Handbook of Research on Strategy and Foresight

Edited by

Laura Anna Costanzo

Lecturer in Strategic Management, School of Management, University of Surrey, UK

Robert Bradley MacKay

Senior Lecturer in Strategy, Business School, University of Edinburgh, UK

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23 The role of intuition in strategic decision making*

Marta Sinclair, Eugene Sadler-Smith and Gerard P. Hodgkinson

Introduction

The strategic decisions confronting senior managers and other key stakeholders in modern organizations are complex judgemental problems that demand expertise gained through an amalgam of practical experience and learning for their resolution. At the heart of the strategy formation process is the ability of decision makers to synthesize 'vast arrays of soft information' into new perspectives (Mintzberg et al., 1998: 164) achieved as much by insights which are visioned, imagined and intuited as through a rational analytical process of defining, diagnosing, designing and deciding (see Mintzberg and Westley, 2001: 89). Although many organizations place a premium on analytical skills, analysis is a necessary but insufficient basis for effective strategic decision making (Louis and Sutton, 1991; Simon, 1997; Hodgkinson and Sparrow, 2002; van der Heijden et al., 2002). The situations confronting strategic actors are not so much tightly structured 'puzzles' to be solved as loosely structured problems that require both detailed information processing and holistic interpretation. Adopting the metaphor of photography, the strategy formation process is akin to the use of a 'zoom lens' camera that can be adjusted both in order to view the world narrowly to capture detail and more widely, in order to capture overall patterns and trends.

In this chapter we explore the role that intuition plays in strategic decision making, a process that demands a delicate balance between rational analysis and intuitive judgement. There is a considerable volume of work on intuition in the interrelated fields of cognitive psychology, social cognition and cognitive neuroscience, indicating that reason and affect are served by separate cognitive systems. At this juncture it is opportune to consider the implications of this work for advancing understanding of strategic decision processes in organizations and how these processes might be improved. For the purposes of this chapter, 'intuiting' is defined as a process leading to a recognition or judgement that is arrived at rapidly, without deliberative rational thought, is difficult to articulate verbally, is based on a broad constellation of prior learning and past experiences, is accompanied by a feeling of confidence or certitude, and is affectively charged (Davis and Davis, 2003; Dane and Pratt, 2007). We do not conflate intuition with related concepts such as incubation and insight. Nor do we equate it with creativity, but we do regard it as one of the vital antecedents to the creative process in organizational (and other) contexts (see also Crossan et al. 1999; Runco and Sakamoto, 1999; Raidl and Lubbart, 2001).

We consider intuition, and its counterpart, analysis, from an information processing standpoint, specifically from the perspective of dual-process theory in social cognition (for example, Chaiken and Trope, 1999) and cognitive psychology (for example, Gilovich et al., 2002). We examine critically the notion of a single, overarching intuition-analysis dimension of information processing style, argued by some researchers to underpin managerial and organizational decision making (for example, Hayes and Allinson, 1994),

and present a more compelling complex alternative, consonant with recent advances in dual-process theory and research. We begin by offering a critical evaluation of the classical rational choice model of decision making and consider the limits of rationality in the strategic management process. Having set the scene in terms of the limits of rationality, the overarching information processing architecture, dual-process theory and the cognitive, affective and somatic nature of intuition, the chapter specifically examines the role that intuition plays in strategic decision making. The concepts of naturalistic and non-conscious decision making are discussed as a means of understanding how managers use their experience to make decisions in specific contexts. The role of pattern recognition (as a basis for expertise) and the novel combination of stimuli (as a basis for innovation) in decision making in general, and in strategic decision making in particular, are also discussed. In conclusion, we consider the implications of our analysis for fostering intuitive awareness among current and future generations of strategic decision makers, through education and training and development interventions.

Limits of rational choice models in strategic decision making

The model of decision making that many senior managers are taught and expected to employ entails the pursuit of an analytical, linear process in an attempt to optimize decision outcomes. The archetypal rational manager is likely to follow a linear choice process in order to select the 'best' alternative from those with which she or he is faced. Typically, following initial identification of the problem to be addressed, pertinent data are collected and analysed, alternatives are generated, potential solutions are compared against the criteria for success, and a choice is made between competing solutions, based on a (subjective) estimate of the likelihood of each event unfolding (that is, its subjective probability) and its subjective value (or utility) to the decision maker (see Janis and Mann, 1977; Arkes and Hammond, 1986; Miller et al., 1996). The rational choice model has a number of clear advantages; for example, it allows consistency (it is repeatable), serves as a generic decision aid (it can be applied across many different situations), helps novices to learn how to solve problems and make decisions (it is a rigorous training tool) (Klein, 1998), and forces decision makers to make explicit the bases of their actions (Arkes and Hammond, 1986).

However, the rational choice model is predicated upon several assumptions that are highly questionable from a psychological standpoint, given the complex, uncertain and time-pressured environments confronting many organizations, not least the assumption that decision makers have the requisite computational skills and time to go through the sequential optimization process implied by this model (Simon, 1957; see also Hodgkinson and Sparrow, 2002). The assumptions that the required data actually exist in a tangible and, ideally, quantifiable form, and that cause-and-effect relationships are understood sufficiently to enable outcomes to be predicted on the basis of logical and quantitative analyses are also dubious. As observed by Arkes and Hammond (1986: 6): 'likelihoods and utilities are often not easy to assess', and since the effectiveness of the approach is largely based on the accuracy of the likelihoods and utilities used 'every effort should be made to obtain good estimates'. For the most complex problems the decision process is not wholly objective; nor is it devoid of ambiguity and interpretation. Human judgement (however 'expert') is inherently involved in the design and deployment of the 'objectified' decision analysis techniques that flow out of the rational model of decision making.

To reiterate, the effective development and deployment of decision analysis tools are both highly dependent upon the judgement of individuals whose rational analytical capabilities are ultimately fallible. Human input is necessary to build models, and expert judgement is rarely an exclusively rational process (Griffith et al., 2008). For example, in designing expert systems for medical diagnoses it is medical professionals who must decide what criteria to include in the model underpinning the system (such as what to look for in an X-ray image), and how the model should be built, since there is no alternative to a human judge or designer for such a task (Hogarth, 2001).

Modern-day critiques of rational analysis in strategic decision making can be traced back at least as far as the writings of Chester Barnard in the 1930s. Barnard, himself an AT&T executive, drew a distinction between 'logical mental processes' and 'non-logical mental processes' (that is, contrasting modes of cognition). The former encapsulated conscious thinking (that is, reasoning) expressible in words or other symbols. In Barnard's view this type of thinking was a major characteristic of the work of analytical scientists, but was not so much in evidence in high-pressure tasks or in much of the work of 'businessmen [*sic*] or executives' (Barnard, 1938: 302–3). In contrast, he maintained that individuals processed knowledge within the non-logical mode of cognition unconsciously or without conscious effort (in this sense, he anticipated Reber (1989) on the role of implicit learning and knowledge) and by definition, non-conscious processes could not be analysed reliably through self-reflection. Significantly, Barnard argued that the potential harmfulness of logical mental processes lay in their wrongful elevation above their non-logical counterparts, the latter being undervalued and underappreciated as a resource.

However, it was Herbert Simon's notion of 'bounded rationality' (Simon, 1957) that placed psychology centre stage within the field of organization theory. Given the cognitive limitations of decision makers, relative to the complexity of their environments, human behaviour is intendedly rational, but only in so far as this is possible within the bounds of the human information processing system; hence, human beings 'satisfice' rather than maximize in decision making. In marked contrast to the rational model of decision making outlined above, Simon argued that decision makers set a minimally acceptable standard that must be met and search only until the first available alternative is found that meets that threshold criterion (see also March and Simon, 1958; Simon, 1989, 1997).

