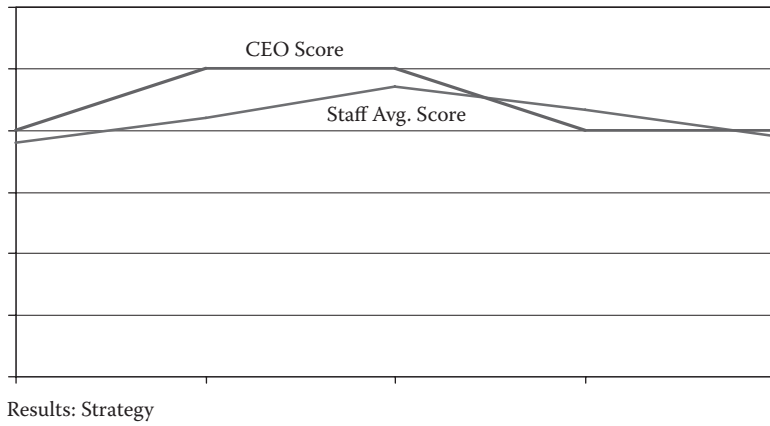


FIGURE 17.1 Averaged division presidents' scores compared to the CEO's scores on strategy.

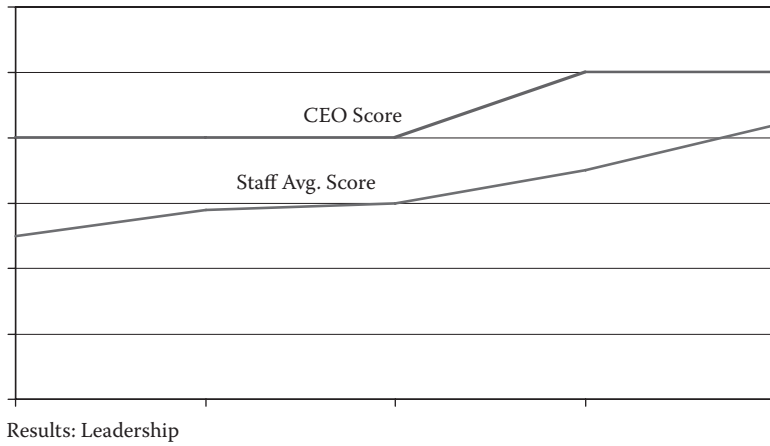


FIGURE 17.2 Averaged division presidents' scores compared to the CEO's scores on leadership.

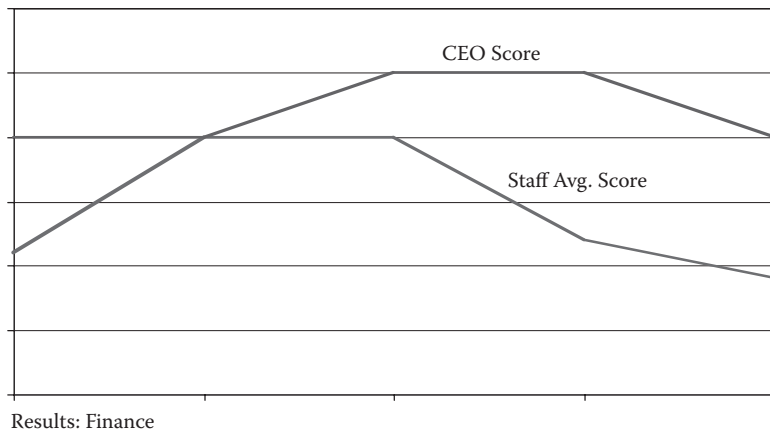


FIGURE 17.3 Averaged division presidents' scores compared to the CEO's scores on finance.

As a process check, we administered the same instrument to an equal of number of business-knowledgeable controls (BS or MBA business students who were not yet functioning managers or consultants and had not ever actually run a company of any size). Their performance was much lower. This, too, was an expected result.

Because the Profiler is an instrument used to profile the judgments of senior management, we do not use traditional quantitative measures, such as regression, ANOVAs, or other statistical tests. Instead, we rely on basic responses, means, and graphs to get a snapshot of the individual's performance against others' in the group. Our sample sizes are small, and we concentrate on describing the user and how he or she modifies thinking and behavior in response to dynamic conditions. Traditional assessment measures based on traditional statistical techniques are not appropriate for this kind of in-depth, dynamic assessment. Our results, therefore, are presented as descriptive observations only.

