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EXPLORING INTUITION AND ITS ROLE IN MANAGERIAL DECISION MAKING

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We review and reconceptualize "intuition," defining intuitions as affectively charged judgments that arise through rapid, nonconscious, and holistic associations. In doing so, we delineate intuition from other decision-making approaches (e.g., insight, rational). We also develop a model and propositions that incorporate the role of domain knowledge, implicit and explicit learning, and task characteristics on intuition effectiveness. We close by suggesting directions for future research on intuition and its applications to managerial decision making.

> The human brain can be a magnificent synthesizer of disparate pieces of nebulous information, and often formal techniques and procedures thwart and inhibit this mysterious mechanism from operating efficiently (Raiffa, 1968: 272).

A classic trade-off noted by decision theorists is that decision accuracy is often inversely related to decision speed. Consequently, there has been pressure to understand how to make high-quality decisions relatively quickly (see Eisenhardt, 1989; Hitt, Keats, & DeMarie, 1998; Perlow, Okhuysen, & Repenning, 2002). Toward this end, in numerous articles in the popular business press and in a steadily growing body of more scholarly literature, authors have turned to the notion of "intuition" as a means of managing this trade-off (e.g., Burke & Miller, 1999; Hayashi, 2001; Khatri & Ng, 2000). As the epigraph suggests, intuition draws on our inborn ability to synthesize information quickly and effectively—an ability that may be hindered by more formalized procedures.

Within organizations, intuition has been posited to help guide a wide range of critical decisions. Research suggests that intuition may be integral to successfully completing tasks that involve high complexity and short time horizons, such as corporate planning, stock analysis, and performance appraisal (Hayashi, 2001; Isenberg, 1984; Shirley & Langan-Fox, 1996). Agor (1986) shows how managers use intuitions for strategic decisions, such as whether to invest capital in a project or whether to market controversial prescription drugs. Hayashi (2001) frames several high-profile executive-level decisions, including the development of the Dodge Viper and the prime-time launch of *Who Wants to Be a Millionaire,* as intuitive or "gut" decisions. Research further suggests that the need for intuition may be especially acute in organizations embedded in turbulent environments (Khatri & Ng, 2000).

The effective use of intuition has even been seen as critical in differentiating successful top executives and board members from lower-level managers and dysfunctional boards (Agor, 1986; Barnard, 1938; Harper, 1989). Ralph Larsen, former chair and CEO of Johnson & Johnson, suggested:

> Very often, people will do a brilliant job through the middle management levels, where it's very heavily quantitative in terms of the decision-making. But then they reach senior management, where the problems get more complex and ambiguous, and we discover that their judgment or intuition is not what it should be. And when that happens, it's a problem; it's a *big* problem (Hayashi, 2001: 61).

We believe that there have been two major barriers to a productive discourse on the topic of intuition within the management literature. The first concerns the considerable confusion surrounding what intuition is. Although intuition has a long history in the organizational sciences (Barnard, 1938; Behling & Eckel, 1991; Isaack, 1978; Peters, Hammond, & Summers, 1974; Prietula & Simon, 1989; Simon, 1987), in the litera-

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ture in this area scholars have failed to agree on what intuition is and what it does. This conceptual confusion comes, in part, from the various perspectives used to understand intuition. For example, among Western philosophers, intuition was often perceived as the most pure and immediate way of knowing (Osbeck, 2001; Wild, 1938). It represented access to divine or inborn knowledge. In the East, many Buddhists viewed intuition as a means of obtaining penetrating knowledge and as a "gateway to a wider and richer world" (Guenther, 1958: 26).

While some maintain that intuition is a mystical avenue to knowledge (e.g., Ferguson, 1999; Franquemont, 1999; Vaughan, 1979), researchers in the areas of management and psychology have explained intuition through a wide range of phenomena, including heuristics (Bazerman, 1986; Denes-Raj & Epstein, 1994; Tversky & Kahneman, 1983), expertise (Blattberg & Hoch, 1990; Prietula & Simon, 1989), and nonconscious information processing (Epstein, 1990, 1994, 2002; Kahneman, 2003; Lieberman, 2000). Thus, one purpose of this paper is to seek out sources of conceptual agreement or overlap across different disciplines and, thus, provide greater clarity about the concept of intuition.

A second barrier hindering this line of inquiry is that scholars often fail to distinguish between when intuitions are used and when they are used *effectively*. To illustrate, evidence suggests that individuals are likely to rely on intuitive thought processes when they face extreme time pressures (De Dreu, 2003; Edland & Svenson, 1993; Kaplan, Wanshula, & Zanna, 1993; Kruglanski & Freund, 1983; Maule, Hockey, & Bdzola, 2000; Suri & Monroe, 2003). Therefore, intuition may play a significant role in the decisions of firefighters (Klein, 1998), military commanders (Kaempf, Klein, Thordsen, & Wolf, 1996), emergency room surgeons (Abernathy & Hamm, 1995), and corporate executives operating under severe time constraints (Agor, 1986; Burke & Miller, 1999; Hayashi, 2001). The mere use of intuition, however, is not a panacea for the speed-accuracy trade-off, since its use may simply facilitate speed at the expense of accuracy. Therefore, we need to better understand those conditions that foster the *effective* use of intuition to complement existing work on when intuition is simply most likely to be used (e.g., Ruder & Bless, 2003; Sinclair, Ashkanasy, Chattopadhyay, & Boyle, 2002; Woolhouse & Bayne, 2000).

Drawing on recent advances in psychology and the decision sciences, we suggest that, under certain conditions, intuition may indeed facilitate rapid and effective decision making in organizations. Before such gains can be realized, however, we must first understand the boundary conditions that surround the concept. We begin with an exploration of what intuition is and how it is different from other related concepts, such as insight and instinct. We then consider the factors that determine when the use of intuition in decision making is most effective. Toward this end, we synthesize findings across a range of disciplines and formulate a set of propositions surrounding the effectiveness of intuitive decision making.

WHAT INTUITION IS: BRINGING TOGETHER INTUITIVE PROCESSES AND OUTCOMES

Having both academic and nonacademic significance, "intuition," perhaps not surprisingly, has a wide range of terms associated with it, including *gut feelings* (Hayashi, 2001), *hunches* (Rowan, 1989), and *mystical insights* (Vaughan, 1979; Wild, 1938). Table 1 provides a sample of definitions of intuition culled from work in psychology, philosophy, and management.

One confusing aspect of past research is the tendency to call both intuitive processes and their associated products, or outcomes, "intuition." For example, Jung (1933), Westcott and Ranzoni (1963), and Raidl and Lubart (2000-2001) refer to intuition largely as a process—a way of perceiving or sorting data. Rorty (1967), in contrast, sees intuition primarily as an outcome—as what one apprehends or recognizes. Others combine both process and outcome without differentiating between them. We believe that intuition is marked by a unique process and outcome; however, we also believe it is important to disentangle the two. Thus, we begin by addressing intuition as a process and positioning this process vis-à-vis the larger "dual processing" perspective that is currently favored among decision-making theorists, especially in psychology. We then build from this perspective to identify process and outcome characteristics that historically have been central to many definitions of intuition.