There is continuity between Simon's and Barnard's work (Barnard wrote the Foreword to the first edition (1947) of Simon's *Administrative Behavior*), but Simon was troubled by Barnard's account because it did not give any clues as to what subconscious processes go on while judgements are being made. Simon turned to work on the psychology of expert judgement and artificial intelligence (AI) in an endeavour to provide a convincing explanation. Simon's position on the role that intuition plays is summarized thus: 'Intuition and judgement – at least good judgement – are simply analyses frozen into habit and the capacity for rapid response through recognition' (Simon, 1987: 63). This perspective, however, was questioned by other researchers who cautioned that such understanding would reduce intuitive information processing to a variant of non-conscious analysis (see Hammond et al., 1987).

Simon's model of intuitive judgement is founded upon the notion of intuition as a manifestation of expertise and as a process of pattern recognition and pattern matching. For example, he estimated that experts, such as the chess players upon which his

experiments with co-researcher William Chase were based, are likely to have internalized around 50,000 familiar patterns (Simon, 1997: 134) and have been gained over 10 years or more of intense practice (see also Ericsson and Charness, 1994). According to this view, experts store patterns in long-term memory along with other associated information. Simon (1987) also acknowledged the role of emotion in decision making, but concluded that 'emotion-driven intuition' results in 'irrational decisions'.

Recent research in the field of cognitive neuroscience (Damasio, 1994; Le Doux, 1996) presents a more complex picture. It suggests that the 'other associations' above and below the level of conscious awareness may include the level of danger or opportunity, or the feeling of elation or disappointment that a particular pattern may have induced in past successes or failures. The implications of this work are that memories may be embodied in a resonating emotion as 'somatic markers' that can be re-activated in a context-congruent situation (Damasio, 1994). In other words, the patterns, or at least the judgements that arise from the use of those patterns, may be affect-laden. Mumby and Putnam (1992) go even further, arguing that emotions are present in one form or another in most decisions, a view that is congruent with the notion of the 'affect heuristic', as conceptualized by Finucane et al. (2000) (see also Slovic, 2000, 2002; Slovic et al., 2004). Juxtaposing Simon's satisficing model with these recent advances in cognitive neuroscience, Mumby and Putnam propose that organizational decision making occurs within 'bounded emotionality'.

An important caveat to the critiques of rationality offered here and elsewhere (Hodgkinson and Sparrow, 2002; Sadler-Smith and Shefy, 2004; Sadler-Smith and Sparrow, 2008) is that the value of rational analysis under certain circumstances cannot be denied, nor is it our intention to do so. Research attests, however, to the fact that rational analysis is not the exclusive means by which effective decision making in organizations occurs – intuition has an undoubted role to play (Mintzberg, 1976; Isenberg, 1984; Eisenhardt, 1989; Burke and Miller, 1999; Khatri and Ng, 2000; Hayashi, 2001; Sinclair et al., 2002; Sadler-Smith, 2004). In Simon's theory intuition does not operate in isolation from rational analysis; rather, rational analysis and intuitive judgement are complementary processes:

> [E]very manager needs to be able to analyse problems systematically. Every manager also needs to be able to respond to situations rapidly, a skill that requires the cultivation of intuition and judgement over many years of experience and training. The effective manager does not have the luxury of being able to choose between 'analytic' and 'intuitive' approaches to problems. (Simon, 1997: 139)

In this respect, Simon (ibid.: 131) assumed that conscious and subconscious decision processes are highly similar in the sense that they draw upon 'factual premises and value premises, and operate upon them to form conclusions that become the decisions'.

During the 1980s and 1990s a number of researchers (for example, Taggart and Robey, 1981; Allinson and Hayes, 1996) advanced arguments broadly consistent with Simon's formulation, predicated upon a presumed bipolarity in human information processing (that is, analysis versus intuition). Taggart and others explained this in terms of the brain science of the time (the so-called 'left-brain–right-brain' distinction), manifested most famously perhaps in the widely-cited paper by Mintzberg (1976), entitled: 'Planning on the left; managing on the right'. However, as discussed in the next section of this chapter,

the dual-process formulations alluded to earlier have fuelled debates regarding whether or not these two contrasting modes of cognition are in fact served by a common underlying system or, alternatively, by independent cognitive systems, and the nature and extent of their interaction.

The absence of a robust and compelling psychological framework to underpin the models offered by Simon and others resulted in major conceptual problems. Simon, for example, appealed to arguments from the AI research of the time. This offered only weak explanations for the role of affect. In the case of Taggart and his colleagues (for example, Taggart and Robey, 1981), their work was limited by reliance upon oversimplified models of brain lateralization which were popular at that time. Agor (1989) was one of the first researchers to conduct large-scale descriptive studies of intuition among managers for which he used survey research. Unfortunately, however, the instrument he used, the Agor Intuitive Management survey, was predicated upon Jungian notions of psychological type and the aforementioned, ultimately flawed, arguments for the bipolarity of intuitive and thinking styles (see ibid.: 140).

A plausible psychological framework for the analysis of intuition must be capable of accommodating the latest developments in social cognitive neuroscience concerning the limits of rationality and the role of affect in organizational decision making. We maintain that dual-process formulations of cognition present the field of strategic management with such a framework (see also Hodgkinson and Sparrow, 2002; Sinclair et al., 2002; Hodgkinson and Sadler-Smith, 2003a,b; Sinclair and Ashkanasy, 2005; Dane and Pratt, 2007; Hodgkinson and Clarke, 2007; Hodgkinson et al., 2008; Sadler-Smith and Sparrow, 2008).

Dual-process formulations of cognition

In the 1960s and 1970s neurophysiologists and neurosurgeons, spearheaded by the pioneering work of Roger Sperry and Michael Gazzaniga, investigated hemispheric asymmetries in human brain functioning, using various surgical, electroencephalographic (EEG) and experimental techniques. Inferences were drawn by Ornstein (1977) and others regarding differential functions of the brain's two hemispheres, and this notion later became popularized in the concept of 'left-brain–right-brain' differences, more technically known as hemispheric functional asymmetry, underpinned by the lateralization hypothesis (Sperry, 1968; Gazzaniga, 1971). As noted earlier, this idea was adopted by a number of management scholars as a means of explaining several important aspects of behaviour, including interpersonal functioning and decision making. For example, Taggart and Robey (1981) employed the concept of hemispheric functional asymmetry as the basis for their model of management decision strategies, in which a 'left-brain' decision style was characterized as analytic, logical and deductive in nature, while a 'right-brain' style was characterized as synthetic, non-logical and inductive. Their argument was that due to hemispheric dominance, one mode of decision making predominated in most individuals, a hypothesis that was consonant with the then prevalent asymmetric lateralization thesis. Herrmann (1996) expanded this model even further by developing it into a quadrant-based 'brain dominance' thesis, which postulated several finer-grained distinctions that he argued underpinned rational and intuitive processing. In terms of intuition, he differentiated between a form of intuition which he termed 'sensory intuition' and a more abstract type of intuition. He argued

that the former was processed in the limbic system, while the latter originated in the more evolved parts of the brain.

Overall, the 'split brain hypothesis' is simple to comprehend, has high face validity and has enjoyed widespread popular appeal. In keeping with this line of reasoning, Hayes and Allinson (1994) reviewed a substantial body of literature and postulated a single, superordinate dimension of individual differences in information processing, which they subsequently labelled 'the intuition–analysis dimension'. 'Intuition . . . refers to immediate judgment based on feeling and the adoption of a global perspective. Analysis . . . refers to judgment based on mental reasoning and a focus on detail' (Allinson and Hayes, 1996: 122).

