

# INTUITION IN MANAGEMENT RESEARCH: A HISTORICAL REVIEW

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## **Abstract**

In this historical review we chart the progress of intuition research over the past eight decades. We highlight the distinction between intuition research in management and intuition research in base disciplines and related fields, and offer a critical commentary on the ways in which the dynamic between these two historical threads has affected progress in the study of intuition in organizations. We conclude by identifying several promising new directions for intuition research, and offer a number of recommendations to intuition researchers in management which may help in taking this topic forward in ways that do not recapitulate previous errors, diversions or digressions.

## **Introduction**

Management researchers over the course of the past eight decades have been concerned greatly with the relationships between human beings' information processing capacities and the complexities, dynamism, and uncertainties that characterise managerial work. A perennial theme in these debates has been the question of how human rationality, which is by nature bounded, can be deployed to deal efficiently and effectively with the ambiguous and time-pressured decisions and problems that are common in managerial work. Intuition is amongst the hardest of bounded rationality's perennials, appearing and re-appearing in various guises from the 1930s to the present day. In this article we chronicle the development of intuition research in management, and illustrate parallel insights in related fields of scientific inquiry (i.e. behavioural, biological, and brain sciences), discoveries which have availed management scholars of conceptual, theoretical, and methodological resources which have been utilised to greater and lesser extents during the study of intuition in management. This historical review maps in chronological sequence the key developments (see Figure 1). We reflect upon how lessons from the history of intuition research in management may illuminate the way forward. We begin not with the discoveries of a scientist but of a practitioner; our story ends with a consideration of emerging insights not from management and organisation studies but from cognitive neuroscience and evolutionary biology.

[FIGURE 1 HERE]

### **Chester Barnard and the 'Incessant Din of Reasons' (1930s ff.)**

In spite of the fact that as early as 1916 George van Ness Dearborn in the

*Psychological Review* declared the concept of intuition to be “a live one and real, worthy therefore of at least brief scientific discussion” (p.465), and notwithstanding the contemporaneous insights of C.G. Jung (as manifested in the iNtuiting-Sensing dimension of Jungian psychological types), a lone figure dominates the landscape of the early days of management intuition scholarship - Chester Irving Barnard (1886-1961). Barnard worked for nearly 40 years in the American Telegraph and Telephone (AT&T) Company, starting out in the statistical department and rising to the presidency of New Jersey Bell Telephone Company. He was one of the first management writers to attempt to articulate what intuition is, to speculate on its nature and origins, and on the circumstances and particular job roles to which it is relevant.

In the Cyrus Fogg Brackett lecture to the Engineering faculty and students of Princeton University on the 10<sup>th</sup> of March 1936 in a talk entitled ‘The Mind in Everyday Affairs’ (reproduced as the Appendix to his book *The Functions of the Executive*, 1938) Barnard declared that mental processes fall into two distinct categories: ‘non-logical’ and ‘logical’. These are not clearly separated but meld into each other:

“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, which are only made known by a judgment, decision or action.” (Barnard, 1938, p.302)

For Barnard the most significant difference between individuals and between the various types of work that they do lies in the degree to which ‘thinking’, in the sense of analytical reasoning, is used or required. He argued that executives, as contrasted with scientists for example, do not often enjoy the luxury of making their decisions on the basis of ordered and leisurely rational analyses, but depend to a large

extent on intuitive responses to situations requiring fast decision taking and complex judgements. But like all human beings managers are nonetheless subject to one of the most deep-seated of human necessities – the need for expressing reasons to the extent that these become an “incessant din” (p.305), in spite of the fact that “much reasoning and much talking is loose, incorrect, and bad” (p.304).

Barnard’s conceptualisation of intuition is naïve in that he did not provide a set of formal scientific criteria for distinguishing between ‘logical’ and ‘non-logical’: “Some of it is so unexplainable that we call it ‘intuition’. A great deal of it passes under the name of ‘good judgment’” (Barnard, 1938, p.305). Barnard did not regard non-logical processes as mystical (cf. Wild, 1938); on the contrary, he felt they were grounded chiefly in knowledge and experience, and their sources lay in physiological conditions or factors, or in the physical and social environment:

“...mostly impressed upon us unconsciously or without conscious effort on our part. Because they are so complex and so rapid, often approaching the instantaneous, these processes cannot be analyzed by the person within whose brain they take place consisting, as they do, of a mass of patterns, concepts, techniques, and abstractions that increase in number and complexity with directed experience, study and education” (Barnard, 1938).

Barnard’s contribution lies in the fact that as a practising executive he not only observed with great acuity and at first-hand the issues of which he wrote, but also thought about them deeply and insightfully, and without a scientific framework in which they could be placed.

There was a psychology of which Barnard appears to have been, and as a non-academic may be excused for being, unaware: for example in his compatriot William James’ (1842-1910) writings (e.g. the ‘automization’ of mental functions, 1890), but perhaps most notably in C.G. Jung (1875-1961) who delineated a number of psychic

functions including sensing, thinking, feeling, and intuiting “which I hold to be perception by way of the unconscious, or the perception of an unconscious content” (Jung, 1928, p.34) and which “should permit us to divine the more or less hidden possibilities and backgrounds of a situation, since these hidden factors also belong to *a complete picture of a given moment*” (Jung, 1928, p.35, emphases added) (see Denhardt and Dugan (1978) for a comparison of Barnard and Jung in the context of managerial intuition). As later developments would demonstrate, Barnard’s ideas were not only compatible with some of the psychologies of the time, they anticipated by several decades Polanyi’s (1958) and Reber’s (1969) theories of tacit forms of knowledge, and implicit learning respectively, as well perhaps as containing intimations of automatic-versus-controlled processing. For Barnard experience-based observations and a-theoretic interpretations of how managers, such as he, processed information reflected self-evident attributes of human cognition.

### **Herbert Simon and Bounded Rationality (1950s ff.)**

Herbert A. Simon (1916-2001) was the first scholar to analyse intuition’s role in management and organisation in a systematic and scientific way and elevate understandings of it beyond Barnard’s lucid but limited account. There is continuity between these two pioneers of intuition research to the extent that not only did Barnard write the preface to the original 1945 edition of Simon’s *magnum opus Administrative Behavior*, Simon himself also later acknowledged Barnard’s essay *The Mind in Everyday Affairs* as providing a “persuasive account” of executives’ decision processes (Simon, 1987, p.56). Simon saw the task of behavioural models of rational choice as being to replace the global rationality of ‘economic man’ (*Homo economicus*), “with a kind of rational behavior that is compatible with the access to

information and the computational capacities” which human beings are endowed with by nature (Simon, 1955, p.99). The logical consequence of this position is that human behaviour in the environment of business organisations is “intendedly” but not wholly rational, i.e. organisational behaviour is “boundedly” rational (Simon, 1947 when it first appeared in print, Jones, 1999). Choices are made that are satisfactory, i.e. good enough and actors ‘satisfice’ because the computational demands of maximising are beyond their computational capabilities: “The central nervous system is a serial information processor that must serve an organism endowed with multiple needs” (Simon, 1967, p.29).

By substituting an ‘administrative man’ of limited knowledge and ability for the perfectly rational *Homo economicus* of unlimited knowledge and omnipotent capabilities (see Gigerenzer, 2001) it becomes possible to explain “many of the phenomena of organizational behavior” and provide the basis for a behavioural theory of decision making in organisational contexts (Simon, 1955, p.114). In later empirical work Simon and his colleague William Chase conducted a series of experiments involving chess experts that explored the cognitive basis of intuitive judgements, and led ultimately to the development of a pattern-recognition based theory of intuition. Simon argued that the term ‘intuition’ may be used to describe decision making behaviour that is speedy and for which the expert is unable to describe in detail the reasoning, or other processes that produced the answer. For Simon intuition is “nothing more and nothing less than recognition” (Simon, 1992, p.155), “analyses frozen into habit and the capacity for rapid response through recognition” (Simon, 1987, p.63), and managers’ intuitive skills depend on the same kinds of mechanisms as those of chess masters or physicians and “it would be surprising if it were

otherwise” (Simon, 1997, p.136).