TABLE 1
Definitions of Intuition

Source	Definition of Intuition
Jung (1933: 567–568)	That psychological function transmitting perceptions in an unconscious way
Wild (1938: 226)	An immediate awareness by the subject, of some particular entity, without such aid from the senses or from reason as would account for that awareness
Bruner (1962: 102)	The act of grasping the meaning, significance, or structure of a problem without explicit reliance on the analytic apparatus of one's craft
Westcott & Ranzoni (1963: 595)	The process of reaching a conclusion on the basis of little information, normally reached on the basis of significantly more information
Rorty (1967: 204)	Immediate apprehension
Bowers, Regehr, Balthazard, & Parker (1990: 74)	A preliminary perception of coherence (pattern, meaning, structure) that is at first not consciously represented but that nevertheless guides thought and inquiry toward a hunch or hypothesis about the nature of the coherence in question
Shirley & Langan-Fox (1996: 564)	A feeling of knowing with certitude on the basis of inadequate information and without conscious awareness of rational thinking
Simon (1996: 89)	Acts of recognition
Shapiro & Spence (1997: 64)	A nonconscious, holistic processing mode in which judgments are made with no awareness of the rules of knowledge used for inference and which can feel right, despite one's inability to articulate the reason
Burke & Miller (1999: 92)	A cognitive conclusion based on a decision maker's previous experiences and emotional inputs
Policastro (1999: 89)	A tacit form of knowledge that orients decision making in a promising direction
Lieberman (2000: 111)	The subjective experience of a mostly nonconscious process—fast, alogical, and inaccessible to consciousness—that, depending on exposure to the domain or problem space, is capable of accurately extracting probabilistic contingencies
Raidl & Lubart (2000-2001: 219)	A perceptual process, constructed through a mainly subconscious act of linking disparate elements of information
Hogarth (2001: 14)	Thoughts that are reached with little apparent effort, and typically without conscious awareness; they involve little or no conscious deliberation
Myers (2002: 128–129)	The capacity for direct, immediate knowledge prior to rational analysis
Kahneman (2003: 697)	Thoughts and preferences that come to mind quickly and without much reflection
Epstein (personal communication, 2004)	The working of the experiential system

Historical Context: Two Information Processing Systems

Intuition has long been viewed as involving a form of information processing that differs from rational, or analytical, processes. Distinctions between "rational" and "nonrational" human thought can be traced as far back as Aristotle (Sloman, 1996). In management research, Barnard similarly distinguished between "logical" and "nonlogical" modes of thinking, attributing intuition to the latter:

> By "logical processes" I mean conscious thinking which could be expressed in words, or other symbols, that is, reasoning. By "non-logical processes" I mean those not capable of being expressed in words or as reasoning. . . . This may be because the processes are unconscious, or because they are so complex and so rapid, often approaching the instantaneous, that they could not be analyzed by the person within whose brain they take place (1938: 302).

More recently, psychologists have adopted a dual processing approach, arguing for two distinct types of information processing systems in human beings (e.g., Epstein, 2002; Gollwitzer & Bayer, 1999; Sloman, 1996). One information processing system, which from an evolutionary perspective is believed by some to be the older of the two systems (Epstein, 1994; Reber, 1992), involves the automatic and relatively effortless processing and learning of information (Stanovich & West, 2000). This system, which permits

individuals to learn from experience and reach perceptions of knowing without conscious attention (Hogarth, 2001), has been referred to as *experiential* (Epstein, 1990, 1994, 2002; Epstein, Pacini, Denes-Raj, & Heier, 1996; Pacini & Epstein, 1999), *automatic* (Bargh, 1996; Bargh & Chartrand, 1999), *tacit* (Hogarth, 2001), *natural* (Tversky & Kahneman, 1983), *associative* (Sloman, 1996), and *system 1* (Kahneman, 2003; Stanovich & West, 2000).

Bargh and Chartrand (1999) argue that a large portion of everyday life is determined by this first information processing system. Insofar as such processes are rapid, effortless, and often quite effective, nonconscious processes serve as "mental butlers" that conveniently manage our tendencies and preferences (Bargh & Chartrand, 1999). As we explain below, intuition is often associated with this system (e.g., Epstein, 2002, Kahneman, 2003; Sloman, 1996).

The second system enables individuals to learn information deliberately, to develop ideas, and to engage in analyses in an attentive manner. This system has been referred to by various names, including *rational* (Epstein, 2002; Epstein et al., 1996; Pacini & Epstein, 1999), *intentional* (Bargh & Chartrand, 1999), *deliberate* (Hogarth, 2001), *extensional* (Tversky & Kahneman, 1983), *rule based* (Sloman, 1996), and *system 2* (Kahneman, 2003; Stanovich & West, 2000). Rational decision-making models, which have garnered the lion's share of research on managerial decision making, utilize this system of information processing.

Drawing on the conceptual foundation provided by dual processing theories, we now turn to the concept of intuition. Like other authors, we view the *process* of intuition as relating to the domain of the "nonconscious" information processing system (e.g., Epstein 1990, 1994, 2002; Kahneman, 2003). However, in making this case, we also stress that not *all* nonconscious operations are fundamental components of intuition itself. We have two primary reasons for differentiating intuition from any given nonconscious system depicted in dual processing theory. First, the nonconscious systems in dual processing theories typically involve a larger group of phenomena than are central to intuition. For example, research on the nonconscious system has often focused on learning processes. However, as we will argue, intuitive processes pertain less to learning and more to how learned information is accessed and used. We view learning as an *input* to intuition effectiveness, but do not see intuition as a learning process per se. Second, our focus on both processes and outcomes of intuition differentiates our work from traditional research on nonconscious systems, such as that on the experiental system, which has focused nearly exclusively on processes only. Specifically, we conceptualize intuition both by its process (which we refer to as *intuiting*), as well as its outcome (which we term *intuitive judgments*).

In constructing a definition of the construct, we build on and bridge work in psychology, philosophy, and management; our focus is on those aspects of intuition that are common and central to all three. Specifically, our review of the various literature on intuition has tended to converge on four characteristics that make up the core of the construct: intuition is a (1) nonconscious process (2) involving holistic associations (3) that are produced rapidly, which (4) result in affectively charged judgments. We explore these characteristics in detail below.

Intuiting Is Nonconscious

One of the defining characteristics of intuitive processing is that it is nonconscious[1]—it occurs outside of conscious thought. Jung, for example, defined intuition as "that psychological function which transmits perceptions in an unconscious way" (1933: 567–568). Simple perceptions, however, are not the only type of information that is transmitted through this means. The nonconscious processing of information can occur at various levels of sophistication (Epstein, 2002; Pacini & Epstein, 1999), and intuiting can involve the processing of more complex information than perceptions. On this point, Epstein and Pacini make the following observation about the nonconscious, experiential system:

> At its lower reaches, it [the experiential system] is a relatively crude, albeit efficient, system for automatically, rapidly, and effortlessly processing

[1] This characteristic of intuition has been called "unconscious," "subconscious," "preconscious," and "nonconscious" (Epstein, 1994; Hogarth, 2001; Jung, 1933; Reber, 1992; Simon, 1987). However, each of these terms has slightly different meanings (see Kihlstrom, 1987, for a review). For the sake of parsimony, we refer to what each of these terms has in common: they are nonconscious.

> information while placing minimal demands on cognitive resources. At higher reaches . . . the experiential system can be a source of intuitive wisdom and creativity (1999: 463).

In further clarifying the connection between nonconscious processing and intuition, we reemphasize the distinction between intuitive processes and outcomes. While the outcomes of intuiting, intuitive judgments, are clearly accessible to conscious thinking, how one arrives at them is not. Hence, there is "no awareness of the rules of knowledge used for inference" during intuiting (Shapiro & Spence, 1997: 64). Similarly, Osbeck writes that intuition, from a philosophical perspective, involves direct apprehension that is "not mediated by other reasoning or representation" (2001: 123). As we discuss below, this quality differentiates intuition from insight.

Intuiting Involves Making Holistic Associations

A second characteristic of intuiting is that it involves a process in which environmental stimuli are matched with some deeply held (nonconscious) category, pattern, or feature. Historically, this matching process has gone by numerous names, including *awareness* (Wild, 1938), *apprehension* (Rorty, 1967), *recognition* (Simon, 1996), and *seeing* (Osbeck, 1999). More recently, Raidl and Lubart described intuition as involving a process of "linking disparate elements of information" (2000-2001: 219). This linking together of elements is why many refer to intuiting as being *associative* (Epstein, 1994; Epstein et al., 1996; Kahneman, 2003). Further, because intuiting involves recognizing features or patterns (e.g., Klein, 1998), rather than making connections through logical considerations, it has also been conceptualized as *holistic* (Epstein, 1990; Shapiro & Spence, 1997). As such, Bowers, Regehr, Balthazard, and Parker speak of intuition as involving a "perception of coherence (pattern, meaning, structure)" (1990: 74). In sum, since the associations in intuition refer to the recognition of patterns or structures, we refer to this aspect of intuiting as making *holistic associations*.