According to this view, intuition and rationality are opposite poles of a common dimension, with the relative contribution of analysis or intuition determined by a combination of dispositional and contextual factors. Allinson and Hayes reported the development and validation of a 38-item self-report inventory, the Cognitive Style Index (CSI), which is designed to locate individuals along a continuum that reflects the unidimensional, bipolar conception of information processing hypothesized by them earlier (Hayes and Allinson, 1994).[1]

Unfortunately the CSI has been found wanting both theoretically and psychometrically. In terms of its construct validity, a series of exploratory and confirmatory factor analyses of large samples in different occupational, educational and national settings consistently fail to uphold the notion of a single unitary dimension of human information processing (Hodgkinson and Sadler-Smith, 2003a,b; Hodgkinson et al., 2006a). Instead what emerges from these construct validation studies is a more complex state of affairs in which analysis and intuition coexist as separate constructs (albeit intercorrelated). Moreover, most researchers would now accept that the notion of a 'split brain', with one hemisphere exclusively processing information 'analytically' and the other processing information 'intuitively', is an oversimplification that is perhaps at best treated as a metaphor for different modes of information processing. In cognitive neuroscience more complex models have emerged in which several systems, not exclusively located in one hemisphere or the other, interact with one another (see, for example, Lieberman et al., 2004). Hence, in theoretical terms the concept of a single processing system, in which individuals exhibit degrees of preference for analysis or intuition, is found wanting in a number of significant respects and must be rejected in favour of an alternative and less-simplified position.

On the basis of the findings reviewed above, a more compelling conceptual position is one in which human information processing is served by a number of independent cognitive systems underlain by separate neural pathways for certain affective and cognitive processes that coexist and interact. Such a conception fits well with the broad range of dual-process theories that have emerged comparatively recently in cognitive psychology and social cognition (see Chaiken and Trope, 1999; Gilovich et al., 2002). This alternative conception of analysis and intuition, predicated on the assumption of two parallel cognitive systems, is supported by both experimental research (Epstein et al., 1996) and empirical evidence from studies in occupational settings (Isenberg, 1984; Burke and Miller, 1999).

One dual-process theory, typical of dual-process conceptions more generally, that provides a particularly convenient framework for advancing our understanding of the

complementary roles played by analysis and intuition in strategic foresight and decision making is the Cognitive–Experiential Self-Theory (CEST), developed by Epstein and his colleagues (see Epstein, 1991, 1998, 2000; Denes-Raj and Epstein, 1994; Epstein et al., 1996; Pacini & Epstein, 1999). Epstein et al. (1996: 391) maintain that: 'people process information by two parallel, interactive systems', which interface harmoniously but operate in different ways. The rational system, falling within the realms of conscious control, is analytical in nature, whereas the experiential system operates at a non-conscious level, on the basis of experientially-based intuition. In this model the experiential mode acts as the default, unless the rational processing is consciously activated. More specifically: 'The rational system . . . is conscious, relatively slow, analytical, primarily verbal, and relatively affect free . . . The experiential system . . . is preconscious, rapid, automatic, holistic, primarily nonverbal, intimately associated with affect . . . ' (Pacini and Epstein, 1999: 972).

As with the unidimensional view of cognitive style advanced by Hayes and Allinson (1994) and Allinson and Hayes (1996), Epstein and his colleagues maintain that the extent to which rational–analytical and/or experiential–intuitive processing predominates is an interactive function of dispositional and situational factors. This implies not only a dynamic relationship between both cognitive systems but also a complex structure within each system (for details, see Sinclair et al., 2002). It is also consistent with Forgas's (1994, 1995) conclusion that an information processing strategy is determined by the cumulative effect of problem, decision and personal characteristics. In Forgas's Affect Infusion Model, however, each strategy has a different propensity to be 'infused' by affect, thus resulting in different levels of affect-laden processes or outcomes (Forgas, 1995). This line of reasoning has found support in recent cognitive neuroscience research that has identified separate neural pathways for certain affective and cognitive processes (for further details, see Damasio, 1994, 1999; Le Doux, 1996; Isen, 2000). Additional research has detected activation processes in several specific brain regions that imply a possible connection between affect and intuition that appears to be more complex than previously envisaged connections (Lieberman, 2000; Bechara, 2004).

As noted above, CEST is but one of a family of dual-process theories (for additional representative examples, see Bargh, 1989; Reber, 1989; Epstein, 1994; Evans and Over, 1996; Hammond, 1996; Sloman, 1996; Klein and Kihlstrom, 1998; Adolphs, 1999; Chaiken and Trope, 1999; Smith and DeCoster, 1999; Ochsner and Lieberman, 2001; Lieberman et al., 2004) the respective functions of which may be labelled generically as 'System 1' (including intuitive) and 'System 2' (including analytical) processes, in keeping with the broad System 1/System 2 architecture proposed by Stanovich and West (2000).

System 1 processes are implicit, tacit or automatic self-processes that operate without effort, intention or awareness and with rapid retrieval. Stanovich and West summarized System 1 processes as being associative (Sloman, 1996), heuristic (Evans, 1984, 1989), tacit (Evans and Over, 1996), implicit (Reber, 1989), experiential (Epstein, 1994), quick and inflexible (Pollock, 1991), intuitive (Hammond, 1996), recognition primed (Klein, 1998) and automatic (Shiffrin and Schneider, 1977). System 1 processes lead to judgements based on accumulated experience without the explicit retrieval and evaluation of autobiographical evidence. They are affective, slow to form, slow to change, relatively insensitive to one's thoughts about oneself and behaviour and relatively insensitive to explicit feedback from others. Affect is implicated in System 1 processes to varying

degrees, ranging from the affect-free notion of pure heuristics (that is, cognitive 'short cuts' which may or may not be founded upon logically valid assumptions – see Gigerenzer and Todd, 1999; Kahneman and Tversky, 1982) to the notion of experiential processing (Epstein, 1994), in which emotions loom large. In other words, System 1 processes vary with respect to their degree of 'affective charge' (see also Dane and Pratt, 2007).

System 2 processes, in contrast, are effortful and intentional processes that rely on symbolic representations organized into propositions and explicit autobiographical evidence stored in episodic memory. These processes are performed in working memory (Baddeley and Hitch, 1974; Baddeley, 1986). Stanovich and West (2000) summarized System 2 processes as being rule based (Sloman, 1996), analytic (Evans, 1984, 1989), explicit (Evans and Over, 1996; Reber, 1989), rational (Epstein, 1994), intellective (Pollock, 1991), analytical (Hammond, 1996), rational-choice based (Klein, 1998) and controlled (Shiffrin and Schneider, 1977). Unlike System 1 processes, System 2 processes are affect free. System 2 processes are called on to respond flexibly when System 1 processes are ill-equipped to perform the task at hand.

Having offered dual-process formulations as a superordinate conceptual framework and CEST as a theoretical basis for the advancement of better understanding strategic foresight and organizational decision making, we now pause to consider in greater depth the nature of intuition. As shall be seen, this rather complex construct has begun making significant inroads into management theory and management practice.

Exploring intuition in management theory and management practice

In recent years, several management scholars have defined intuition in terms which are relevant and applicable both to management theory (Klein, 1998; Sinclair and Ashkanasy, 2005) and management practice (Klein, 2003; Sadler-Smith and Shefy, 2004). Particular interest in the concept of intuition has arisen in the field of strategic management (see, for example, Hodgkinson and Sparrow, 2002; Hodgkinson and Clarke, 2007). These developments have drawn upon the recent advances in social cognition, cognitive psychology and cognitive neuroscience outlined in the previous section. One possible reason for the interest of strategic management researchers in intuition is because strategic planning and strategic decision making encompass a high degree of uncertainty and ambiguity, both of which are factors that managers attempt to alleviate by employing intuitive judgements (Burke and Miller, 1999; Khatri and Ng, 2000; Klein, 2003). In addition, intuition is employed by strategic decision makers and other key stakeholders as a means to support or engage in creativity, visioning and foresight (see Isenberg, 1984; Mintzberg, 1989; Davis and Davis, 2003; Sadler-Smith and Shefy, 2004; Miller and Ireland, 2005).