Simon’s account of intuition as domain-specific expertise resonates with later theories of intuition in which pattern-recognition plays a preeminent role (e.g. Klein 1998). In this view, intuition is an outcome of an expert’s rapid recognition of, and response to, situations characterised by familiar cues, the latter giving access to large bodies of explicit and tacit knowledge assembled through learning and experience (Simon, 1983) stored in long term memory. In terms of the processing mechanisms - and bear in mind he was writing over half a century ago - Simon did not “rule out the possibility that the unconscious [mind] is a better decision maker than the conscious [mind]” (1955, p.104). This view resonates with Dijksterhuis’s ‘unconscious thought theory’ in which he posits that “contrary to conventional wisdom, it is not always advantageous to engage in thorough deliberation before choosing” and that ‘unconscious thought’ has its own “generative power” (Dijksterhuis, Bos, Nordgren, and van Baaren, 2006, p.1005).

Simon’s account of intuition is not unproblematic. Gobet and Chassy (2009, p.158) for example pointed out a number of important limitations: (1) they re-iterate De Groot’s (1986) and Dreyfus and Dreyfus’ (1986) critiques that intuition is more than pattern-recognition; it has constructive and productive aspects which mean that it not only reproduces “previous solutions, but also creatively combines elements to produce new solutions”, without this there is little room in Simon’s theory for a creative intuition. Indeed, Simon asserted that it is possible to construct a normative theory of creative discovery processes “which need not be attributed to chance, irrationality, or *creative intuition*” (Simon, 1974, p.479, emphases added); (2) in spite of the fact that Simon (1987) addressed explicitly the issue of emotion in decision

making, “the links between intuition and emotions are not spelled out in any detail” in Simon’s account (Gobet and Chassy, 2009), nor does he explain the difference between emotional feelings (which he depicts largely as negative in his 1987 article) and intuitive feelings (cf. Damasio, 1999). Both Barnard and Simon saw intuitive judgement as possessed of certain positive features (e.g. speed of response) that rendered it a desirable attribute of the practising manager (e.g. with experience it was likely to be more right than wrong).

In recognition of his pioneering research into decision-making processes in organisations, Herbert A. Simon was awarded the Nobel Prize in Economics in 1978.

### **Kahneman and Tversky and the ‘Down Side’ of Intuitive Judgement (1970s ff.)**

The roots of behavioural decision theory (BDT) include Simon’s treatises on bounded rationality in the late 1940s and 1950s, and Meehl’s work on the inaccuracies of expert clinical prediction (Meehl, 1954). The main development of BDT came about as a result of the collaboration between Daniel Kahneman and Amos Tversky (Shapira, 2008). In the late 1960s and early 1970s Kahneman (b. 1934) and Tversky (1937-1996) explored the systematic biases accruing from judgements and choices based on intuitive errors which stem from a number of fallacies and miscomputations inherent in human information processing (Kahneman and Tversky, 1973; Tversky and Kahneman, 1974). In the ‘heuristics and biases’ research programme Kahneman and Tversky defined intuition as “thoughts and preferences that come to mind quickly and without much reflection” (Kahneman, 2002, p.449). Their research was guided by the notion that intuitive judgements are ‘natural assessments’ elicited by the task at hand (Gilovich and Griffin, 2002) and occupy a position between the automatic operations of perception and the deliberate operations

of reasoning (for an overview and critical assessment of BDT see Shapira, 2008).

Although Tversky and Kahneman asserted that heuristics sometimes succeed and sometimes fail, their experimental results were typically interpreted as indicating human computational deficiencies (i.e. the ‘down-side’ of certain forms of bounded rationality - see Hodgkinson and Sparrow, 2002) attributable generally to one of three main heuristics that underlie judgements under conditions of uncertainty: (1) representativeness heuristic (i.e. ‘what is typical’); (2) availability heuristic (i.e. ‘what comes easily to mind’); (3) adjustment and anchoring (i.e. ‘what happens to come first’) (Kahneman, Slovic and Tversky, 1982; Kahneman, 2002, 2003). Their seminal work revolutionised research on judgement and decision making, and their influence quickly spread beyond psychology into fields as diverse as medicine, politics, law, economics, and business administration (Gilovich and Griffin, 2002, p.1). The utility of heuristics, the ubiquity of their occurrence, and their attendant errors and biases have been demonstrated in the amassed body of evidence demonstrating that decision makers employ rules of thumb intentionally and unintentionally, consciously and non-consciously, “in order to render the world manageable” (Hodgkinson and Sparrow, 2002, p.15).

From the perspective of a history of intuition in management, several aspects of the heuristics and biases programme as originally conceived by Kahneman and Tversky and their co-researchers are noteworthy: (1) heuristics are neither irrational nor a-rational; rather, they are natural assessments and “sensible estimation procedures”, based on sophisticated underlying processes (e.g. retrieval and matching) in response to simple questions rather than to complex judgemental problems (Gilovich and Griffin, 2002, p.3); (2) although the label ‘intuition’ was applied to

these judgements, the intuitive judgements to which they pertain are ‘cold’, i.e. affect is absent from the original three general-purpose heuristics (i.e. availability, representativeness, and anchoring and adjustment), as it was in Simon’s account of intuition also. This limitation was acknowledged by Kahneman and Frederick (2002) thus: “the failure to identify [the affect heuristic] earlier reflects the narrowly cognitive focus that characterized psychology for some decades” (p.56). Gilovich and Griffin (2002) are keen to point out that in the heuristics and biases programme decision makers are seen usually through a ‘cognitive miser’ lens (i.e. humans as conservators of mental effort), a view which led to dissatisfaction amongst some decision researchers. Gilovich and Griffin also maintain that dual-process theory (see below) is more consistent with the ‘natural assessments’ view, and that the latter rather should be considered the prime focus and consolidated as being “what the heuristics and biases program is really about” (2002, p.16).

In recognition of his contribution for having integrated insights from psychological research into economic science, especially concerning human judgement and decision-making under uncertainty, Daniel Kahneman was awarded the Nobel Prize in Economics in 2002.

### **Birth of a Management ‘Neuromyth’ (1970s ff.)**

At around the same time as Kahneman and Tversky were conducting their ground-breaking psychology laboratory studies of heuristics and biases, in the biology laboratories of Caltech and various other institutions in the USA a group of psychobiologists, foremost amongst whom was Roger W. Sperry (1913-1994), were studying the effects of severing the *corpus callosum* (the bundle of nerves which connects the two hemispheres of the brain) as a way to treat epileptic seizures. Sperry, with

various colleagues including Phillip Vogel, Joseph Bogun, and Michael Gazzaniga, conducted a series of experiments that demonstrated clear functional specialisation of the brain's two hemispheres.

Much has been written on this subject (see Springer and Deutsch, 2001), for our purposes it is sufficient to note that Gazzaniga (2002) summarised the different aspects of thought and action that each hemisphere is responsible for as follows: (1) the 'left-brain' is dominant for language and speech (it 'can talk'), it can also solve problems, and is always 'hard at work' seeking meaning in events. It looks for order and for reason even if there is none to be found and as a result it tends to over-generalise; (2) the 'right-brain', while it cannot 'talk' and is deficient at rational problem solving, it is dominant in visual motor tasks and 'lives in the present', and unlike the left brain, which tends to confabulate, the right brain tends to give a much more truthful account of experiences.