Psychologists and other decision science scholars suggest that, in making holistic associations, individuals nonconsciously map stimuli onto cognitive structures or frameworks. Research has typically focused on one of two types of cognitive structures. The first and most common line of research examines the role of relatively simple cognitive structures, such as *heuristics,* in the formation of intuitive judgments (Bazerman, 1986; Bodenhausen, 1990; Kahneman, Slovic, & Tversky, 1982; Kahneman & Tversky, 2000; Tversky & Kahneman, 1983). As we will argue below, this line of research has often concluded that intuitive decision making is inferior to rational decision-making models.

A second line of inquiry suggests that intuiting may involve the use of more complex, but still not consciously accessible, cognitive structures. For instance, drawing on the work of Agor (1989), Shirley and Langan-Fox (1996: 573) have argued that intuiting results from a process of recognition and retrieval in which large numbers—perhaps several thousands—of chunks or patterns stored in long-term memory are accessed without conscious effort. This stream of research, focusing largely on the intuitions of experts (e.g., surgeons making life-and-death decisions, chess masters engaging in competition), contends that experts possess highly sophisticated, nonconscious cognitive structures that permit rapid and accurate responses to highly demanding situations (Dreyfus & Dreyfus, 1986; Klein, 1998, 2003; Prietula & Simon, 1989; Simon, 1987, 1992, 1996; Simon & Chase, 1973). Such research has tended either to favor the use of intuition over more rational models or to position intuition as a useful complement to analytical thinking. Thus, intuition is seen as a subset of the entire population of decision-making approaches successfully used by experts. However, common to both the heuristic and expert decision-making perspectives is the view that individuals nonconsiously make holistic associative connections between the stimuli they encounter and their underlying cognitive structures in the process of intuiting.

Making holistic associations is not only a characteristic of intuiting but also speaks to one of intuition's advantages over other decision-making approaches: our nonconscious ability to make such categorical connections is greater than our ability to mimic it consciously. As Raiffa (1968) argues in the quote that opens our paper, such ability may be undermined by our attempts to use more conscious, or rational, means of making judgments and decisions. It has even been stated that, in some instances, rational analysis may prevent people from "seeing the obvious" (Pirsig, 1974: 196). As noted above, conscious thinking appears to rely on

connections made through a slow and effortful analysis (Epstein, 1990, 1994; Kihlstrom, 1987). These properties contrast sharply with the holistic and associative qualities of the experiential system. All told, it comes as little surprise that intuiting is perhaps better suited than rational methods to integrate wide-ranging stimuli into usable categories of information.

Intuiting Is Fast

A third characteristic of the intuition process, and the one that has seemed to spark the most interest among both managers and academics, is its speed (Bastick, 1982; Burke & Miller, 1999; Kahneman, 2003; Khatri & Ng, 2000; Myers, 2002). Although there has been some debate about whether intuiting is *always* fast (see Hogarth, 2001), the vast majority of researchers view intuiting as quite fast—especially when compared with the use of rational decision-making processes. The centrality of "speed" is seen in the concepts of intuition used by philosophers (see Wild, 1938, for a review). Rorty for example, views this process as involving "immediate apprehension" (1967: 74). Osbeck, in a newer review of the philosophical roots of intuition, views speed as a defining aspect of intuiting and notes that Locke and Hume viewed intuition as "the immediate perception of connection between ideas" (2001: 121).

This emphasis on speed is echoed in other more recent perspectives on intuition. Researchers who view intuiting—and nonconscious information processing more generally—as an evolutionary precursor to more conscious and analytical thinking point to the advantages of having an information processing system that responds quickly to environmental stimuli (Epstein, 1994; Haidt, 2001; Reber, 1992). Kihlstrom (1987: 1447) similarly argues that processing information nonconsciously does not require attention and, thus, does not produce the same information "bottlenecks" that conscious processing does.

From a managerial perspective, the speed of intuiting is not only taken for granted but is often seen as a primary motivator for developing and employing intuition at work (Agor, 1986; Burke & Miller, 1999; Khatri & Ng, 2000; Klein, 2003). Moreover, the speed characteristic of intuition has long been recognized by management theorists. Barnard proclaimed intuition to be a component of "non-logical mental processes" that are capable of handling a "mass of experience or a complex of abstractions in a flash" (1938: 305). March and Simon echo Barnard's view, asserting that one of the hallmarks of intuiting, in addition to its nonconscious nature, is its speed:

> The distinctive earmarks of intuition are rapid response (a matter of seconds) and inability of the respondent to report a sequence of steps leading to the result—even denial of awareness of such steps. . . . what impresses observers about intuition is that responses, especially those of experts, are frequently correct even though they seem to have required almost no processing time or effort (1993: 11).

Intuiting Results in Affectively Charged Judgments

Although "intuiting" refers to a unique way of processing information, individuals often use intuition as a noun—as the product of such processing. To differentiate the process and product facets of intuition, we use the term *intuitive judgment* to signify intuition in its outcome state.

We make reference to "judgments" rather than some other outcome state, given the strong association between intuition and problem solving. To illustrate, pioneering works in managerial problem solving (Barnard, 1938; Simon, 1987, 1996) and classic works on decision making (Kahneman et al., 1982; Tversky & Kahneman 1974, 1983) focus explicitly on how individuals use intuiting to solve problems. This problem-focused treatment of intuition is echoed in the work of Policastro (1999), who holds that intuition is a type of knowledge used to orient decision making.

We further clarify intuitive judgments as "affectively charged," given that such judgments often involve emotions. Chen and Chaiken (1999: 87), for example, suggest that the presence of "cognitive feelings" may indicate that heuristic processes are operating. And, more generally, synonyms for intuition, such as "gut feelings" and "gut instincts" (Hayashi, 2001; Shapiro & Spence, 1997), as well as "*feeling* in our marrow" (Barnard, 1938: 306), reflect an affective component to intuitive judgments. Thus, one way that we identify a judgment as intuitive is that it is accompanied by affect. For example, Agor (1986) notes that as executives make intuitive judg-

ments, they often experience excitement and harmony. And Shirley and Langan-Fox define intuitions as "feelings of knowing" (1996: 564).

The coupling of affect and intuitive judgments has a long intellectual history. At a very basic level, these judgments may be thought of as affective because they are detached from rationality. Thus, rationality is often associated with the "head" and intuition with the "heart"—a common divide in philosophy. However, recent research suggests other possibilities. To begin with, intuitive judgments may be *triggered* by emotions and affect. Positive mood, for example, has been linked to an increase in the use of intuition and a decrease in more rational approaches to decision making (see Weiss & Cropanzano, 1996, for a review). Similarly, managers often view affect as an important input to intuition and describe intuitions as "affect-initiated decisions" (Burke & Miller, 1999). And Hogarth argues that "emotion and affect can, therefore, be important inputs to intuitive thought in the sense that they can induce responses without corresponding awareness" (2001: 61).

Moreover, emotions and affect may also play a role in the intuition *process* itself and, thus, result in affect-laden judgments. Epstein (1990, 1994, 2002), for example, ties emotion and intuition through the experiential information processing system described above by suggesting that all processes in the nonconscious (experiential) system are emotionally driven. Bastick makes a similar argument, suggesting that "intuitive information is accessed through appropriate feelings" (1982: 279). Epstein further argues that the cognitive frameworks in the experiential system, which he refers to as *schemas,* are "inductively derived from emotionally significant experiences" (1990: 170).