The lack of conceptual clarity which dogged intuition research until comparatively recently resulted in a number of disparate definitions of intuition, and presented an additional challenge for the advancement of theory and research. Not only were scholars unable to agree on what intuition is (often conflating it with insight and creativity) but, more importantly, they were unable to agree on what it 'does' (Dane and Pratt, 2007). Nevertheless, a number of researchers (Shirley and Langan-Fox, 1996; Boucouvalas, 1997; Sadler-Smith and Shefy, 2004; Sinclair and Ashkanasy, 2005) have concluded that most conceptualizations of intuition fall into two broad but, we argue, mutually reinforcing categories: (i) intuition as an experience-based phenomenon, drawing on tacit knowledge accumulated through experience and quickly retrieved through pattern recognition

(see Behling and Eckel, 1991; Brockman and Anthony, 1998; Crossan et al., 1999) – neatly encapsulated in Herbert Simon's notion of 'analyses frozen into habit' (Simon, 1987); and (ii) intuition as a phenomenon incorporating sensory (sometimes referred to as 'somatic' from the Greek *soma* meaning 'body') and affective elements (see Briggs and Myers, 1976; Agor, 1984; Damasio, 1994; Parikh et al., 1994; Epstein et al., 1996; Petitmengin-Peugeot, 1999). Several additional supplementary observations also emerge from the literature on intuition: first, intuiting occurs below the level of conscious awareness (Reber, 1989); second, intuition involves holistic information processing (Klein, 1998; Davis and Davis, 2003). Based on the above understanding, we view the process of intuition as: a rapid non-sequential information processing mode, which involves cognition *and* affect (including somatic elements), and occurs without deliberative rational thought, while frequently accompanied by a feeling of certitude (compare Simon, 1987; Epstein et al., 1996; Shapiro and Spence, 1997; Sinclair et al., 2002).

Intuitive processing has been linked in strategic management to the fast 'digestion' of complex, ambiguous sources of information that complements (but does not necessarily replace) rational processing (see Mintzberg, 1976; Louis and Sutton, 1991). It involves a non-conscious scanning of internal resources in long-term memory (Reber, 1989) and external cues in the environment (Klein, 1998) in order to identify relevant pieces of information that are fitted into the 'solution picture' (analogous to assembling a jig-saw puzzle). When the assembled pieces begin to cohere they 'start making sense, the "big picture" suddenly appears, frequently announced by a feeling of certitude or relief' (Sinclair and Ashkanasy, 2005: 357). This is not to confuse intuition with insight – although the two are related.

Although insight and intuition are closely interconnected, each is a distinct concept in its own right. At the moment when an insight solution takes place, the problem solver moves rapidly from a position of not knowing to a position of knowing; moreover, the problem solver is able to articulate the problem's solution (hence the process is no longer pre-verbal or below the level of conscious awareness). Insightful experiences may be preceded by 'feelings of knowing' or 'feelings of warmth' (intimations or intuitions that the problem is near to solution) (Reder and Ritter, 1992; Koriat, 1993). Intuition can occur in the process of insight as a precursor to the 'eureka' moment, as in the many anecdotal accounts of insight in the process of scientific discovery (see Gruber, 1995). Eminent creators of scientific and artistic works, for instance, frequently report following a 'tacit understanding' or 'preliminary perception of coherence' when doing their work, which guides them to an explicit representation of it in the form of a 'hunch' or hypothesis (Runco and Sakamoto, 1999: 68).

Wallas (1926), who was one of the first scholars to describe in a systematic way the process of insight via preparation and incubation, referred to the phenomenon of 'intimation' within the incubation process. Hogarth (2001: 255) argued that the term 'insight' is better 'reserved for those *moments* when people suddenly realize that they can see into the structure of problems', which often occur when people are not consciously engaged in seeking the problem solution (our emphasis).

Since intuition concerns judgement (as well as problem solution), not all intuitions manifest themselves as fully formed (insightful) solutions. As noted above, some intuitions remain as judgements which are affectively charged (Dane and Pratt, 2007) to varying degrees. Such intuitive judgement may eventually be empirically verified or

refuted, and only at this point is it revealed whether or not the intuitive judgement was accurate. Intuitive judgements (as opposed to insightful solutions) involve rapid and non-conscious pattern recognition and syntheses of past experience and domain expertise where the processing speed is attributed to circumventing relatively slow-paced deliberation (see Bastick, 1982; Isenberg, 1984; Simon, 1987; Myers, 2002). Accurate intuitions rely upon a situational awareness that is grounded in the prior learning and experiences that formed the deep knowledge structures underpinning the intuitive judgement (see Hogarth, 2001). A definition of intuition that encompasses a number of these disparate elements has been offered by Dane and Pratt (2007, p. 40): 'intuitions are affectively charged judgements that arise through rapid and non-conscious holistic associations'.

As we have seen, a distinction may be drawn between the view of intuition offered by Simon (that is, analyses frozen into habit with the capacity for fast recognition and response), in which the issue of affect is overlooked or at least played down, and more recent conceptions (Sadler-Smith and Shefy, 2004; Sinclair and Ashkanasy, 2005; Dane and Pratt, 2007), in which the role played by affect in intuitive judgement is given a greater emphasis. This distinction notwithstanding, it is conceivable that both forms of intuition (affectively charged judgements and analyses frozen into habit) draw upon similar underlying unconscious pattern recognition processes, differentiated merely in terms of the strength of the 'affective tag' associated with the judgement (see also Finucane et al., 2000; Slovic et al., 2004). A continuum can be envisaged in which the non-conscious cognitive processes which support the interpretation of the relevant environmental cues, their matching with an extant pattern or the detection of a mismatch (when the decision maker recognizes that something is 'out of kilter' or simply 'doesn't feel right' – see Klein, 1998) are accompanied to a greater or lesser extent by affect (that is, an affective 'tag' in Finucane et al.'s terminology).

Our proposal for the differential strength of affect in intuitive judgements is in keeping with the argument for the importance of the affect heuristic more generally in human judgement put forward by Finucane, Slovic and their colleagues, who in turn built upon the work of Zajonc (1980). Zajonc not only researched the related area of implicit perception, but also was an early proponent of the importance of affect in decision making (Finucane et al., 2000). Slovic et al. (2004) suggested that we each have our own 'affect pool' which contains positive and negative markers which consciously or unconsciously 'tag' to varying degrees 'all of the images in people's minds' (p. 314). The affect pool is implicated via an involuntary 'sensing' process when people make a wide variety of judgements, including probability judgements (see Slovic, 2000). Following affect as a heuristic can sometimes be quicker and more efficient than laboriously weighing up the 'pros' and 'cons' of a situation (Slovic et al., 2004); it does, however, have potential drawbacks.

This discussion of information processing-based theories of intuition returns us full circle to the question of whether intuition and rational decision making are served by the same basic cognitive systems, notwithstanding the fact that the former process occurs at a much greater speed and without conscious awareness (see Taggart and Robey, 1981; Allinson and Hayes, 1996). On the basis of dual-process formulations outlined in the previous section, we maintain that this is not the case. Intuitions are inherently linked to experiential processing which uses a separate cognitive system that operates without conscious attention or awareness, but does so in concert with the rational system (see also Sinclair and Ashkanasy, 2005; Dane and Pratt, 2007; Hodgkinson et al., 2008). Slovic

et al. (2004: 314) summarize the interaction of the two systems thus: 'We now recognise that the experiential mode of thinking and the analytic [that is, rational] mode of thinking are continually active, interacting in what we have characterized as the "dance of affect and reason"'. Strategic foresight and effective organizational decision making, we maintain, are both ultimately the product of analytic and experiential processes (see also Hodgkinson and Clarke, 2007).