In recognition of his discoveries concerning the functional specialisation of the cerebral hemispheres, Roger W. Sperry was awarded the Nobel Prize in Physiology or Medicine in 1981<sup>1</sup>.

As early as the mid-1970s these concepts were adapted and elaborated on by management researchers, most famously by Henry Mintzberg who, in drawing attention to his view that management was much as 'art' as 'science', declared that planning was a 'left hemisphere' process (i.e. logical, analytical, and verbal), managing was a 'right hemisphere' process (i.e. creative, intuitive, and imagistic), and "which hemisphere of one's brain is better developed may determine whether a

person ought to be a planner or a manager” (Mintzberg, 1976, p.49). This idea was embraced eagerly in business and management circles, for example small business research (Isaack, 1981), strategic decision making (Agor, 1986), and consumer behaviour (Kassarjian, 1982). The left-brain/right-brain model of information processing gained momentum through the 1970s and 1980s. For example Taggart and colleagues proposed a ‘human information processing (HIP) metaphor’ in which a ‘left-hemisphere’ decision style was characterised by logical, sequential, objective, deductive, and analytic processes, whilst a ‘right-hemisphere’ decision style was characterised by non-logical, simultaneous, subjective, a-causal, inductive, and synthetic processes, including intuition (Taggart and Valenzi, 1990).

The influence of the ‘split-brain’ school of thought has been strong and pervasive to the extent that even as late as the mid-1990s the split-brain/hemispheric dominance concept was offered by organisational behaviour researchers as an explanation for individual differences in intuitive and analytical processing. For example, the Cognitive Style Index (CSI) is an instrument predicated upon the split-brain model (see Allinson and Hayes, 1996, p.122) traceable to Mintzberg’s (1976) *Harvard Business Review* article. As we shall witness, the turn of the century saw major conceptual, theoretical, and methodological advances which rendered split-brain models of decision making and associated techniques for the assessment of individual differences problematic to say the least. These more recent advances notwithstanding, the split-brain model prevails in the popular business and management literature. Ned Herrmann for example in his *The whole brain business book: Which quadrant dominates you and your organization?* offered readers a ‘Whole Brain Technology’ based on assessment using the ‘Herrmann Brain Dominance Instrument (HBDI)’ and promised an improved understanding not only of

how the brain works, your own ‘mentality’ and that of colleagues, family members, and friends, but also of what “turns you on, and why you do things in the way you do them” (Herrmann, 1996, p.4). Almost a decade on from Herrmann, Daniel Pink in his *New York Times*, *BusinessWeek*, *Wall Street Journal*, and *Washington Post* best-seller *A whole new mind: Why right-brainers will rule the future* (translated into 23 languages) challenged what he saw as the orthodoxy of reductive and analytical forms of thinking (referred to as ‘L[i.e. ‘left-hemisphere’]-directed’). Pink argued that in the ‘information/conceptual-age’ societies of the West there is an imperative to be ‘re-animated’ by a new ‘R-directed’ frame of mind that cherishes abilities such as “forging relationships rather than executing transactions, tackling novel challenges rather than solving routine problems, and synthesizing the big picture rather than analyzing a single component” (Pink, 2005, p.34).

It may come as a surprise, therefore, that a little over a decade after Mintzberg (1976) a number of management researchers were already expressing scepticism and doubts about the veracity of the application of the psycho-biologists’ findings. Hines (1987), for example, reviewed current research on hemispheric differences and concluded that the claims of Mintzberg (1976), Agor (1986), and others represented a “hemisphere mythology”, and that any attempts to improve performance, training and selection using “such non-existent dichotomies will at best be unproductive” (p.605). Simon (1987) referred to the split-brain doctrine in management as a “romantic extrapolation” and made two salient points as far as intuition research is concerned: (1) physiological research does not imply that either hemisphere is capable of problem solving, decision making, or creative discovery independent of the other (i.e. both analysis and intuition are essential, a point on which Mintzberg (1976) concurred); (2) for the purposes of organisational behaviour “it is the differences in behavior, and not

the difference in hemispheres that are important...The important questions for us are ‘what is intuition?’ and ‘how is it accomplished?’, not ‘in which cubic centimetres of the brain tissue does it take place?’ (Simon, 1987, p.59). Thirty years after Mintzberg (1976), the eminent neuroscientist Michael Gazzaniga (2006, p.66) in the *Harvard Business Review* issued a timely caution regarding the implications of contemporary research in the behavioural neurosciences for business and management (the title of the article was ‘The brain as boondoggle’).

Viewed sympathetically, the ‘spilt-brain’ idea is at best a convenient metaphor for two different modes of thinking. It also sounds a cautionary note for those who may wish to incorporate the latest findings from the neurosciences into the field of management and organisation too prematurely: without due diligence they run the risk of creating and promulgating 21<sup>st</sup> century neuro-mythologies. The simple left/right model of information processing has given way to more sophisticated conceptualisations of ‘neural geography’ in which intuitive and analytical approaches to decision making are underpinned by complex, interconnected neuropsychological networks and systems, hence, reference to gross left/right differences in information processing are “perhaps best avoided altogether” (Hodgkinson, Sadler-Smith, Burke, Claxton, and Sparrow, 2009, p.282).

### **Beginnings of Systematic Description, and Normal Science (1980s ff.)**

The 1980s were a period in which a number of parallel streams of intuition research co-existed. BDT entered what might be described as a period of normal science: psychologists gradually accumulated evidence in support of the foundational tenets of a paradigm (heuristics and biases) which is a central plank of classical behavioural decision research (see Gilovich, Griffin and Kahneman, 2002; Shapira,

2008). In management the neuro-myth persisted, but management research also witnessed the beginnings of a systematic investigation of intuition's role in organisational decision making processes. The efforts of Mintzberg and others refocused management researchers' attention on intuition in practice; for example Isenberg (1984) reported 12 case studies of 'how senior managers think', and found that "the higher you go in a company the more important it is that you combine intuition and rationality" (p.81). Participants appeared to use intuition in five distinct ways: (1) sensing when a problem exists; (2) performing well-learned behaviours rapidly; (3) integrating and synthesising data; (4) checking on the results of rational analysis; (5) coming to plausible decisions quickly by by-passing in-depth analysis. Agor (1986) surveyed 200 'highly intuitive' managers with 11 open-ended questions on issues related to use of intuition. He found that the conditions under which intuition 'functioned best' included: (1) uncertainty; (2) absence of precedent; (3) requirement to use limited or ambiguous data and information; (4) existence of equally plausible alternatives; (5) time pressure. Notwithstanding these achievements in descriptive research, the 1980s became a period of *stasis* as far as theoretical understandings of the processes and mechanisms of management intuition were concerned. In the decade that followed, three scientific developments occurred outside of the management field, but the impact of which on intuition research in management is hard to overestimate.

### **Three Pillars of Modern Intuition Research (1990s ff.)**

#### *Dual-Process Theories*

In their recent review of theory and research directed more broadly to the analysis of cognition in organisations Hodgkinson and Healey (2008) noted that both

heuristics and biases and intuition research received an impetus from dual-process theories of cognition. Dual-process theories of reasoning and decision making constitute an extensive domain of inquiry and comprehensive reviews are to be found in Chaiken and Trope (1999), Stanovich and West (2000), and Evans (2008). Dual-process theories - summarised cogently by Evans (2003, p.454) as essentially positing “two minds in one brain” - come in a number of forms and have in common the notion that there are two contrasting modes (systems) of information processing: System 1 processes are contextually-dependent, automatic, largely unconscious, associative, intuitive, implicit, and fast; System 2 processes are contextually-independent, analytic, rule-based, explicit, and relatively slow (Stanovich and West, 2000).