Descriptions of Managers' Profiles

We compared the average performance of the division presidents to the performance of the CEO with respect to their level of business expertise. The figures relate the average performance of all eight division presidents to the CEO alone across five years based on the three Dreyfus scored questions: strategy, leadership, and finance. The strategy question captures the user's beliefs about how the strategy of the company will be able to meet projected goals. The leadership question taps the user's confidence in the company's leadership to carry out strategy and vision. The finance question probes the user's beliefs about the contribution of key financial aspects of the company to short-term goals. These questions reflect key areas of information that would shape a top-level manager's decisions about a company. The biodevice managers showed marked agility on most dimensions. That is, their accuracy increased as they got more information with each "year" of the instrument they completed. In addition, in nearly all cases, they adjusted their thinking when their predictions were off the mark, demonstrating an ability to revise their thinking based on feedback.

On the strategy question, the CEO and staff expertise levels are nearly the same (see Figure 17.1). On the leadership question (Figure 17.2), the CEO performed slightly better than the staff, but in general the staff showed sufficient expertise in line with expectations. However, when we looked at the staff's predictions on the finance question, the results were troubling. All the staff except the CEO performed poorly. On this question, the division presidents performed more like the MBA students in our novice group. As can be seen in Figure 17.3, the division presidents rarely showed expertise above Level 2 or 3. Moreover, their predictions actually got worse over time, indicating that they did not revise their thinking over the years in response to feedback.

In general, financial understanding and financial agility should be the easiest of the three key questions, and a persistent blind spot in this area was not expected among managers at this level of seniority and experience. After discussing the results with the CEO, he indicated that a serious problem was emerging concerning the way finances were being managed, causing the company to lose more and more money as their revenues increased. One reason the CEO wanted to use the Profiler was to

determine whether this financial issue was due to a blind spot of his managers, or whether something out of the company's control was the root cause.

The Profiler revealed that the financial mental models of the division presidents had not changed as the company had grown. Their financial strategy regarding sales was to use consignment inventory to entice prospective clients early on to try the products. When the company was small and heavily funded by investors, this was a highly effective strategy. However, with gross revenues approaching \$1 billion, this was a lock up of capital that the company did not have and could not afford. The division presidents did not appreciate the negative implications of their strategy. As they lacked a full understanding of the financial dynamics of the uses of capital, and were unaware of the need for additional investment and sustainable positive cash flow and profits, the senior managers believed they were impacting the right variables with new products and market penetration. However, their growth strategies were actually putting the company's existence at risk.

*Conclusions: Pitfalls and Successes of Assessing
Complex Distributed Cognitive Systems*

Our analysis of the company, along with the results of the Profiler, made clear that the CEO had been "covering" the financial blind spot of his global team, allowing them to focus on penetrating the worldwide marketplace and growing the company. However, as the company doubled in size, this was an unrealistic approach. The CEO's expertise in finances was only sufficient so long as the challenges remained minimal and the company grew at a steady pace. Rapid expansion required the company to draw on the "distributed cognition" and financial skills of the team in a way they had not anticipated. By relying solely on the CEO's financial expertise, the company had created a blind spot that could have led to financial ruin.

We made a presentation on our findings at a board of directors' meeting and got enthusiastic agreement that we had uncovered an important shortcoming, and that those reporting to the CEO could not yet succeed to his position, or rely only on him to cover the financial decision making given the company's current size. The feeling in the room was that the problem had been identified in time and that remedial action could be taken. Furthermore, the staff themselves felt that they had sufficient insight into the problem, and that they knew what steps to take. They realized that they, as a unit, made decisions on the allocation of assets that were putting the company at risk, especially with some acquisition pending. They asked us to evaluate their staff members. As a result, 15 more people, all of whom were directly reporting to the division presidents, used the Profiler. Not surprisingly, the profiled results showed that the identified knowledge gap had spread to the lower levels. Every staff member assessed had a profile similar to his or her boss's.

Unfortunately, coordination among the collective "experts" in the organization was fragile, and the CEO was unable to compensate for gaps in team members' financial expertise. As the company continued to grow and the CEO was more involved in shaping the future of the company, he was less able to steer the financial decisions of his direct reports and the financial problems continued. Within six months, the

CEO and several of his staff were let go by the board of directors and the company continues to struggle under new leadership.

In the end, this case study created more questions than it answered. On the one hand, these data provided support for our model of a business expert's decision-making process. The CEO and his staff of division presidents scored high on two of the dimensions that are critical to expert decision making in business. In these areas (strategy and leadership), the company was healthy. However, the persistent blind spot in the area of finance, in which their thinking was similar to that of an advanced beginner or competent decision maker (on the Dreyfus stage model), led to the company's downfall. This occurred even though all the managers had long track records of professional achievement. On the other hand, when it comes to running large companies, expertise can and perhaps must reside among a group that works closely together to ensure that the situation is well managed, particularly in the face of rapid growth. This case study highlights the importance of identifying blind spots among top decision makers and presented the tools that can enable this process.