Intriguingly, research in neuroscience has suggested a link between intuition and affect via activation of basal ganglia in the human brain (see Lieberman, 2000, for a review). This line of investigation has shown that basal ganglia are engaged through positive affective stimuli and positive emotional experience, and these same neural mechanisms play a central role in engendering the nonconscious associations that spur intuitive judgments. In essence, both intuitions and emotional appraisals appear to arise through highly similar neurological pathways. Taken together, evidence from organizational, cognitive, and neurological psychology suggests that affect and emotions are an integral component of intuitive judgments.

In sum, research suggests that affect is associated both with the intuiting process and with intuition as an outcome. We therefore use the term *affectively charged* to denote the affective tenor of intuitive judgments, as well as to reflect how such judgments were generated (i.e., were "charged" via an affective process).

Other Elements Associated with Intuition

Our central characteristics of intuition are based on their commonality to definitions across philosophy, psychology, and management. In addition to their commonality, they also appear to be the most "core" features. Consequently, we have excluded some additional characteristics of intuition since they appear to result from the core characteristics we suggest. To illustrate, several conceptualizations of intuition involve a feeling of certitude (Shirley & Langan-Fox, 1996) and a perception that one's intuitions are correct—despite the lack of rational analysis (Bruner, 1962; Wescott & Ranzoni, 1963). This characteristic, however, likely is due to the affective and associative properties we have discussed. As noted, Agor (1986) has argued that as executives make intuitive judgments, they often experience strong and positive emotions (e.g., excitement, harmony). Such positive feelings may, in turn, lead to an enhanced sense of confidence in an individual's own judgments (see Tiedens & Linton, 2001, for a discussion). Thus, if I feel good about a judgment, I must be right about it.

In addition, the holistic, associative properties of intuition involve recognizing patterns or other linkages among disparate stimuli. Hence, philosophers have linked intuition with "seeing" or "recognizing" an answer (Osbeck, 1999, 2001). Because intuition involves "recognizing" a solution (Simon, 1996), it is likely that individuals will have more confidence in their intuition than in a "wild guess," which is often made when no solution is recognizable.[2]

[2] However, we should be clear that just because an individual has confidence that the solution is a good one does not mean that the individual will adopt the solution. That is,

As noted earlier in the paper, we have also excluded characteristics ascribed to intuition that seem unique to a particular disciplinary domain. For example, intuition is associated with both experiential (Epstein 1990, 1994, 2002) and system 1 (Kahneman, 2003; Stanovich & West, 2000) processes in dual processing theories. Both of these processes are associated with additional characteristics (e.g., presence of "vibes," "seized by emotions," and "pleasure driven") that do not necessarily accord with the core features of intuition discussed above. Because not all of these characteristics have traditionally been associated with intuition, additional validation is needed before viewing them as core and central to the concept.

Intuition Defined and Delineated

To summarize, intuitions are *affectively charged judgments that arise through rapid, nonconscious, and holistic associations*. These characteristics not only capture what we mean by intuition but also help clarify which types of decision-making processes are intuitive and which are not. To illustrate, of all other ways of making judgments and decisions reviewed here, only the nonconscious use of heuristics and internalized patterns of information fall within what we call intuition. In contrast, we believe that rational decision making is highly dissimilar to intuition. The former involves the use of systematic procedures designed to thoroughly assess all pertinent information, evaluate costs and benefits, and, ultimately, make a decision based on conscious deliberation (see Janis & Mann, 1977, for more detail on rational decision-making models). In short, it is highly analytic and relies on logical connections. Moreover, as we have discussed, rational decision making involves a completely different type of information processing system than the experiential system utilized in intuition. In brief, intuition differs from more rational models of decision making in that it is (1) nonconscious, (2) holistic, (3) associative, and (4) faster.

In addition, intuition differs from other decision-making approaches that are typically viewed as "fast." For example, intuition is similar to guessing only in terms of its speed. Guessing neither involves affectively charged judgments nor requires making associations through nonconscious information processing. It also lacks the secondary outcome associated with these two characteristics of intuition: certitude. Intuition is also different from instincts and insights—terms often used synonymously with intuition in everyday speech. We follow the lead of Hogarth (2001) and Epstein (2002) in arguing that biological instincts (e.g., shutting one's eyes in the presence of bright light) are "hardwired" responses or autonomic reflexes to stimuli. Thus, instincts are innate capabilities that originate outside the experiential processing system.

Next, insights or "sudden unexpected thoughts that solve problems" (Hogarth, 2001: 251) may involve experiential processing in the form of an "incubation period." However, unlike intuition, insight is often a lengthy process that begins with deliberate, analytical thinking that precedes the incubation period (Hogarth, 2001; Shirley & Langan-Fox, 1996). Further, when a solution is gleaned through insight, one "suddenly becomes aware of the logical relations between a problem and the answer" (Lieberman, 2000: 110; see also Sternberg & Davidson, 1995, for a more comprehensive treatment of insight). This suggests another distinction between insight and intuition: in the former one consciously becomes aware of the logical connections supporting a particular answer or solution, whereas in the latter one is unable to consciously account for the rationale underlying the judgment that has arisen.

CONDITIONS INFLUENCING THE EFFECTIVENESS OF INTUITIVE DECISION MAKING

Thus far, we have focused largely on the process of intuiting and how this process differs from the processes that guide other forms of decision making, such as rational analysis. We now turn our attention more fully to the products of intuiting—intuitive judgments—and the conditions that explain when these judgments are most effective.

In research that has focused on the effectiveness of intuitive decision making, disagreement abounds as to whether intuitive judgments lead to effective decisions. To begin with, a substan-

individuals may still distrust intuitive means, regardless of the veracity of the solution.

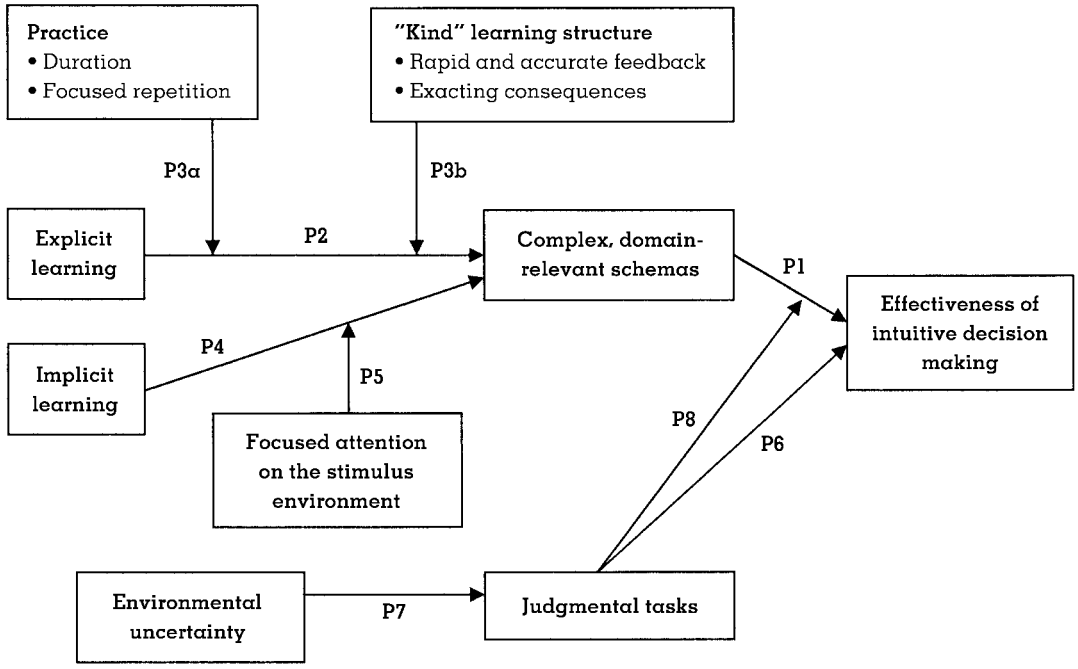
tial body of research suggests that the use of intuition in decision making is generally inferior to other, more rational models (e.g., Dawes, Faust, & Meehl, 1989; Kahneman et al., 1982; Meehl, 1954; Schoemaker & Russo, 1993). In contrast, a growing body of literature suggests that for certain people, under appropriate conditions, intuition may be as good as, or even superior to, other decision-making approaches (Blattberg & Hoch, 1990; Hammond, Hamm, Grassia, & Pearson, 1987; Khatri & Ng, 2000).