Among the many dual-process theories Epstein’s Cognitive-Experiential Self-Theory (CEST) (Epstein, 1985, 1994), which posits a ‘rational (i.e. analytical) system’ and an ‘experiential (i.e. intuitive) system’ (Epstein, Pacini, Denes-Raj, and Heier, 1996; Epstein, 2008), is especially pertinent to intuition research because of the primacy that it accords to affect (i.e. ‘gut feel’, ‘hunch’, ‘vibe’, etc.). According to CEST when a person responds to an emotionally significant event, the experiential (intuitive) system automatically searches its memory banks for related events, including their emotional accompaniments. Although the terms ‘intuition’ and ‘gut feel’ are not explicitly used in CEST (‘experiential’ and ‘vibes’ are preferred terms), Epstein (2008, p.29) argued that everything discussed about the experiential system is relevant to intuition because intuition is regarded as a subset of experiential processing.

CEST has come to enjoy considerable prominence amongst management

intuition researchers in the 2000s (e.g. Hodgkinson and Clarke, 2007; Hodgkinson et al, 2009; Leybourne and Sadler-Smith, 2006; Sinclair and Ashkanasy, 2005). There are several likely reasons for this: (1) availability and ease-of-scoring of Epstein et al's Rational Experiential Inventory (REI), an instrument for assessing individual differences in preferred approaches to information processing based on independent rationality ('need for cognition') and experientiality ('faith in intuition') scales; (2) CEST formed the theoretical basis of Hodgkinson and Sadler-Smith's (2003) critique of Allinson and Hayes' (1996) CSI; (3) the affective component of intuitive judgement aligns closely to Epstein's conception of the intuition construct. Indeed, Epstein has gone as far as to claim that the most, if not all, of the attributes of intuition "can be accounted for by the operation of the experiential system" (Epstein, 2008, p.33).

#### *The Somatic-Marker Hypothesis*

The small number of behavioural decision researchers who did acknowledge the role of affect in human judgement and decision making (e.g. Simon, 1987) lacked an explanation of the mechanisms whereby affect is infused into the decision making process. Given that affect is a psychological function associated with a number of specific neural systems, the proper level of analysis for such a function is "the level at which that function is represented in the brain" (Le Doux, 1996, p.16). In pursuit of this level of explanation for affect's role in decision making neurologists Antonio Damasio, Antoine Bechara, and colleagues studied several patients with lesions of the ventro-medial pre-frontal cortex (VMPC) who "showed impairments in judgment and decision making in real-life settings, in spite of maintaining normal intellect" (p.337). Following the lead of earlier work (Eslinger and Damasio, 1985) involving the study

of modern clinical cases similar to the famous ‘frontal lobe syndrome’ suffered by 19<sup>th</sup> century railway worker Phineas Gage, Damasio and colleagues formulated the somatic marker hypothesis (SMH).

Damasio and his co-researchers (Bechara, Damasio, Tranel, and Damasio, 1997) compared the performance in an experiment based on a high-risk gambling task of normal participants and patients with damage to the VMPC, the brain region that Gage had suffered damage to, which was thought to be involved in infusing emotion in the decision process (these were the so-called ‘Iowa Gambling Task’, IGT, studies). Damasio and colleagues’ research programme offered strong evidence that when the VMPC is intact autonomic responses associated with intuitions based upon previous experience and emotional states guide decision making and outcomes in advance of awareness and influence higher-order thinking processes both consciously and unconsciously: this is the essence of the SMH. For a critical review of the SMH see Dunn, Dalgleish, and Lawrence (2006).

### *Recognition-Primed Decision Model*

Pioneering NDM researcher Gary Klein described himself and his colleagues as ‘naturalists’ whose investigations are concerned with how people actually make decisions in field settings rather than investigations that test “hypotheses drawn from mathematical and statistical theories” (1998, p.291) thus intimating dissatisfaction with mainstream BDT. Klein and his colleagues investigated the strategies used by experienced professionals when performing complex, ill-structured, high-stakes tasks, in time-pressured, uncertain and dynamic conditions (Zsombok and Klein, 1997). The Recognition-Primed Decision (RPD) model describes what professionals such as fire-fighters, nurses, or military commanders actually do under conditions of time

pressure, ambiguity, and changing conditions. RPD postulates that under such conditions experts can make good decisions without having to consciously perform extensive, multi-attribute analyses and that they are able to do so by employing their experience to recognise problems as similar to problems previously encountered, or which are at least similar to problems they have met before.

Klein argued that intuition depends on the use of experience to recognise key patterns that indicate the dynamics of the situation. Because the patterns encountered in real-life situations can be nuanced and subtle, people often cannot describe what they actually noticed, or how they judged a situation as typical or atypical. Klein is keen to point out that intuition is not infallible and our experience can mislead us; hence, we may make errors of judgement. However, such experience has the potential to add to our knowledge and skills base (both tacit and explicit), thereby contributing to the on-going acquisition of expertise. Whilst RPD offers a convincing account of intuitive judgement Klein only offered the merest of glimpses of the significance of affect in RPD (“sometimes...we just ‘feel’ the problem, an emotional sense that something is not right”, 2003, p.96). He alluded to, but did not elaborate on, the potential of somatic-markers as an explanation of this phenomenon.

### **Management Intuition Research in the 1990s: Description and Prescription**

The 1990s witnessed a continuation of the general tendency among management researchers of not engaging with the substantive theoretical advances taking place in the base disciplines. Instead, management researchers were concerned with asking questions about the role of intuition in managing modern organisations and, on the basis of their findings, offering prescriptive advice about when it should and should not be used based on an impoverished understanding of the scientific basis

of intuitive cognition.

Parikh, Neubauer, and Lank (1994) conducted a cross-sectional survey of managers across nine countries covering issues relating to ‘what is intuition?’, ‘how relevant is intuition?’, ‘how can intuition be identified?’, and ‘when is intuition used?’ The detailed findings, published in the monograph by Parikh and his colleagues are for the most part descriptive and lack any substantive theoretical insights. In similar vein, at the end of the decade Burke and Miller (1999) conducted interviews with 60 experienced professionals holding significant positions in major organisations across the USA. They explored the nature of intuition, how it is developed, how often it is used, and the type of workplace situations in which intuition is deployed. Based on their findings Burke and Miller provided a picture of intuition-in-use and offered advice to executives on when intuition should be used, i.e. when time is of the essence, when explicit cues or guidance are lacking, when uncertainty prevails, and when it is necessary to run a check-and-balance on quantitative analyses.

By the end of the 1990s intuition research as it applied to the mainstream of management and organisation had come full circle, re-iterating, confirming, or extending a number of the insights offered by Barnard over half a century earlier (e.g. what intuition is, its nature and origins, and the circumstances and job roles to which it is relevant). The studies by Parikh et al (1994) and Burke and Miller (1999) represent something of a watershed in management intuition research. With the advent of the new millennium, the practical relevance of intuition was beyond doubt (managers used it, and were interested in finding out how to use it more effectively), and the stage was set for intuition researchers in our field to proceed with a more rigorous programme of inquiry; however, from a theoretical standpoint the ‘loose end’

of affect's place in BDT and NDM was as yet unresolved.