Naturalistic decision making: dual-process formulations in action

The view of intuition as 'analyses frozen into habit' is commensurate with the stance taken by those researchers who have explored how experience-based judgements are made in field settings by domain experts, who appear to draw upon non-conscious cognitive processes to arrive at a single course of action (Klein, 1998). This is the perspective of naturalistic decision making (NDM) (Klein, 1997; Zsambok, 1997). Theories and models of NDM (defined as the ways in which people use their experience to make decisions in field settings) posit fast pattern recognition as the means by which experts reach decisions without conscious deliberation: 'in dynamic, uncertain and often fast paced environments' (Zsambok, 1997: 5).

The field of NDM originated in the 1980s in the USA and was the outcome of extensive case study research of decision makers operating in aviation, combat, and other highly pressured work situations including hospital accident and emergency departments and intensive-care units (see, for example, Klein, 1998, 2003). In emphasizing the crucial role of situation awareness in field settings (as opposed to the artificial laboratory settings employed in other areas of decision research) NDM researchers focused upon the ways in which decision makers deploy intuitive processing *in situ*. Experts' knowledge is 'pattern indexed' and it allows the decision maker to immediately retrieve the information needed to focus on solving a problem in a specific situation (Drillings and Serfaty, 1997). Klein and colleagues have analysed the ways in which actors rapidly draw upon the non-conscious elements of the human information processing system (that is, those elements depicted as less effortful within the dual-process formulations discussed in previous sections). NDM adds to our understanding of intuitive judgement in the context of dual-process formulations, but whether or not the switch from the rational to the experiential system or conversely from the experiential system to the rational system is consciously controlled or 'kicks in' automatically is unclear. From our own perspective, it seems most likely that cognitively skilled strategic decision makers learn to recognize when to deploy each of the two systems to best effect and are able to use the two systems in harmony (see also Louis and Sutton, 1991; Epstein et al., 1996; Hodgkinson and Sparrow, 2002; Hodgkinson and Clarke, 2007). Indeed, one of the characteristics that differentiate expert and novice decision makers is the extent to which they are able to recognize when to use intuition and when to fall back on conscious deliberation (Louis and Sutton, 1991). Moreover, experts are able to switch back and forth more readily than their less-expert counterparts and have the capability to engage in a different type of rational processing (Dreyfus and Dreyfus, 1986). Non-experts are more likely to engage in a calculative rationality by applying and improving their concepts, theories and knowledge of procedures. Experts on the other hand engage in a 'deliberative rationality' of detached, contemplative reflection (when time permits), which guards against 'grooved thinking' or 'tunnel vision' and provides an opportunity to challenge intuitions and literally 'recognize' (that is, re-think their assumptions and beliefs; Benner et al., 1996).

The recognition primed decision (RPD) model (one of a number of NDM models) was developed by Klein and his colleagues in order to explain how experienced fire ground commanders used their expertise to identify and carry out a course of action without the need to engage in lengthy, deliberative analyses (the sorts of time-pressured situations in which Klein and his colleagues have undertaken their work preclude such deliberations) (Klein, 1997). In its simplest form RPD consists of two functions, matching the situation to a prior experience to determine a singular course of action ('sizing up' the situation), and evaluating the consequences of the action through a mental simulation to see whether the course of action is likely to run into difficulties ('imagining' the course of action). If the mental simulation suggests potential problems, the decision maker moves on to another singular course of action.

Klein defines intuition as: 'recognizing things without knowing how we do the recognizing' (1998: 33); hence, within RPD the emphasis upon the role played by intuition is at the 'front end' of the process. The 'sizing up' of the situation occurs intuitively on the basis of recognizing prototypes or detecting any deviations from the decision maker's expectations.

The role of affect in intuition-based decision making

At first glance, Klein's RPD model implies a definition of intuition that seems to accord closely with the analysis frozen into habit view of Herbert Simon. However, it is clear from the case studies upon which Klein's RPD model is based that affect is also of vital importance, as for example when an experienced decision maker's situational awareness results in a particular combination of cues not 'feeling' right, but without him or her being able to say why. As noted by Klein (1998), decision makers involved in the sorts of life-or-death situations examined in his NDM research programme are often unable to reflect upon the reasoning mechanisms underpinning their judgements. Indeed, in a number of cases decision makers have misattributed their success to extra-sensory perception (ESP) rather than to their own underlying expertise (see Klein, 1998: 33). This suggests that a more complete account of NDM needs to embrace a wider conception of intuition, in recognition of the fact that decision makers appear to base their judgements not only on what they think about a given problem, but also on what they feel about it. Work on the affect heuristic alluded to above is potentially very helpful in this regard, as might be a more detailed consideration of the work of Damasio (1994, 1999) concerning the role of 'somatic markers' in decision making.

The relationship between intuitive judgement (as opposed to judgements in general) and affect appears to be more complex than is suggested by Finucane et al. (2000). At the onset of the decision-making process, affect may assist or impede access to intuitive processing; for example, negative mood states may predispose an individual to engage in rational analyses to a greater extent (Elsbach and Barr, 1999; Sinclair et al., 2002). Moreover, the experiences and the associated learning under which intuitions are acquired may be affectively encoded, thus making affect an integral element of the mental models and mental simulations (Kahneman and Tversky, 1982; Klein, 1998) upon which intuition draws (Forgas, 1995). This argument is consistent with the notion of affective 'tags' advanced by Slovic and his colleagues, as outlined earlier.

The understanding of the role of affect in intuitive judgements has benefited significantly from recent research in cognitive neuroscience and related fields which has

explored the somatic aspects of decision making. For example Bechara et al. (1997) compared the performance on a high-risk gambling task of normal participants and patients with damage to the ventro-medial prefrontal cortex (VMPC) – a brain region implicated in the induction of emotions. Damage to the VMPC region can result in the impoverishment of 'decision-making apparatus to a dramatic degree' (Damasio, 1999: 280 and 302). In an experimental setting, Bechara et al. (1997) observed that normal participants (that is, without damage to the prefrontal cortex) began to choose advantageously before they were consciously aware which strategy worked best; moreover, they generated anticipatory skin conductance responses (SCRs) before they exercised a risky choice and before they became consciously aware of the strategy they were adopting. Patients with prefrontal cortex damage continued to choose disadvantageously, even after they realized the correct strategy; they also failed to demonstrate any anticipatory SCRs.

The amygdala and VMPC are involved in processing that is automatic, fast and involuntary. These structures are implicated not only in the processing of emotionally arousing tasks, but also in several higher-order cognitive activities, such as planning and decision making (Adolphs and Damasio, 2001). Taken as a whole, these findings indicate that the autonomic responses associated with intuitions based upon previous experiences and emotional states guide decision making and outcomes in advance of conscious awareness. Dual-process theorists have speculated that the intuitive system underpinning such processes may have evolved earlier in humans than did the rational system (Epstein, 1994). The pattern of somatic and visceral signals from the body acts as a warning, and the marker signals are adaptive in that they allow the decision maker to anticipate the 'pain' or 'pleasure' of particular outcomes (see also Le Doux, 1996; Shafir and LeBouef, 2002; Bechara, 2004).