In this case study the Profiler uncovered the mental models used by the team and by the CEO. In so doing, we found a persistent blind spot with respect to one aspect of business expertise, despite significant acumen among team members in other business areas. Perhaps most significantly, we found that because the CEO may have been covering for the inadequate mental models of the rest of senior management, he may have enabled the persistence of domain-specific blind spots concerning financial issues. Because the senior management team was unaware of their inadequacy in the financial area and the consequences of their shortcomings, they were unable to identify and modify their strategies in time. Thus, while the Profiler was successful in uncovering a serious issue among senior management, our intervention may have been too late. The blind spots had become so entrenched in the company's strategy that by the time everyone realized what was wrong, change was too difficult to enact.

References

- Chase, W. G., & Simon, H.A. (1973). The mind's eye in chess. In W. G. Chase (Ed.), *Visual information processing*. New York, NY: Academic Press.
- Chi, M. T. H., Glaser, R., & Farr, M. J. (1988). *The nature of expertise*. Hillsdale, NJ: Erlbaum.
- Cole, M., Engestrom, Y., & Vasquez, O. (1977). *Mind, culture and activity; Seminal papers from the laboratory of comparative human cognition*. Cambridge, UK: Cambridge University Press.
- DiBello, L. (1997). Exploring the relationship between activity and the development of expertise: Paradigm shifts and decision defaults. In C. Zsombok & G. Klein (Eds.), *Naturalistic decision making* (pp. 17–28). Mahwah, NJ: Lawrence Erlbaum Associates.
- Dreyfus, H. (1997). Intuitive, deliberative, and calculative models of expert performance. In C. Zsombok & G. Klein (Eds.), *Naturalistic decision making* (pp. 17–28). Mahwah, NJ: Lawrence Erlbaum Associates.
- Dreyfus, H. L., & Dreyfus, S. E. (1986). *Mind over machine: The power of human intuition and expertise in the era of the computer*. Oxford, UK: Blackwell.
- Gentner, D., & Stevens, A. L. (Eds.). (1983). *Mental models*. Hillsdale, NJ: Erlbaum.
- Gore, J., Banks, A., Millward, L., & Kyriakidou, O. (2006). Naturalistic decision making and organizations: Reviewing pragmatic science. *Organization Studies*, 27, 925–942.

- Hollander, E. A. (1978). *Leadership dynamics: A practical guide to effective relationships*. New York, NY: Free Press.
- House, R. J., Spangler, D., & Woycke, J. (1991). Personality and charisma in the U.S. presidency: A psychological theory of leadership effectiveness. *Administrative Science Quarterly*, 36, 364–396.
- Hunt, J. G. (1999). Transformational/charismatic leadership's transformation of the field: An historical essay. *Leadership Quarterly*, 10, 129–144.
- Hutchins, E. (1996). *Cognition in the wild*. Cambridge, MA: MIT Press.
- Klein, G. (1999). *Sources of power*. Cambridge MA: MIT Press.
- Marion, R., & Uhl-Bien, M. (2001). Leadership in complex organizations. *Leadership Quarterly*, 12, 389–418.
- Meindl, J. R., Erlich, S. B., & Dukerich, J. M. (1985). The romance of leadership. *Administrative Science Quarterly*, 30, 78–102.
- Polanyi, M. (1967). *The tacit dimension*. Chicago, IL: University of Chicago Press.
- Roth, P. L., Bobko, P., & McFarland, L. A. (2005). A meta-analysis of work sample test validity: Updating and integrating some classic literature. *Personnel Psychology*, 58, 1009–1037.
- Schmidt, F. L., & Hunter, J. E. (1998). The validity of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological Bulletin*, 124, 262–274.
- Scribner, S. (1987, April 11). *Head and hand: An action approach to thinking* (Occasional Paper 3). Paper presented at the annual meeting of the Eastern Psychological Association, Arlington, VA.
- Vygotsky, L. (1986). *Thought and language* (A. Kozulin, Translator and Ed.). Cambridge, MA: MIT Press.
- Wegner, D. M. (1987). Transactive memory: A contemporary analysis of the group mind. In B. Mullen & G. R. Goethals (Eds.), *Theories of group behavior* (pp. 185–208). New York, NY: Springer-Verlag.