### **Heuristics and Biases Revisited: Making Sense of 'Gut Feel' (2000 ff.)**

The turn of the millennium for BDT witnessed not only recognition of the role that affect plays in decision making in general and in intuitive judgement in particular, but also a systematic attempt to account for its role by utilising concepts that had emerged only several years earlier in neurology (i.e. the SMH) and combine these with relevant insights from dual-process theory. As Hodgkinson and Healey (in press) have observed: (1) earlier variants of dual-process theory reinforced the cognitive miser notion (cf. Gilovich and Griffin, 2002, p.5); (2) more recent developments suggest that an automatic *and* affective reflexive or X-system "underpins" the controlled operations of a reflective system responsible for higher forms of cognition such as logical reasoning, planning and hypothetical thinking (Lieberman, 2007).

Clearly one of the limitations not only of Simon's theory (e.g. Simon, 1987), but also of RPD (Klein, 1998), classical heuristics and biases programme, and BDT more generally was a failure to recognise or account for the role of automaticity *and* affect in intuitive judgement. Notwithstanding the fact that biologists (e.g. Le Doux, 1996) and psychologists (e.g. Zajonc, 1980) had long-recognised the significance of affect for human behaviour and choice (see Oatley, 2004 for a historical review), both bounded rationality and the heuristics and biases programme from their inception to the mid '90s emphasised cognition over affect, as had RPD from its inception (even though the role of feeling states was, according to Hodgkinson and Healey (in press), "well-appreciated" in Janis and Mann (1977) but subsequently overlooked). This is unsurprising since in the tradition of judgement and decision research there has been

the long-held view that decision making is a purely rational and cognitive process (Hastie and Dawes, 2001, p.206). It was not until the late-'90s that the distinctive role played by affect began to be explained satisfactorily by BDT researchers and studied by them in decision making processes (Slovic, Finucane, Peters, and MacGregor, 2002). A reliance on feelings to guide judgement is referred to by some researchers as an 'affect heuristic' (as conceptualised by Slovic and his colleagues). This represented an explicit acknowledgement by heuristics and biases researchers of affect in their theory. For a review of the empirical evidence relating to the affect heuristic, see Slovic et al (2002).

One of the notable strengths of Slovic's work (Slovic et al, 2004) is the theoretical connections noted between the affect heuristic and dual-process theories, and Epstein's CEST in particular (the rational system which Slovic and colleagues prefer to label as the 'analytic' system on the grounds that there are "strong elements of rationality in both [i.e. experiential and rational] systems", p.313). Slovic and colleagues appealed simultaneously to both the SMH and CEST: firstly, they consider Bechara and Damasio's SMH as the most comprehensive theoretical account of the role of affect in decision making; secondly, they regard the affect heuristic "as *the* centrepiece of the experiential mode of thinking" (p.319, emphasis added), and which was most likely the dominant mode of risk assessment and survival throughout most of the evolutionary history of *Homo sapiens*. In Slovic and colleagues' theorising of the affect heuristic we witness much-needed cross-fertilisation, integration, and synthesis within and across the various fields that have shed light upon the fundamentals of intuition.

#### **A 'New Wave' of Intuition Research in Management (2000s ff.)**

The fundamental conceptual and theoretical developments in the psychological and biological sciences that were necessary to build an integrative understanding of intuition's role in organisational behaviour were themselves not consolidated until the 1990s. Therefore at the beginning of the new millennium management researchers were fortunate to have the pragmatic rationale (e.g. Burke and Miller, 1999; Parikh et al, 1994) and the conceptual and theoretical resources (i.e. Damasio, 1994; Epstein, 1994; Finucane, Alhakami, Slovic, and Johnson, 2000; Klein, 1998) to enable them to embark on a more scientifically rigorous programme of intuition research and scholarship based on empirical and theoretical work.

#### *Selective Review of Empirical Studies*

The empirically-based developments witnessed in the early 2000s drew on insights from BDT and dual-process theories, and went beyond the reporting of frequencies and percents that characterised the descriptive and prescriptive work of the 1990s. Several groups of researchers in the USA, Europe, and beyond chose instead to deploy multivariate statistical techniques in medium- to large-sample cross-sectional studies to examine relationships between intuition and behaviour and performance, as well as pursuing construct validation issues.

One of the first significant studies of this type was that of Khatri and Ng (2000) who compared the use of intuition in strategic decision making across three industry types (type was a proxy for environment instability). Khatri and Ng's (2000) justification for their research was that "although intuitive processes are critical for effective strategic decision making, there is little in the way of applied research on the topic [and] only a handful of serious scholarly works on the subject" (p.57). Other cross-sectional studies have examined the relationships between intuition and

performance in a variety of areas of business, for example small firm performance (e.g. Sadler-Smith, 2004), strategic decision preferences (Hough and ogilvie, 2005), project management (Leybourne and Sadler-Smith, 2006), performance in non-profit organisations (Ritchie, Kolodinsky and Eastwood, 2007), and strategic decision effectiveness (Elbanna and Child, 2007). By incorporating insights from dual-process theory researchers also were able, on theoretical grounds, to challenge the orthodoxy of the unitary ('split-brain') position as it applied to individual differences in managers' information processing (i.e. cognitive) styles (see Hodgkinson and Sadler-Smith, 2003; Hodgkinson, Sadler-Smith, Sinclair, and Ashkanasy, 2009).

More recently researchers have augmented hypothetico-deductive inquiry with other approaches in order to capture subjective experiences and retrospective accounts of intuition using inductively-driven methods. For example, on the basis of interviews with 14 loan officers in a large Israeli commercial bank Lipshitz and Shulimovitz (2007) found that in rating the credibility of loan applicants, loan officers integrated 'hard' financial data with 'soft' impressions and gut feelings, but regarded feelings as more valid indicators of applicants' credit worthiness than they did relevant financial data. Woiceshyn (2009) studied how 19 oil company CEOs managed complex situations; she referred to interplay between intuition and rational analysis as a three-loop 'spiralling' process (zooming-out/zooming-in; analysis-by-principles; testing the tentative decision). Hensman and Sadler-Smith (2011) used in-depth semi-structured interviews with 15 highly-experienced banking executives to study intuitive decision making in the finance sector. They found that reliance on intuition was related not only to the nature of the task (e.g. factors of time and uncertainty) and individual factors (e.g. participants' experience and confidence), but also organisational contextual factors (e.g. constraints and conventions, accountability

and hierarchy, team dynamics and organisational culture). These recent qualitative studies are welcome; however, the processes of intuiting and associated intuitive outcomes present unique challenges and opportunities to intuition researchers wishing to ‘capture’ intuitions. The potential of the full range of methods has yet to be exploited (e.g. psycho-phenomenology, Critical Incident Technique, Experience Sampling Methods, and Day Reconstruction Method), and readers are referred to Hodgkinson and Sadler-Smith (2011) for a critical review of methods available for investigating intuition.

### *Selective Review of Conceptual and Theoretical Work*

The 2000s have also witnessed a significant number of conceptual and theoretical advances which have built on the foundational work in BDT and NDM described above. Building on the work of Hogarth (2001) and others, and in an initial attempt at a conceptual synthesis of NDM and SMH, Sadler-Smith and Shefy (2004) drew attention to the affective (‘intuition-as-affect’) and cognitive (‘intuition-as-expertise’) facets of intuition, and used this as a basis for recommendations to executives on how to make more effective use of intuition and develop better intuitive judgement skills. In parallel with these developments Sinclair and Ashkanasy (2005) defined intuition as a non-sequential information processing mode, which comprises both cognitive and affective elements, resulting in direct knowing without any use of conscious reasoning. Sinclair and Ashkanasy’s contribution is significant for two reasons: (1) they used the extant literature to build an integrative model of analytical and intuitive decision making, which combined characteristics of the problem at hand, decision makers’ dispositions, decision context, the decision itself, and conscious analytical and non-conscious intuitive processes, with affect and gender as

moderating variables; (2) they (re-)introduced a “supra-consciousness” element in their discussions, suggestive of a transpersonal intuition, which they “reserved for *unknown* processes” (p.360, emphasis added), thereby reprising the mystical, Jungian and spiritual perspectives that earlier writers had adopted (for example Vaughan, 1979, mooted a ‘spiritual intuition’).