To reconcile these divergent perspectives, we turn to an exploration of the conditions that influence whether intuition is effective as a decision-making approach. Our review suggests that two broad sets of factors influence intuition effectiveness: (1) domain knowledge factors and (2) task characteristics. These factors are depicted in Figure 1.

First, one of the primary differences between research on the effectiveness of intuition conducted by researchers interested in heuristics and those interested in expert decision making pertains to the relative emphasis attached to the existence and accumulation of domain knowledge. While some scholars have tended to focus primarily on heuristics and heuristic biases that affect most individuals, regardless of their domain knowledge, others have focused more extensively on expert knowledge structures and how such structures influence the quality of intuitive decision making within specific domains. We seek to integrate these bodies of work by examining how various degrees of domain knowledge, ranging from simple heuristics to sophisticated "expert" schemas, may influence the effectiveness of intuition as a decision-making approach in a given domain. We also examine how expert schemas may form via implicit and explicit learning.

Second, research suggests that intuition is good in some situations but not in others. For example, research concerned with heuristic biases has focused on how the use of intuition to solve highly structured math and probability problems can lead to highly inaccurate solutions. However, as noted in our introduction, intuition may be most appropriate for "executive" decisions, which involve strategy, investment, and human resource management issues. These types of decisions are far less structured than math problems. We discuss each set of intuition effectiveness factors below.

FIGURE 1
Factors Influencing the Effectiveness of Intuitive Decision Making



Domain Knowledge Factors: Schemas

An individual's knowledge of a domain is reflected in the *schemas* he or she has about that domain. We use the term *schema* generally to denote various cognitive structures that represent "knowledge about a concept or type of stimulus, including its attributes and the relations among those attributes" (Fiske & Taylor, 1991: 98). We suggest that a primary means for determining when intuition will be effective involves the nature of schemas employed by the intuiter. As we discuss below, schemas may be relatively simple and contain little domain knowledge (i.e., are domain independent), as in the case of heuristics (Denes-Raj & Epstein, 1994; Tversky & Kahneman, 1974). Alternatively, schemas may be complex and contain much domain knowledge, as in the case of experts' cognitive maps (Simon, 1996).

Heuristic schemas. In a well-established body of research in psychology and the decision sciences, scholars have argued that intuition involves the use of heuristics—mental shortcuts that reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations (Tversky & Kahneman, 1974). When presented with a problem, individuals can use heuristics to draw associations among multiple stimuli, to focus on critical information, and to develop a perception of the right answer or best route by which to proceed.

While heuristics are often useful for quickly assessing probabilities and making decisions in uncertain situations, they may also lead to severe and systematic errors (Tversky & Kahneman, 1974). Indeed, a large portion of decision-making literature over the past three decades has focused on heuristic-based judgmental errors. Such studies suggest that while the appeal of heuristic-based intuition is strong—and that individuals will often choose to use heuristics, even when they know it is not rational to do so (Denes-Raj & Epstein, 1994)—rational processes for problem assessment are less subject to random inconsistencies and systematic distortions (Schoemaker & Russo, 1993).

We argue that heuristics and other simple cognitive frameworks are likely to lead to inaccurate intuitive judgments because they tend to be "simple" and, thus, may be inadequate to process complex environmental stimuli. This argument mirrors the bulk of research on the shortcomings of heuristics and stereotypes. It essentially takes a "requisite variety" approach that the complexity of schemas should match environmental complexity in order to be effective (see Weick, 1995). We further suggest that heuristics may be more domain independent and may be commonly applied (inappropriately) across various domains. With regard to domain independence, the relative lack of domain sensitivity diminishes the effectiveness of intuitive decision making as simple "rules of thumb" are indiscriminately applied to an inappropriately large number of problem domains. With regard to the frequency of their use, research suggests that individuals who lack adequate domain knowledge may have inflated self-assessments of their own ability to make accurate judgments (Kruger & Dunning, 1999) and, thus, may have a higher propensity to apply simple schemas across a wide variety of situations.

Expert schemas. While the heuristic-based view of intuition has dominated research on intuition and problem solving, a growing body of research suggests that that "experts" can make highly accurate intuitive decisions (Dreyfus & Dreyfus, 1986; Klein, 1998, 2003; Prietula & Simon, 1989; Simon, 1987, 1992, 1996). We argue that the main difference between these bodies of research lies in the nature of the schemas of experts, which are (1) highly complex and (2) domain relevant.

Simon and Chase's (1973) foundational article on the memory storage patterns of chess masters and grandmasters provides an early example illustrating the role of complex schemas in guiding the decisions of experts. This study revealed that chess masters are able to recognize at least 50,000 different configurations of chess pieces on sight, which are stored or "chunked" as familiar patterns in long-term memory. When presented with an arrangement of pieces on a chessboard, chess masters almost immediately recognize both the patterns of the chess pieces and the appropriate strategic moves for the given situation. Consequently, grandmasters in speed chess competitions can effectively play several games simultaneously, even when they are only allowed a few seconds per move (Simon & Chase, 1973).

Broadening these findings beyond the chess domain, "expert" intuition may be aptly described as a "pattern matching" process, whereby information is encoded and chunked

into patterns, stored in schemas, and then equated with environmental stimuli (Simon, 1996). As Prietula and Simon note when discussing the difference between a novice and experienced foreman:

> In fact, the veteran does not scan the environment and process information any faster than the inexperienced foreman; rather, he (or she) has learned to grasp the meaning of certain patterns of operations and activity on the plant floor. In a sense, the foreman does not need to think about this information; he simply reacts to it (1989: 121).

Scholars advocating for the effectiveness of expert or "mature" intuition (e.g., Baylor, 2001; Blattberg & Hoch, 1990; Burke & Miller, 1999) use the same underlying logic as Simon and his colleagues: experts have complex cognitive maps (or schemas) that trigger effective intuitive judgments.

Despite the promise of these complex schemas for effective decision making, an important boundary condition applies. Because complex schemas develop in a particular domain (one's area of expertise), they are more likely to lead to effective decisions in that domain than when used in a different domain or context. Thus, complex managerial schemas may serve a manager well at the office but may lead to inaccurate intuitive judgments at home. This suggests that, for intuitions to be effective, schemas must be both complex and domain relevant.

> *Proposition 1: Individuals who can bring complex, domain-relevant schemas to bear on a problem are more likely to make effective intuitive decisions than those who employ heuristics and simpler, domain-independent schemas.*

Domain Knowledge Factors: Learning

In addition to research on the content of schemas, in a growing body of work, researchers are exploring how individuals come to gain the complex, domain-relevant schemas needed for effective intuition. The literature on expertise discussed above suggests that there may be a learning component to developing the schemas that underlie accurate intuitive judgments. In particular, researchers are coming to connect the formation of sophisticated cognitive structures to both explicit and implicit learning. We briefly review the general relationship between learning and the formation of complex, domain-relevant schemas.

Explicit learning. Explicit learning occurs when individuals are consciously aware that changes are accruing to their underlying knowledge bases (Lovett, 2002). Perhaps the most researched link between explicit learning and intuition has been on how experts, such as chess grandmasters, come to attain mastery over a particular domain. The general argument posited in this research is that experts deliberately develop a vast repertoire of patterns in memory that allows them to respond to contingencies in an automatic and proficient manner (Simon, 1996; Simon & Chase, 1973). Thus, we suggest a general relationship between explicit learning and intuition effectiveness.