In explaining the neuro-anatomical processes which underlie the somatic marker hypothesis, Bechara (2004) proposed a 'body loop' mechanism. According to this view, a somatic state is actually re-enacted and its signal relayed back to cortical and subcortical regions of the brain, impinging in turn upon the neural substrates underpinning conscious and non-conscious decision processes. Previously encountered situations and stored representations also play a key role. When an emotion has been expressed more than once, representations of it are formed in the somato-sensory and insular cortices. The body loop may be bypassed, and a fainter image of the emotional or somatic state created. Hence, bodily feedback is 'imagined' and represented cognitively in working memory and thus influences feelings and decisions. Bechara refers to this mechanism as the 'as-if' loop.

If, as argued by Slovic and his colleagues (Slovic et al., 2004), mental representations are affectively 'tagged', this is likely to be as true of the mental representations that underpin strategic decisions as of those underpinning other forms of decision. The question of which decisions engage the body loop and which engage the as-if loop is the subject of ongoing investigations (Bechara, 2004: 38). Bechara argues that in decision making under certainty, that is, where the outcome is predictable and explicit, it is the as-if loop that is activated, whereas in decision making under uncertainty, that is, where the outcome is unpredictable or unknown and thus cannot be estimated, the body loop proper is activated. Although the detailed programme of scientifically rigorous empirical work to validate this theory has yet to be undertaken, nevertheless, it seems reasonable at this juncture to speculate that the various loop mechanisms postulated by Bechara,

the 'body loop' and the fainter 'as-if' loop, might account for variations in the degree of affect accompanying intuitive-based judgements in organizational strategic decision processes.

The development of a more comprehensive account of intuition, incorporating cognitive and affective elements, should hopefully result in a deeper and more complete understanding of strategic foresight and organizational decision making. In this connection, several management researchers have identified different forms of intuition which emphasize the experience/expertise or affective bases of intuition to different extents. For example, Crossan et al. (1999) distinguished between expert and entrepreneurial intuition. Expert intuition entails the use of a pattern recognition process to extrapolate from past situations, in a manner akin to Simon's (1987) notion of analysis frozen into habit or the RPD model of Klein and his colleagues (Zsambok, 1997; Klein, 1998). The nature of entrepreneurial intuition is less clear, but Gaglio (2004) proposes that the cognitive processes of mental simulation and counterfactual reasoning (both of which are key aspects of the simulation heuristic) are mechanisms by which entrepreneurs identify and develop innovative opportunities. These are unlikely to be cognitive processes *per se* and it seems reasonable to hypothesize that they consist of a fusion of cognitive and affective elements that yield decisions that 'feel' appropriate. Many entrepreneurs attest to the role that 'gut feel' plays in their business venturing activities (Hastie and Dawes, 2001) and the popular literature is replete with such accounts.

The multifaceted nature of intuition is apparent in the work of Sauter (1999), who distinguished between an 'operative intuition' that alerts individuals to potential problems and a 'creative (novel) intuition' that serves as a basis for the generation of new ideas or patterns. In this sense, each type of intuition seems to serve a different purpose: a quick recall of expert knowledge versus an innovative outcome in which intuition is an antecedent of the creative process and may draw upon different forms of knowledge that ordinarily lie beyond the realms of conscious awareness. Expert intuition is non-verbal to the extent that it draws upon tacit knowledge (Brockman and Anthony, 1998). It does not require deliberative thinking but the underlying reasoning can be verbalized and analysed if necessary, as borne out by studies using the applied cognitive task analysis (ACTA) methods that have underpinned much RPD research (Crandall et al., 2006). This is consistent with the experience-based view of intuition. Conversely, entrepreneurial intuition mostly precedes verbalization, and thus may play a vital role in foreseeing future without the impediment of 'non-conscious rationalization' (Westley and Mintzberg, 1989). The ways in which intuition, and in particular the role of mental simulation, operates in the business venturing context to foster creativity, innovation and entrepreneurship is an area which requires further research.

Implications for understanding strategic decision making

The ability to imagine a more desirable future and 'invent' ways of achieving it is a critical aspect of strategic decision making and foresight. The dual-process formulations outlined in the previous sections of this chapter not only offer a more viable portrayal of the cognitive processes at work in strategic decision making in field settings, but also contribute a number of practical insights to the attainment of this vital goal.

The term 'strategic planning' has been portrayed by Mintzberg (1994) as an oxymoron, on the grounds that it conflates the fundamentally distinctive cognitive processes of

analysis and synthesis. According to Mintzberg, strategy cannot be planned because strategy is about synthesis (a blending of ideas and resources), whereas planning is about analysis (an examination of the parts). The analytic/synthetic distinction is one which was encountered previously in the context of a hypothesized duality in human information processing (see Taggart and Robey, 1981). As noted earlier, Mintzberg (1976) appealed to the prevailing brain science of the time in an attempt to explain this basic distinction (the 'right brain' was postulated to be synthetic and holistic – that is, intuitive in nature – while the 'left brain' was portrayed as analytical in nature). As argued above, recent developments in cognitive psychology, social psychology and cognitive neuroscience (as encapsulated in dual-process theory) point to two different systems that operate in parallel and which are not mutually exclusive (summarized within the overall System 1 and System 2 processing architecture, as outlined by Stanovich and West, 2000).

That dual-process conceptions potentially have much to offer by way of insight into the cognitive processes underpinning strategic decision making, and the attainment of strategic foresight, can be illustrated conveniently in respect of the widely acclaimed practice of scenario planning (for example, Wack, 1985; van der Heijden et al., 2002). The practice of scenario planning does not envisage a single 'right' answer; complex problems are likely to have many possible answers and the ultimate decision is likely to involve a combination of intuitive judgements and creativity as well as rational analysis (see Hodgkinson and Clarke, 2007). In the words of van der Heijden and colleagues:

> There is no suggestion here that analysis is not extremely important, but it cannot do the job entirely on its own. We need to independently define the important questions to analyse. For this reason analysis needs to be complemented by intuition . . . an iterative process in which exploiting intuition and asking the right questions alternates with rational thinking to find answers. (van der Heijden et al., 2002: 235–6)

More generally, Eisenhardt and Zbaracki (1992: 35) have called for: 'a more realistic view of strategic decision making by opening up our conceptions of cognition and conflict to include insight, intuition, emotion, and conflict resolution'. In practice, the balance between intuitive judgement and rational analysis in strategic decision making is determined by a variety of factors, including various characteristics of the decision maker (such as his or her level of domain expertise or personal disposition) and the context in which the decision is being taken (including the degree of 'structured-ness' of the decision problem or the momentary state of the decision maker) (Hodgkinson and Clarke, 2007; Sadler-Smith and Sparrow, 2008).

Shapiro and Spence (1997: 67) drew a distinction between 'well-' (tightly) structured problems (for example, accounts receivable, order entering and inventory control), and 'ill-' (loosely) structured problems (for example, mergers and acquisitions, new product planning and research and development planning). Dane and Pratt (2007) equate well-structured problems to Laughlin's (1980) notion of 'intellective tasks', characterized by objective criteria for success within the definitions, rules, operations and relationships of a particular conceptual system. They equate ill-structured problems to Laughlin's 'judgemental tasks', political, ethical, aesthetic, or behavioural judgements for which there is no objective criterion or demonstrable solution – to which might be added the capability to exercise moral or ethical judgements, both of which are crucial elements of any decision maker's portfolio.