The tenor of Sadler-Smith and Shefy (2004) was largely sympathetic towards the utility of intuitive judgement (i.e. they offered an advocacy for ‘informed’, i.e. expertise-based, intuition), whilst that of Sinclair and Ashkanasy was mixed (the title of their article was ‘Intuition: Myth or decision making tool?’). A more sceptical tone was also adopted by Miller and Ireland (2005) who, although acknowledging that many executives and managers embrace intuition as a viable and sometimes effective approach, concluded that it is a “troublesome decision tool” (p.21). They distinguished between ‘holistic hunch’ (the underlying processes which are not “well understood” (p.21) but are valuable when firms are emphasising exploration) and ‘automated expertise’ (recognition of familiar situations and the straight-forward but partially sub-conscious application of previous learning) (cf. Crossan, Lane, and White, 1999). Miller and Ireland advocated that managers should: (1) exercise caution and only deploy holistic hunches when the costs of failure can be absorbed without significantly affecting a firm’s viability; (2) rely on automated expertise when exploiting existing strategies and technologies (rather than when exploring), and where constraints of time or other resources preclude raising knowledge to an explicit level. Kirton (2003, p.52) has also addressed the issue of logic and intuition with respect to innovation, arguing that both adaptors and innovators need logic and intuition (e.g. “intuition can be very useful as a way of setting up a hypothesis but is unacceptable as ‘proof’”), but that they are likely to use them not only to different

degrees, but in qualitatively different ways.

Although the researchers referred to above acknowledged several of the fundamental principles underpinning current understanding of intuition as manifest in BDT, NDM, and SMH none provided a comprehensive, integrated account and testable research propositions. The need for such a contribution was recognised by Dane and Pratt (2007) who not only defined the construct in a way that has become widely accepted (i.e. “affectively charged judgments that arise through rapid, non-conscious and holistic associations”, p.40), but also provided a comprehensive review and theorisation of intuition and its role in managerial decision making. Dane and Pratt provided much-needed conceptual clarity by delineating intuition from other related constructs such as instinct and insight (cf. Hogarth, 2001), discriminated between intuiting and intuition, and developed a theoretical model and hypotheses that incorporated the role of domain knowledge, learning, task and environmental characteristics, situation awareness, and affect.

In a review of intuition research across the behavioural sciences more generally, Hodgkinson, Langan-Fox, and Sadler-Smith (2008) argued that although until comparatively recently the construct has been regarded as “scientifically weak” and on the “fringes” of psychology, intuition has now emerged from the shadows to become “legitimate subject of scientific inquiry” (p.19). However, despite the many notable developments that have taken place (as summarised above) Hodgkinson et al (2008) saw considerable challenges ahead for researchers, not least the need to understand more fully the relationships between intuition’s somatic, affective, and cognitive components. Although recent years have witnessed significant advances in the integration of concepts and models from areas such as the behavioural

neurosciences, dual-process theory, and NDM, there is still no fully-integrated and holistic theoretical picture of how the fundamental processes of intuiting interact within and between the physiological and psychological levels of analysis; nor, indeed, is it yet clear how the basic processes identified by cognitive and behavioural neuroscientists relate to specific aspects of organisational behaviour (see Hodgkinson and Healey, in press).

### **New Directions**

Recent years have witnessed significant new developments in intuition research both from within management and organisation studies, and in base and previously unrelated disciplines (e.g. neuroscience and moral philosophy). In the final section of our historical review a number of promising new directions will be considered.

#### *Dis-aggregation into Types*

Historical examination of intuition research reveals the idea of intuition as non-unitary to be not new. For example, Epstein et al (1996, p.403) speculated that just as mathematical, verbal, and abstract logic comprise rational processing (i.e. facets of System 2), there may also be “several experiential [intuitive] abilities, such as visualization, imagination, and aesthetic sensibility” (i.e. facets of System 1). Earlier still, other scholars such as Wild (1938), Vaughan (1979), and Cappon (1994) also postulated different types of intuition.

Dane and Pratt (2009) disaggregated intuitive outcomes systematically into three types based on the ‘nature of associations’, ‘intensity of affect’, and ‘level of incubation’, as follows: (1) problem-solving intuition is the outcome of a process of pattern-matching “honed through repeated training and practice” (p.5). In essence it

corresponds to what Kahneman and Klein (2009) and Salas, Rosen, and DiazGranados (2010) referred to as 'intuitive expertise'. However, Dane and Pratt used the term problem-solving intuition to avoid conflating this type of intuition with one of its causes (i.e. expertise); (2) creative intuitions are "feelings that arise when knowledge is combined in novel ways" (p.5) based on loose problem structures involving integration of knowledge across different domains. However, Dane and Pratt question whether creative intuition is an intuition at all because it is relatively slow (i.e. the outcome of incubation, and hence more closely related to insight) and therefore may not warrant the descriptor 'intuition'; (3) moral intuition (see Hauser, 2006).

In their disaggregation of intuitive processes Glöckner and Witteman (2010) argued that dual-process models do not provide any differentiation within the categories of intuitive or deliberative processing. They proposed a four-fold categorisation according to a series of underlying cognitive processes (i.e. associative intuition; matching intuition; accumulative intuition; constructive intuition), and argued that their taxonomy qualified some of the more ambiguous assumptions of dual-process models (e.g. that intuition operates on affective information, but it was not clear how). In Glöckner and Witteman's (2010) differentiated analysis, "affect is important as an input *to* as well as output *from* the different processes" (p.18, emphases added). This view is consistent with Slovic et al's (2002) model of the affect heuristic (i.e. affectively-tagged images already in the affect pool are inputs to the decision process) and Dane and Pratt's (2007, p.40) definition of intuition as "affectively-charged judgments" (i.e. the affective charge is subjectively experienced as an output referred to generically as 'gut feel').

The extent to which Glöckner and Witteman's analysis of intuitive processes maps onto related processes such as insight (see Hogarth, 2001; Jung-Beeman, Bowden, Haberman, Frymiare, Arambel-Lui, Greenblat, Reber, and Kounios, 2004) or intuitive outcomes such as the creative and moral types of intuition (Dane and Pratt, 2009) is not clear (note that Glöckner and Witteman's matching intuition shares some of the features of Klein's RPD model, and hence is less problematic in this regard). Further research is required to explore the relationships between the disaggregated *processes* of intuiting (i.e. Glöckner and Witteman's analysis) and disaggregated *types* of intuition (i.e. Dane and Pratt's analysis), as well as relationships to the SMH (e.g. are somatic markers inputs or outputs in Glöcker and Witteman's conceptualisation?) and dual-process theory more generally (e.g. how does the intensity (high/low) and valence (positive/negative) of an affective charge vary across different types of intuitive processes and outcomes?).