> *Proposition 2: Explicit learning will positively influence the effectiveness of intuitive decision making through the formation of complex, domain-relevant schemas.*

However, learning is heightened with certain types of practice. Research suggests three primary elements of "good" practice: duration, repetition, and feedback. First, development periods for mastery tend to be long. With respect to the relationship between practice and expert intuition in management, Khatri and Ng argue that, for managerial intuition to be effective, it "requires years of experience in problem solving and is founded upon a solid and complete grasp of the details of the business" (2000: 58). More specifically, research suggests that a ten-year period of intense preparation appears necessary for achieving expertise in a domain (Ericsson & Charness, 1994; Ericsson, Krampe, & Tesch-Römer, 1993; Simon & Chase, 1973).

Additional characteristics of practice that strengthen the link between explicit learning and the development of complex, domain-relevant schemas are repetition and feedback. Ericsson and colleagues, for example, argue that it is only through "deliberate practice," involving repetition and successive refinement through concentration and immediate, accurate feedback, that an individual will develop the capacity to perform as an expert (Ericsson & Charness, 1994; Ericsson & Lehmann, 1996; Ericsson & Smith, 1991). Similarly, Hogarth (2001) argues that practice done in "kind" learning struc-

tures will facilitate effective intuition. Kind learning structures are those where feedback is both relevant and exacting. Relevant feedback is conceptualized as speedy and accurate feedback that enables the individual to learn to assign proper causal relationships among decisions, actions, and outcomes. Exacting feedback implies a significant need for precision. A brain surgeon, for example, has little room for error while operating on a patient. Exacting feedback generally leads to accurate learning because small errors can have serious consequences.

In sum, we argue that individuals who want to form complex, domain-relevant schemas must engage in repetitive practice over a long period of time. They must also receive feedback about their performance that is both accurate and exacting.

> *Proposition 3a: The relationship between explicit learning and the formation of complex, domain-relevant schemas will be strengthened when individuals engage in focused, repetitive practice over long periods of time.*
>
> *Proposition 3b: The relationship between explicit learning and the formation of complex, domain-relevant schemas will be strengthened when individuals perform in the presence of "kind" learning structures (rapid and accurate feedback and exacting consequences).*

Implicit learning. While explicit learning may indeed make for more advanced and effective intuitive decision making in some situations, a growing body of research suggests that it may not always be necessary for the formation of complex, domain-relevant schemas. Instead, schemas may develop through implicit learning. Implicit learning refers to the process by which one acquires—outside of one's conscious awareness—knowledge about the structure or pattern underlying a complex stimulus environment (Reber, 1989: 219; see also Lewicki, Hill, & Bizot, 1988; Reber, 1992; Reber, Walkenfeld, & Hernstadt, 1991; Seger, 1994; Stadler & Frensch, 1998).

Implicit learning differs from its external counterpart in important ways. Not only are individuals unaware that such learning is occurring, but research suggests that implicit knowledge is stored in the brain differently from other types of knowledge. To illustrate, knowledge acquired via implicit learning will be retained when an individual suffers from amnesia, even when more explicit knowledge is lost (Seger, 1994). This suggests that although explicit and implicit learning can occur simultaneously in a given context, implicit learning involves a different process of knowledge acquisition and storage.

Both implicit learning and intuition have been linked to the nonconscious processing system described earlier. Just as intuition involves a nonconscious, experiential processing of information stored in memory, implicit learning refers to a similar nonconscious process of knowledge acquisition. Reber (1989) has tied implicit learning to "intuitive knowledge" and argues that it is through implicit learning that individuals come to form the complex cognitive structures necessary for intuitive judgments and decisions. In support of this claim, researchers have linked implicit learning to the acquisition of grammar rules (Reber, 1989; Reber et al., 1991) and spatial processing algorithms (e.g., Lewicki et al., 1988), as well as to other types of knowledge acquisition, such as covariation and puzzle learning (see Seger, 1994, for a review of implicit learning tasks).

We believe that implicit learning may result in the complex, domain-relevant schemas necessary to engender the effective use of intuitive judgments in managerial decision making. To illustrate, the veteran foreman noted earlier by Prietula and Simon (1989), who "has learned to grasp the meaning of certain patterns of operations and activity on the plant floor," may have developed this proficiency not simply through explicit learning—since it is unlikely that the foreman "deliberately practiced" observing operations on the plant floor—but, rather, through implicit learning as well.

> *Proposition 4: Implicit learning will positively influence the effectiveness of intuitive decision making through the formation of complex, domain-relevant schemas.*

It is important to note that just as there are factors that strengthen the relationship between explicit learning and the formation of complex, domain-relevant schemas, there are also factors that strengthen the link between such schema

formation and implicit learning. In particular, while implicit learning is largely automatic, there is some research that suggests that individuals may be able to "process stimuli in ways that allow implicit learning to function more effectively" (Seger, 1994: 176). Such control may be afforded by consciously *paying attention to the stimuli in question* (Carlson & Dulany, 1985; Nissen & Bullemer, 1987). Attention, however, is not focused on attempts to deliberately decipher cause and effects. As Reber's research has shown (Reber, 1976; Reber, Kassin, Lewis, & Cantor, 1980), attention directed toward such "hypothesis testing" will lead to substandard performance. Rather, individuals should focus on stimuli as a whole. For example, while managers may be unable to consciously notice those rewards that will best motivate individuals during a time of crisis (a type of covariation learning), they may facilitate the implicit learning of these patterns by paying attention to both rewards and employees during the crisis. Thus, we build from this body of research and posit the following.

> *Proposition 5: The relationship between implicit learning and the formation of complex, domain-relevant schemas will be enhanced when individuals focus attention on the stimulus environment.*

Returning to our initial focus on speed versus accuracy, we suggest that intuitions are more likely to be effective when they tap into complex, domain-relevant schemas than when they involve heuristics. These complex, domain-relevant schemas, in turn, are more likely to be developed when individuals engage in focused and repetitive practice over a long period of time, when they operate in kind learning environments, and when they focus their attention on the stimulus environment.

Task Characteristic Factors

In addition to factors surrounding the domain knowledge of the intuiter, evidence suggests that problem structure may also impact the effectiveness of intuitive decision making. According to Shapiro and Spence (1997), problems lie on a continuum of structuredness. At the less structured end of this continuum lie such problems as merger and acquisition decisions, new product planning, and corporate strategy formation. These unstructured problems are conducive to intuition because of the absence of well-accepted decision rules for dealing with such situations. Echoing this argument, other researchers have argued that analytical strategies that work well for problems that are well-defined are much less effective for ill-defined problems (Claxton, 1998; Hayashi, 2001). Intuition, as a holistically associative process, may actually help to integrate the disparate elements of an ill-defined problem into a coherent perception of how to proceed. As Shapiro and Spence (1997) further note, intuition is often more effective than analysis in enabling individuals to develop an understanding of the structure of a complex system. For this reason, intuitive judgments are said to become more effective relative to rational analysis as a problem becomes increasingly unstructured.

Intellective versus judgmental tasks. We argue that the notion of "problem structure" is captured in the distinction between *intellective* and *judgmental* tasks (Laughlin, 1980; Laughlin & Ellis, 1986; McGrath, 1984). According to Laughlin, intellective tasks involve a "definite objective criterion of success within the definitions, rules, operations, and relationships of a particular conceptual system," whereas judgmental tasks involve "political, ethical, aesthetic, or behavioral judgments for which there is no objective criterion or demonstrable solution" (1980: 128). Laughlin (1980) views the intellective/judgmental distinction as a continuum, as opposed to a strict dichotomy.

While intuition theorists have not referred specifically to intellective and judgmental tasks, research has shown that intuition may be most effective for moral judgments (Haidt, 2001), aesthetic ratings (Hammond et al., 1987; Wilson & Schooler, 1991), and the like. Further, research has shown that intuition is relatively weaker than rational analysis for tasks involving definite objective criteria (MacGregor, Lichtenstein, & Slovic, 1988; McMackin & Slovic, 2000). Thus, it appears that intuitive judgments may be more effective than rational approaches to decision making on judgmental tasks, whereas the converse is true for intellective tasks. This suggests the following proposition.