As the problem structure associated with a task becomes tighter and more intellective, the effectiveness of rational decision making is likely to increase; conversely, intuitive judgements are likely to become more effective relative to rational analysis as a problem becomes increasingly unstructured (Khatri and Ng, 2000; Klein, 2003; Dane et al., 2005; Dane and Pratt, 2007; Sadler-Smith and Sparrow, 2008). The situations that favour analytical approaches are characterized by computational complexity, thus requiring optimization, and a need for justification; moreover, in such situations objective criteria for success exist (Laughlin, 1980; Klein, 2003). Conversely, the situations that favour intuitive approaches are characterized by loosely structured decision problems that are judgemental in nature and that cannot be solved by recourse to computational means *per se*. As noted above, such problems are typically characterized by ill-defined goals and require the decision maker to operate under time pressure in dynamic conditions. In these circumstances, experience plays a vital role (Klein, 2003). Time pressure and the need for a speedy decision are the most frequently mentioned triggers of intuitive decision making (Agor, 1986; Wally and Baum, 1994; Klein, 1998, 2003; Burke and Miller, 1999). Although not all intuitive outcomes are reached quickly (see Hogarth, 2001), the extant literature tends to equate intuition with speed of processing (Dane and Pratt, 2007) – indeed this is one aspect of the distinction between intuition and insight; the latter is preceded by a period of 'incubation' of some duration, which ranges from hours to weeks (see Mayer, 1996).

In many instances, when time is short, non-rational processing that circumvents time-consuming deliberation is the only feasible option for decision makers (Schoemaker and Russo, 1993). Research findings suggest, however, that time pressure and associated stress may influence the non-conscious selection of a variety of information processing strategies (Maule and Svenson, 1993; Maule et al., 2003). While time pressure appears to lead to intuitive decision making, it can also elicit stress, which, as a strong emotional response, may act as a block to further processing (Petitmengin-Peugeot, 1999) or precipitate a reversion to processing in the analytical mode (Elsbach and Barr, 1999; Sinclair and Ashkanasy, 2003). A preference for intuition seems to be further influenced by a number of dispositional characteristics, in particular cognitive style (Epstein et al., 1996; Hodgkinson and Clarke, 2007), risk tolerance and emotional awareness (Wally and Baum, 1994; Sinclair et al., 2002; Sadler-Smith and Sparrow, 2008). Risk tolerance assists decision makers in dealing with the ill-structuredness of strategic problems by helping them cope with the inherent ambiguity which lends itself to intuitive processing. This quality, however, relates to a coping ability rather than a propensity to seek out risk (Sitkin and Weingart, 1995).

Much of the earlier research on managerial intuition and decision making centred on executives, and was predicated on the assumption that this group of managers more than others are involved in decision making of a strategic nature (Barnard, 1938; Isenberg, 1984; Hayashi, 2001). More recent large-scale organizational studies conducted by Agor (1984, 1985, 1986, 1989), Parikh et al. (1994), Allinson and Hayes (1996) and Sadler-Smith et al. (2000) have established that senior managers (including senior executives) have a tendency to use intuition more frequently than do their lower-level counterparts. It does not necessarily follow, however, that this is because of a greater involvement in strategic decision making activities, as opposed to decision making more generally (see also Hodgkinson and Sadler-Smith, 2003a).[2]

While research by Parikh and his colleagues focused on canvassing how decision makers perceive intuition, and thus contributed to the development of a better understanding of the construct, Agor's Intuitive Management survey measured the actual predisposition and further development of intuitive ability (although some researchers attempting to replicate Agor's findings encountered difficulties with the reliability of this scale, see Sinclair and Ashkanasy, 2005). More recently, Khatri and Ng (2000) surveyed senior managers across a variety of industrial sectors in the USA. They found not only that intuitive processes are used often in decision making by senior managers, but also that the use of intuitive decision making was positively associated with organizational performance in unstable environments, whereas it was negatively correlated with organizational performance in stable environments. This supports the contingent view of intuitive judgement proposed by Shapiro and Spence (1997), Klein (2003) and Dane et al. (2005). In a replication and extension of Khatri and Ng's work in a UK small business context, Sadler-Smith (2004) observed that there was a positive relationship between intuitive decision style and contemporaneous financial and non-financial performance (however, unlike the Khatri and Ng study, this did not appear to be moderated by environmental instability). In addition, in keeping with the earlier findings of Allinson et al. (2000), Sadler-Smith (2004) observed a statistically significant relationship between intuitive decision style and subsequent financial performance. This finding was taken as prima facie evidence to support the claims of key stakeholders in high-growth enterprises that their success is attributable to the deployment of intuitive judgements. Meanwhile, Dane et al. (2005) have found that analytical decision making works better in highly structured tasks, although intuition is most effective compared to analysis when decision makers are domain experts who are facing tasks that are poorly (loosely) structured. Further work to disentangle the reasons for these inconsistent and somewhat contradictory findings is now urgently needed. Nevertheless, taken as a whole this body of work serves to underscore the fact that analytical and intuitive approaches are required to varying degrees across differing types of organizational decision and organizational decision context. Dual-process conceptions, as outlined earlier in this chapter, provide a potentially fruitful basis for understanding the ways in which decision makers are able to adapt (or not) to the contingencies confronting them.

Sadler-Smith and Sparrow (2008) argued that senior managers and entrepreneurs are often confronted by dynamism, in terms of both the environmental conditions in which the organization operates and the desired business outcomes (as, for example, in a new business venture or the performance of a new hire in a newly created job role). Against this backcloth, the ability to sense changes and detect faint signals, or move beyond statistical models in foresightful ways, can be advantageous. Intuition, since it derives from integrative pattern recognition and holistic judgements accompanied by affect to varying degrees, may be the only avenue open to managers to weigh, aggregate and make sense of intangibles involved in complex judgements.

Wagner (2002: 50) argued that management competence cannot be easily described because it is based more on intuition than on rationality. If asked to explain their actions, managers may *post hoc* rationalize in ways that fit their actions: 'managers are either at a loss for words or will make up an explanation that may be fictitious, perhaps not intentionally, but only in the spirit of trying to satisfy the questioner' (ibid.: 51). However, as argued by Hodgkinson and Sparrow (2002), the fact that the judgemental aspects of senior manager competence are inherently difficult to describe does not mean that they

are any less valid than the rational and analytical competencies which are comparatively easy to document and measure.

Entrepreneurs and business executives claim the propensity to be able to recognize faint signals or patterns, but also have the confidence to assume that the missing elements of the pattern will take a shape that they can predict or foresee (Isenberg, 1984; Hayashi, 2001). This anticipatory capability may enable entrepreneurs and managers to keep ahead of potential competition and envisage beyond the present. Anecdotal accounts from managers testify to the faith that some senior executives place in intuitive judgement (Isenberg, 1984; Burke and Miller, 1999; Hayashi, 2001). In many instances, strategic application of intuition is indicated by such words as 'big picture', 'holistic approach' and 'foresight'. Individual differences in the way in which strategic decision makers gather, organize, process and act upon information determine their speed of information decision making and the extent to which they will engage in rational and/or intuitive processing (Hodgkinson and Clarke, 2007). Although recent findings confirm earlier conclusions that intuition is mostly used in conjunction with analysis, both modes can be combined in different ways: (i) some decision makers use analysis to find support for their initial 'gut feeling'; (ii) others conduct an analysis first and then check the results intuitively; (iii) in some instances, the rational and intuitive processes are iteratively applied as a set of formative or interim checks throughout a longer-term process (see Isenberg, 1984; Burke and Miller, 1999).