#### *The Emergence of 'Intuitive Expertise'*

From the perspective of 'intuition-as-expertise' (Hogarth, 2001; Sadler-Smith and Shefy, 2004) informed intuition is the result of extensive and deliberate practice, reflection, feedback, and analysis (Dreyfus and Dreyfus, 1986; Ericsson, Prietula, and Cokely, 2007). Hence, it is not possible to understand intuition or improve decision makers' intuitive judgement skills in business organisations without first understanding the nature of intuitive expertise and the conditions under which it is acquired and when it succeeds or fails (Salas et al, 2010). Kahneman and Klein (2009) mapped the boundary conditions that separate intuitive expertise from overconfident and biased judgements. Paralleling Kahneman and Klein (2009), Salas et al (2010) identified the factors that influencing the use and effectiveness of

intuition (i.e. level of expertise and processing styles of the decision maker; task structure and the availability of feedback; and the characteristics of the decision environment).

The recent emergence of ‘intuitive expertise’ as a distinctive topic in its own right represents the conjoining of two major traditions in intuition research, namely NDM and heuristics and biases on the basis that professional (i.e. expert) intuition is “sometimes marvellous and sometimes flawed” (Kahneman and Klein, 2009, p.515). Although there are still major differences between the NDM and the heuristics and biases positions on intuition (e.g. with respect to the concept of bias) Kahneman and Klein (2009) have recently succeeded in bringing jointly the insights of both traditions to bear on the analysis of intuitive judgement. In order to further advance intuition research from the expertise perspective Salas et al (2010, p.965) have called for a programme of empirical research in field settings that tests models of individual- and team-level expertise-based intuition using methods such as think-aloud protocols, narratives, and shadowing, in order to unpack “the black box of intuition”, as well as to longitudinally track evaluations designed to develop the intuitive expertise of individuals and teams.

### *Neuroscience of Intuition*

Modern brain-imaging techniques enable brain activity to be mapped during specific mental activities thus allowing researchers to examine the neural bases of intuitive judgement and its associated processes. For instance, in several studies fMRI (has been used to identify brain regions associated with insight (as distinct from intuition) thereby reinforcing the distinction between these two constructs (Jung-Beeman et al, 2004). The results of other fMRI studies resonate strongly with dual-

process theory; for example, social cognitive neuroscientist Lieberman and his colleagues found that intentional explicit judgements (i.e. in domains where participants had low levels of experience) were associated with activation of a 'reflective' system (referred to as the C-system), whilst intuition-based judgements (i.e. low-effort implicit judgements in areas where the participants had high experience) on the other hand were associated with activations in a reflexive system (the X-system) (Lieberman, Jarcho, and Satpute, 2004). It is suggested by Lieberman (2007) that mirror neurons play an important role in non-verbal communication and intuitive judgements of the behaviour, intentions, and experiences of others, thereby allowing individuals to "use the same systems that process knowledge about self-performed actions, self-conceived thoughts, and self-experienced emotions to understand actions, thoughts, and emotions in others" (Oberman and Ramachandran, 2007, p.310). Current work in management has begun to consider the implications of these developments for the psychological micro-foundations of strategic management theory and research, in particular, the role of reflective and reflexive processes in the development of dynamic capabilities (Hodgkinson and Healey, in press).

### *Evolutionary Perspectives: The Adaptive Toolbox and Moral Intuition*

Evolutionary perspectives are a neglected but potentially fruitful avenue of inquiry for intuition researchers. Dual-process theorists have speculated that System 2 processing evolved some 50,000 to 60,000 years ago (Evans, 2003) but that System 1 processing is much older than this, and may also be present in non-human animals (Epstein, 1994, 2008). From the perspective of evolution through natural selection Gigerenzer and Brighton (2009) in discussing the concept of an 'adaptive toolbox of

the mind', posed the question 'How would a grand planner [i.e. nature] design a human mind?' They responded with a model of the mind of a *Homo heuristicus* that "can make inferences quickly from a few observations...works well in a world where inferences have to be made from small samples, and where the future may change in unforeseen ways" (p.136).

Gigerenzer and his colleagues' 'fast-and-frugal' heuristics research programme which had its inception in the mid to late '90s has two main aims: (1) studying the heuristics that people actually use in everyday contexts and settings (i.e. their 'adaptive toolbox'); (2) demonstrating in which environments a given heuristic performs well, i.e. the 'ecological rationality' of particular heuristics as specialised tools (Hutchinson and Gigerenzer, 2005). Gigerenzer and Brighton (2009, p.107) described *Homo heuristicus* as being in possession of a benignly biased mind that ignores part of the available information, but which paradoxically "can handle uncertainty more efficiently and robustly than an unbiased mind relying on more resource-intensive and general-purpose processing strategies".

A further area in which concepts from evolutionary biology may shed light on intuitive behaviour in organisations pertains to the domain of moral judgement and intuitive ethics. Haidt's (2001) social intuitionist model, which called into question conventional accounts of the rationality of moral and ethical judgement, has two principal attributes: (1) the model is intuitionist in that "moral judgment is generally the result of quick, automatic evaluations (intuitions)" (2001, p.814); (2) the model is social in that emphasises the significance of social and cultural influences on moral judgement, i.e. social intuitions are learned gradually and implicitly by observation and imitation (e.g. of leaders) within the custom complexes of their socio-cultural

setting (e.g. business organisations), with the latter providing a cultural “front end” for the somatic-marker hypothesis (Haidt, 2001, p.828). Intuitive moral judgement involves non-conscious pattern-matching which elicits an affective response but without conscious awareness of the underlying cognitive and affective processes. In other words, reasoning is reduced to a *post hoc* attribution which creates an illusion of control (see Dane and Pratt, 2009; Sonenschein, 2007).

## **Conclusions and Recommendations**

In this review we have offered our interpretation of the chronological sequence of events that make up the history of intuition research in management.

Until the turn of the century, developments of note in intuition research occurred mainly outside the fields of management. Within management research the picture was sometimes confused and contradictory: for example, there was no clear exposition of the now well-established distinction between insight and intuition. One consequence of this conceptual confusion was that organisational learning researchers lacked clarity in their models, exemplified by Crossan et al’s (1999) observation that, “Interpreting has to do with developing *intuitive insights*” (p.525, emphases added). Moreover, the concept of intuition itself was undefined or poorly-defined. Systematically derived and conceptually robust definitions emerged only in the mid-late 2000s (e.g. Dane and Pratt, 2007; Sinclair and Ashkanasy, 2005). The spate of reviews that have appeared in quick succession in recent years are evidence of a convergence of views on what intuition is, and what it is not (e.g. Dane and Pratt, 2007; Hodgkinson et al, 2008; Hodgkinson et al, 2009; Miller and Ireland, 2005; Sadler-Smith and Shefy, 2004) – to achieve this level of agreement is a major step forward. These and our other historical observations lead us to offer four concluding

recommendations in going forward, namely: (1) the need to strive for more careful conceptual framing; (2) the need for greater cross-disciplinary collaboration and integration; (3) the need for increased methodological rigour and pluralism; and (4) closer attention to levels of analyses issues.

*Recommendation 1, Careful conceptual framing:* We are fortunate that scientific, and even some popular (e.g. Gladwell, 2005) understandings of intuition have evolved to the extent that recent years have seen a clearing away much of the conceptual debris, with a more careful delineation of intuition from closely related yet distinct constructs (see, e.g., Dane and Pratt, 2007; Hodgkinson et al, 2008; Hogarth, 2001). Conceptual slippage at this stage would be a serious retrograde step (e.g. Duggan, 2007) and should be avoided at all costs.