> *Proposition 6: As the problem structure associated with a task becomes more*

judgmental, the effectiveness of intuitive decision making will increase.

Returning again to our discussion of speed versus accuracy, intuition is most likely to effectively manage this trade-off when it is brought to bear on judgmental tasks.

Factors influencing task characteristics: Environmental uncertainty. While we showed earlier that the domain knowledge factors concerning intuition effectiveness are rooted in a sizable body of work on explicit and implicit learning, relatively little has been said about concepts that may be linked to intuition effectiveness and task characteristics. The work that does exist suggests that the type of environment in which an organization operates may influence the effectiveness of intuitive decision making among managers (Agor, 1986; Khatri & Ng, 2000; Shapiro & Spence, 1997). In one of the few empirical studies in this area, Khatri and Ng (2000) found moderate support for their thesis that, during times of environmental uncertainty, the use of intuitive decision making among executives results in greater organizational performance.

Unfortunately, based on this study alone, it is difficult to conclude why this result was found. However, one likely possibility is that during times of environmental instability, managers have to collect and sort through a large, and often incomplete, amount of data in a short time (Khatri & Ng, 2000). That is, decision-making tasks in these environments may be nonroutine. Building on this perspective, we suggest that environmental uncertainty results in a shift away from structured problems and standard operating procedures and is likely to result in a multitude of "plausible alternative solutions," rather than a single objective criterion for success. Under such conditions, decision-making scenarios may move from the intellective end of the task continuum toward the judgmental end. Thus, the positive relationship found between environmental uncertainty and the effectiveness of intuitive decision making may be mediated by the task characteristics described above.

Proposition 7: The relationship between environmental uncertainty and the effectiveness of intuition is mediated by judgmental task characteristics.

Possible Relationships Among Effectiveness Factors

In considering the two broad sets of factors that we view as determining the effectiveness of intuitive decision making, we have said little about whether there are any connections between these two sets of factors. That is, we have yet to discuss whether domain knowledge factors are in some way tied to task characteristic factors in the model we have proposed (Figure 1). While a variety of linkages may be possible, a highly likely possibility concerns linking the most effective domain knowledge characteristic—expertise—with the most desirable type of task for intuition—judgmental.

As noted above, the individuals most capable of making the associations that trigger accurate intuitive judgments are those who possess complex, domain-relevant cognitive structures within a particular domain. Such individuals may be referred to as *experts* (Chi, Glaser, & Farr, 1988; Dreyfus & Dreyfus, 1986; Prietula & Simon, 1989; Shanteau & Stewart, 1992). In Figure 1 we identify a link between expertise and intuition effectiveness via the direct connection drawn from complex, domain-relevant schemas to the effectiveness of intuitive decision making. However, this argument raises the question of whether the relationship between schema type and intuition effectiveness is always of a similar magnitude across various types of tasks. Evidence suggests that the answer to this question is not necessarily.

As we have suggested, the holistic and associative properties of intuition may help to integrate the disparate elements of an ill-defined, or judgmental, problem into a coherent perception of how to proceed. Experts may be especially well-suited to draw these holistic associations on judgmental tasks because the sophistication of their cognitive structures may permit them to integrate the components of an ill-structured problem with relative ease. Such an interaction is implied in many of the examples in the beginning of our paper. For example, the development of the Dodge Viper and the prime-time launch of *Who Wants to Be a Millionaire* both involved highly experienced executives faced with ill-structured tasks.

In contrast, well-defined or intellective tasks may not call for the same extent of holistic and associative connections. As argued above, such

tasks may be approached more effectively through analytical procedures. Moreover, research suggesting that the intuition of experts is ineffective has tended to examine decision making involving highly structured tasks (Bazerman, 1986; Dawes et al., 1989; Kahneman et al., 1982). Hence, we argue that our posited link between complex, domain-relevant schemas (as possessed by experts) and effective intuition may be stronger when experts are working on judgmental tasks. Accordingly, we suggest the following.

> *Proposition 8: The relationship between complex, domain-relevant schemas and the effectiveness of intuitive decision making is moderated by task characteristics such that as tasks become more judgmental, the strength of the relationship will increase.*

DISCUSSION AND IMPLICATIONS

We have attempted to better delineate what intuition is[3] and when people are likely to use it well. In this effort we have synthesized a large and disparate body of research on intuition and moved the field forward through the development of several theoretical propositions. However, it is sometimes only in taking stock of what is known that it becomes clear what is not. While this review helps address many issues regarding intuition, it raises several other issues, and several additional avenues for research, as well. Our comments in this section concern the issues we feel are most critical to bear in mind when conducting further research on intuition.

Intuition "Use" Factors

While we have focused extensively on the factors contributing to the effectiveness of intuitive decision making, we have said little about the conditions in which individuals tend to trust in or rely on their intuitions. Intuition "use" factors are critical, because even if we can foster intuitions that are accurate (e.g., through complex, domain-relevant schema), these intuitions must be "trusted" if they are to be followed. Conversely, intuitions that develop through heuristics and more simplistic schemas may, in many circumstances, be sufficiently compelling to be used as primary inputs to decision making, despite their relative imprecision and dubious accuracy.

Research on intuition suggests a variety of conditions in which we are most likely to use our intuitions rather than to invoke and rely on rational analysis. Among the most common are the presence of positive moods (e.g., Bless, Bohner, Schwarz, & Strack, 1990; Elsbach & Barr, 1999; Isen, Means, Patrick, & Nowicki, 1982; Ruder & Bless, 2003; Schwarz, Bless, & Bohner, 1991) and the role of stable individual differences in thinking style (Briggs & Myers, 1976; Pacini & Epstein, 1999; see also Jung, 1933). However, there may be other, less explored use factors that merit further attention.

To illustrate, research might explore the role of the body in intuition. Bastick (1982) directly ties intuition with "body knowledge," and Agor (1986) and Hayashi (2001) link the use of intuition with specific "body cues." More generally, affective descriptions such as "gut feelings" tie changes in emotions to bodily changes. In a fascinating study, Bechara, Damasio, Tranel, and Damasio (1997) found that individuals asked to play games where the rules are not known, but which differ in terms of their level of risk, will generate skin conductance responses before engaging in high-risk games, even before they have consciously understood that the games are risky. This suggests that the body may "know" and be transmitting information outside of conscious awareness. Further, as Bodenhausen (1990) has shown, circadian variations impact the use of heuristic stereotypes such that individuals who are most alert in the morning ("morning people") are more likely to rely on heuristic processing of information late in the evening, whereas "night people" exhibit the opposite pattern. While promising, research that examines the connection between the body and the use of intuition remains scant.

More "macro" determinants of use, such as cultural factors, may also play a role in intuition

[3] We should note that we have been viewing intuition as a relatively homogenous concept. Wild (1938), however, argued for the existence of aesthetic, moral, and religious intuition. Further, he noted that intuition can arise from divine sources and from the collective unconscious—and not just from our own experientially based cognitive schemas. Future research may help to disentangle what have been perceived as different "types" of intuition (e.g., managerial versus mystical intuition).

use. For example, cultures with a low emphasis on "uncertainty avoidance" (Cyert & March, 1963; Hofstede, 2001) are willing to "take unknown risks" and are "comfortable with ambiguity and chaos" (Hofstede, 2001: 161). Because intuitive judgments are, by their very nature, difficult to justify rationally and often involve unknown levels of risk, cultures low in uncertainty avoidance may be more inclined than other cultures to favor intuitive judgments in decision making. The "masculine versus feminine" cultural distinction (Hofstede, 2001) may also account for differences in the use of intuition across cultures. In particular, feminine cultures, which emphasize the importance of feelings over logic, may be inclined to accept forms of judgment that are tied to affect and emotion. If, as we contend, intuition is tied to affect and emotions, intuitive decision making may be respected and employed in feminine cultures. Consistent with this argument, Hofstede (2001: 318) notes that managers in feminine cultures are expected to use intuition and deal with feelings.