Intuitive decisions involve making predictions based upon knowledge and past experiences which are woven together and stored tacitly; the processes underpinning such decisions are not always open to introspection or available in conscious awareness. The strategic foresight exercised by chief executives may hinge on their intuitive expertise, as this quote from the multinational cosmetics company L'Oréal reveals:

> L'Oréal's success is due to Owen-Jones' [L'Oréal's Chief Executive Officer (CEO)] acute market intuition. He instinctively knew that the world was ready for L'Oréal to duplicate the enormous success it had in France on a global level, by developing worldwide brands and by choosing the right brands to attack the right markets. Rapidity is also a big part of getting to number one: 'Being fast is sometimes more decisive than verifying every idea and validating every hypothesis', says Owen-Jones. 'The fact that intuition has regained such importance in the world of business is deeply gratifying to me'.[3]

Hayashi (2001: 61) interviewed top business executives (CEOs) in the USA known for their shrewd 'business instincts' to explore how they took decisions that seemed not to involve rational analysis. An executive from Johnson and Johnson who was interviewed in connection with this study is quoted thus:

> 'When someone presents an acquisition proposal to me, the numbers always look terrific: the hurdle rates have been met; the return on investment is wonderful; the growth rate is just terrific. And I get all the reasons why this would be a good acquisition. But it's at that point – when I have a tremendous amount of quantitative information that's already been analyzed by very smart people – that I earn what I get paid. Because I will look at that information and I will know, intuitively, whether it's a good or bad deal.'

Intuition as theorized from a cognitive science and AI perspective by Simon (1947) is relatively affect free and operates to reduce cognitive load through what he referred to as

'analyses frozen into habit'. One way that this might be accomplished is through patterns of activity associated with previously experienced decisions accumulating and which are stored in the form of programmed actions (what in RPD terms would be referred to as 'action scripts') to be drawn upon by the experiential system in subsequent situations that more or less approximate previously encountered scenarios. As was noted earlier with respect to RPD, domain experts, by virtue of the relatively deep knowledge structures that they have developed as a function of their significant experience and learning, are capable of recognizing problems and the solution (usually a singular course of action rather than multiple options) without awareness of the underlying process or a verbalized reason for the decision (for further details, see Klein 1998).

Ultimately, however, cognitively *and* affectively based intuition are *both* required for effective strategic decision making. Affect-based intuition as conceptualized in the affect infusion model of Forgas (1994, 1995), akin to 'gut feel', is the vital spark that stimulates creativity and arguably underpins some aspects of strategic foresight. Less affectively charged and more cognitively based intuition, on the other hand, serves a different role: that of cutting through the detail to extract the bigger picture. In this sense, less affectively charged intuition frees up mental capacity, a vital prerequisite for creative problem solving, lest the decision maker should drown in the detail, the condition popularly referred to as 'paralysis by analysis' (Mintzberg, 1994; Langley, 1995).

Implications and conclusions

The study of intuition, and of the interplay of the systems that underpin reason and affect in strategic decision making, is in its infancy; many conceptual, theoretical and methodological challenges and opportunities present themselves to researchers. What is clear is that managers can and do use intuition in a variety of different ways including sensing a problem, producing an integrated picture, as a check on rational analysis and for bypassing analysis (Isenberg, 1984; Burke and Miller, 1999; Hayashi, 2001). As observed by Hodgkinson and Sparrow (2002), the ability to switch back and forth between the analytic and intuitive modes of cognition, that is, 'switching cognitive gears' (Louis and Sutton, 1991), endows decision makers with a vital competence for effective strategizing (see also Hodgkinson and Clarke, 2007). When this competence is highly developed, decision makers are able to use rational analysis and intuitive judgement in concert. What matters, therefore, is that organizational decision makers are taught to appreciate the nature and significance of the respective roles played by analysis and the two forms of intuition identified and discussed in the earlier sections of this chapter. Although at first glance the implications of this analysis are clear and seemingly straightforward, unfortunately, there are several gaps in the current knowledge base that render this prescription potentially problematic at this critical juncture.

First, psychometric instruments for the assessment of individual differences in a form that would fit this modified dual-process conception are found wanting on reliability and, to some extent, construct validity, grounds (see Hodgkinson and Sadler-Smith, 2003a,b; Hodgkinson et al., 2006a). Second, as observed by Hodgkinson and Clarke (2007), there is the question of how far decision makers are able to adapt their preferred styles of information processing to accommodate the shifting contingencies that come into play in complex strategic decision making of the sort discussed in this chapter. In other words, to what extent is the vital skill of switching cognitive gears attainable through training

and development, or to what extent should organizations search for alternative strategies to ensure that decision-making teams are selected with the requisite mix of preferred processing styles for optimal decision making? What exactly is the optimum mix and how would we know? Does the optimum mix vary across different types of organizational decision and decision context or is it fairly constant? These are vital issues that need to be addressed in future work.

Another series of pressing issues concern the potential impact of attempting to blend this range of information processing styles, for previous work on individual differences suggests that task and interpersonal conflict arising from a mismatch of such cognitive styles is likely to be the order of the day (for example, Kirton and McCarthy, 1988). The question of how much latitude is possible in the blending of cognitive styles and the development of leadership strategies for managing the 'cognitive gaps' that might otherwise arise from this line of management practice are further issues equally deserving of urgent scholarly attention (for further discussion of this issue, see Hodgkinson and Clarke, 2007).

Intuition is more likely to be effective when the manager is an expert in the particular domain and rational analysis is not possible or it is inappropriate (Klein, 1998, 2003; Khatri and Ng, 2000; Sadler-Smith, 2000; Hodgkinson and Sparrow, 2002; Sadler-Smith and Sparrow, 2008). Hence, managers may come to rely upon intuition when rationality is at its limits, for example for reasons of underload or overload of information, or because of time pressure. Lengthy analysis is not always possible, and indeed to engage in a rigorous and systematic approach may open up a manager to 'analysis by paralysis' especially in those situations where there is time pressure, forcing him or her to act quickly. The problem with lengthy rational analysis is that a failure to respond in a timely fashion may mean that the problem (or opportunity) could change significantly, disappear altogether or be solved (or capitalized upon) by one's competitors. The way in which intuition is used is likely to depend upon situational factors (for example, the nature of the problem) and individual factors (for example, cognitive style and the level of the manager's expertise in the particular domain) (Hodgkinson and Sparrow, 2002; Hodgkinson and Sadler-Smith, 2003a; Dane and Pratt, 2007; Hodgkinson and Clarke, 2007; Sadler-Smith and Sparrow, 2008).

The question of whether or not managers' intuition can be improved is an open question – the more pressing concern is whether or not managers can be educated in order that they can understand intuition and thus be able to better manage their intuitions in an intelligent fashion. In this regard, management education and training and development programmes should be designed to enable managers to become more aware of the distinctions between insight and intuition and the respective contributions of affect and cognition in decision making, and to equip them with the necessary intra-personal skills to engage in a critically reflective manner upon their learning and decision-making behaviours. To this end, an executive training course in creative intuition has been offered at Stanford Business School since the 1980s, incorporating discussions with individuals who claim to use intuition in their decision making and reflective techniques such as mediation (see Ray and Myers, 1989).

In sum, while the study of intuition is, in many ways, still in its infancy, significant progress has been attained, both in clarifying its nature and in identifying its psychological foundations. Dual-process theories have greatly advanced our understanding of the

complementary roles played by intuition and its counterpart, analysis, in strategic foresight and organizational decision making. Furthermore, a considerable volume of theory and research in the field of management and organization studies has begun to suggest a variety of approaches that might enable present and future generations of decision makers to foster greater awareness of these fundamental processes and how they might be harnessed more effectively. Much has been accomplished, but there is still much to be done in advancing scientific understanding and the practical development and skilful deployment of this vital strategic competence.

Notes

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1. More recently, Allinson et al. (2000) appealed to Ornstein's research of the 1970s to argue that the analytical or intuitive information processing modes 'reflect what are often referred to as the rational and intuitive *sides* of a person' (p. 34, our emphasis).
2. A recent UK survey of strategy workshops has revealed that participation in these events is largely the preserve of the upper echelons. Moreover, intuition seems to play a dominant role, as evidenced by the fact that participants typically engage in minimal preparation beforehand (Hodgkinson et al., 2005, 2006b).
3. Accessed from L'Oréal's website (http://www.en.loreal.ca/_en/_ca/news/), 14 September 2006.

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