*Recommendation 2, Greater cross-disciplinary collaboration and integration:* It is clear that intuition researchers in management have embraced the project of integration, and thereby have made substantial progress; whether such progress would have occurred earlier if management researchers had taken a more holistic perspective remains speculative. What is beyond doubt, however, is that theoretical developments continue apace and empirical evidence from within the psychological sciences is accumulating rapidly with respect to a wider variety of intuitive processes including: implicit attitudes (Plessner, Betsch, Schallies, and Schwierer, 2008), implicit learning (Raab and Johnson, 2008), emotion and motivation (Zeelenberg, Neilssen, and Peters, 2008), individual differences in preferences for intuition (Betsch, 2008), measuring intuitive and rational decision making (Koele and Dietvorst, 2009), frequency estimation (Haberstroth, 2008), intuition and fast and frugal heuristics (Glöckner, 2008), different types of intuition (Glöckner and Witteman, 2010), and the relative

utilities of conscious versus non-conscious processing (Dijksterhuis, 2004). Our historical review suggests that research on intuition in management would benefit greatly through closer cooperation with scholars in the cognitive and behavioural neurosciences.

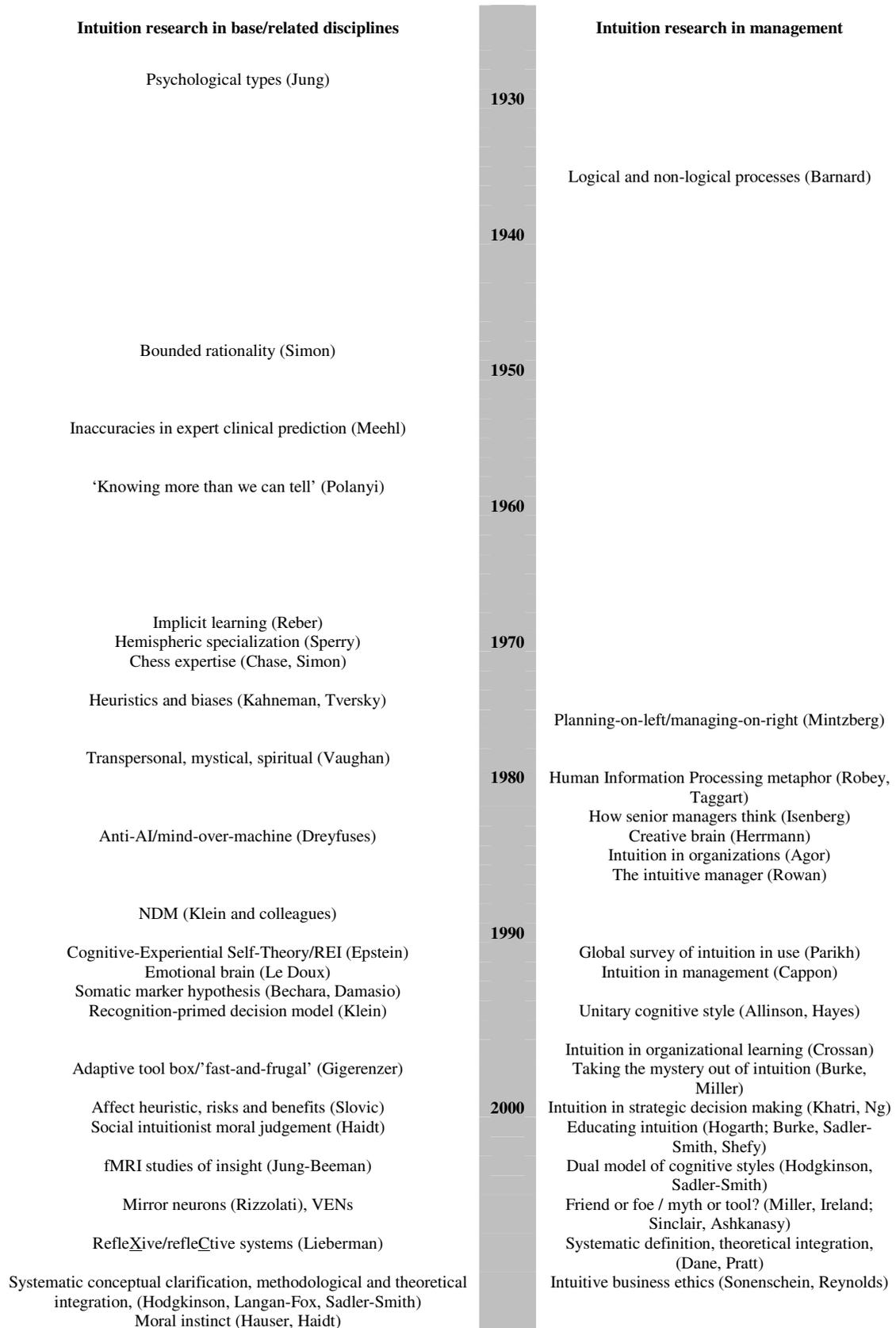
*Recommendation 3, Increased methodological rigour and pluralism:* In the 1990s management researchers devoted considerable effort to the study of individual differences in analytical and intuitive approaches to information processing and the development and validation of various self-report measures. Our review demonstrates that much of this work evolved largely in isolation from parallel streams within and beyond management, an unfortunate trend that resulted in needless duplication of effort and the development of instruments of questionable theoretical and psychometric merit. Looking ahead, researchers should aim for greater cross-disciplinary cooperation, and not over-rely on self-report measures. Perhaps they might consider embracing alternative epistemologies (e.g. phenomenology), and look for more creative ways to study intuitive episodes via retrospective and/or *in-vivo* accounts. Diary methods to capture critical incidents and interview techniques might be suitably combined with self-report instruments and neuro-imaging techniques (see Hodgkinson and Sadler-Smith, 2011).

*Recommendation 4, Closer attention to levels of analysis issues:* Collective intuition is largely absent from intuition research; there has, with only a very small number of exceptions (e.g. Eisenhardt, 1999), been an almost exclusive focus on the individual level of analysis. However, understanding and enhancing the information processing capabilities of strategy-making units and organisations (Hodgkinson and Clarke, 2007) and institutionalising intuitions (Crossan et al, 1999) requires a

broadening of the focus of inquiry to the team and organisational levels in the study of intuition as a multi-level phenomenon. Salas et al (2010) concluded that a deeper understanding of how expertise-based intuition functions at the team level requires multi-level models of expertise-based intuition, not least in order to understand how people communicate and interpret intuitions.

At the present juncture intuition researchers fortunate to have a rich and diverse set of conceptual, theoretical and methodological resources upon which they may draw. History indicates that impactful developments in the study of the role of this pivotal aspect of human cognition in organisational contexts cannot, because of the nature of the construct, be a reductive project or come from within the field of management alone; instead scientific progress is likely to be maintained and enhanced from seeking a deeper and wider perspective which acknowledges the potential contributions of psychology, biology, philosophy, and other source disciplines. In the beginning a practitioner initiated intuition scholarship in management. In the end, for us as scholars working in an applied field, it will be on the basis of the contribution that our research makes to the intuitive craft of management practice by which our work shall be judged.

**Figure 1.** Timeline of selected key ideas in intuition research (authors in brackets; date placing approximate, based on date of publication of representative work)



Disaggregation - processes (Glöckner, Witteman)

Unconscious thought theory (Dijksterhuis)  
Intuitive expertise (Kahneman, Klein)

**2010**

Dual-processing in strategy making units  
(Hodgkinson, Clarke)  
Disaggregation - types (Dane, Pratt)  
Inductive studies (Lipshitz, Shulimovitz)  
Entrepreneurial intuition (Blume, Covin)  
The nature and role of intuition in dynamic  
capabilities development (Hodgkinson, Healey)  
Handbook of Intuition Research (Sinclair)

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## **FOOTNOTE**

- <sup>1</sup> The Nobel Foundation's title of this prize is "for Physiology *or* Medicine" (emphases added)