More generally, research should be done to more explicitly link intuition use factors with those factors we have identified as being integral to intuition effectiveness. For example, it may be the case that learning processes link the two models: as individuals use intuition more, they may become more effective in its use. Other factors may also be common to both intuition use and effectiveness. For example, judgmental tasks such as moral and aesthetic problems, which may be particularly conducive to intuitive problem solving, may also trigger the use of intuition (Haidt, 2001; Hammond et al., 1987).

Interplay Between Intuition and Analysis

In our attempt to differentiate intuition from other decision-making approaches, such as rational models, we did not discuss at length when and how different ways of knowing might complement each other. Researchers who advocate a dual process approach assume that these two systems of knowing work together in making decisions. In a similar vein, Simon (1987) asserts that effective managers do not have the luxury of choosing between analysis and intuition—real expertise involves the use of both types of decision making. And Hodgkinson and Sadler-Smith (2003: 261) argue that the ability to switch between "habits of mind" and "active thinking" is the ultimate skill in today's organizations.

Researchers have put forth a variety of recommendations about how to use intuitions in combination with more rational decision making. For example, Blattberg and Hoch (1990) examined the specific weightings that should be applied to rational models and intuitive judgments, respectively, in making decisions. In assessing the accuracy of brand managers' predictions of coupon redemption rates as compared to a mathematical forecasting model, they determined that a 50/50 weighted combination of model forecast and manager intuition leads to more accurate predictions than either decision-making method in isolation.

Shapiro and Spence (1997) further argue that the *ordering* of the two types of decision making is also important. They suggest that intuition should be recorded first, followed by a more thorough analytical assessment of the problem. The degree to which rational decision making should be emphasized, however, should depend on the nature of the task (e.g., structured or unstructured). In contrast, Agor (1986) argues that many managers use intuition *after* engaging in rational analyses, for the purpose of synthesizing and integrating the information gathered and analyzed. Unfortunately, while many provocative ideas about the interplay between rational and intuitive decision making have been suggested, empirical research in this area, particularly in the field of management, remains insufficient.

Beyond Decision Making

We have focused primarily on the role of intuition in decision making. However, intuition may have other positive benefits as well. To illustrate, some preliminary work suggests a link between intuition and creativity. Langer (1989: 117), for example, has suggested that creativity arises through an "intuitive experience of the world," whereas rational thinking serves only to confirm "old mindsets" and "rigid categories." Likewise, Poincaré (1969: 210) has declared that logic is the "instrument of demonstration," and intuition the "instrument of invention." However, with the exception of a few studies (e.g., Raidl & Lubart, 2000-2001), little empirical research has connected intuition to cre-

ativity. In light of the growing interest in creativity in the management sciences, unpacking how intuition ties in with creative thought may yield valuable theoretical contributions to this line of research.

Next, recent appeals for additional scholarly work on business ethics (e.g., Donaldson, 2003) suggest a need for fresh perspectives on moral reasoning and ethical decision making in organizations. As noted above, Haidt (2001) has argued that moral judgments are intuitive. Thus, by better understanding how intuitive judgments are made, we might better identify the conditions under which individuals disregard their intuitions (i.e., their moral sense of ethical behavior) and engage in actions that conflict with principles of ethics in organizations.

Managerial Implications

We believe that research on intuition is inherently practical. In this paper we have suggested factors that may lead managers to make good decisions quickly. Thus, organizations that wish to facilitate effective intuiting need to concentrate on promoting ongoing and deliberate practice in kind learning environments. They may also encourage managers to be mindful of their environments in order to facilitate implicit learning. By remaining alert and viewing problems from multiple perspectives, "mindful" managers may form new cognitive categories and distinctions (see Langer, 1989) that bolster the complexity and domain relevance of their schemas. Finally, we have suggested that managers should be wary of using intuitions when faced with intellective tasks.

In this discussion section we have also suggested how future research might better understand the relationship between intuition effectiveness and use, thus ensuring that individuals feel comfortable "trusting their gut" when appropriate (e.g., when the individual has domain expertise and is working on a judgmental task). Moreover, we believe that better understanding how intuition and rational analysis work together will result in an even more complete picture of decision effectiveness among managers and other organizational members. Beyond decision making, understanding how intuition plays a role in creativity and ethics seems critical to improving key organizational processes.

In addition to highlighting the promises of intuition, our research also reveals potential challenges and barriers to facilitating effective intuitions. To illustrate, one could argue that the rapid rate of change that characterizes current organizational environments makes intuitive decision making more necessary today than it has been in the past. However, it is also true that job mobility is increasing. As a result, individuals are less likely to engage in a significant degree of focused practice in a particular domain (Prietula & Simon, 1989). In our language, this suggests that individuals may not be able to form complex, domain-relevant schemas—and, thus, must rely more often on simple schemas and heuristics. This is likely to result in the less effective use of intuitive judgments at a time when their use is increasingly critical. Accordingly, organizations that retain members for long periods of time in similar job domains may be more likely than others to provide members with sufficient conditions to develop complex, domain-relevant schemas. This suggests a need to reduce the rate of member turnover in order to foster the development of more effective intuitive decision making among members. Retention is critical if one is to keep highly specialized knowledge workers—a crucial component to competing in a "knowledge economy."

Keeping experts, however, is only one challenge in utilizing experts in a knowledge economy (Matusik & Hill, 1998). Ideally, the information from experts can be captured by the organization (Hammer, Leonard, & Davenport, 2004; Osterloh & Frey, 2000). Can the complex, domain-relevant schemas of experts be transferred to automated information systems or to other individuals? While we have identified the conditions under which an individual can *gain* complex, domain-relevant schemas, it is not clear whether or how the content of these schemas can be *transferred* from one individual to another. Classic work on the transfer of expertise, however, suggests that having experts working together with novices may be critical to this issue (Collins, 1982).

A related challenge for managers concerns the transferability of intuitive skills across fields and industries. Organizations, interested in acquiring individuals with expert knowledge, often hire managers and executives from other firms and agencies. While such individuals are pursued for their rich knowledge bases and de-

cision-making abilities, our model proposes that cognitive schemas must be domain relevant to generate accurate intuitive judgments. For this reason, an individual who possesses expert intuition in one field or industry may not be as effective in making intuitive decisions in a field or industry that differs substantially from the environment in which the individual's cognitive schemas were developed. This brings to mind one of the key weaknesses ascribed to Carly Fiorina in her very public and sudden ousting from Hewlett-Packard in 2005: she did not have the right "type" of experience to succeed at HP. If true, this would suggest that her intuitive reasoning may not have been as effective as someone with more domain-relevant experience.

Thus, we consider the following question. How different must context be before the cross-situational relevance of cognitive schemas is negated? While this question is, as yet, unanswered, we suggest that managers should be slow to embrace intuitive judgments made by organizational newcomers without relevant industry or occupational experience.

Conclusion

We have emphasized throughout this paper how intuition is viewed as a potential means of helping managers make both fast and accurate decisions in organizations. In this regard, we discussed how and why speed serves as one characteristic of intuition and identified factors that make intuitive judgments effective in decision making.

In closing, we suggest that further research on intuition is important not only for building theory on this particular construct but also for increasing our field's attention to nonconscious processes more generally. We have emphasized throughout this work that intuition arises through nonconscious operations. In making this point, we were informed by a growing body of literature in psychology that has shown how a large portion of cognitive thought occurs outside of consciousness (Bargh, 1996; Bargh & Chartrand, 1999; Jacoby, Lindsay, & Toth, 1992; Kihlstrom, Barnhardt, & Tataryn, 1992; Reber, 1992). Some psychologists have even referred to the 1990s as the "decade of automaticity" (Pizarro & Bloom, 2003). Yet despite bourgeoning interest in nonconscious and automatic processes among psychologists, organizational scholars have yet to focus extensively on these mechanisms and how they may influence behavior in organizations. For this reason, we hope that our treatment of intuition may help to put the "nonconscious" into organizational studies.

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