

## Toward an integrated model of intuitive decision making

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**Abstract:** In nowadays complex and changing environment, one cannot expect that only the rational approach works as a panacea to all managerial problems. Actually, organizational decision-making sometimes requires other resources such as intuitive thinking or intuitive decision making when they do not fall in the scientific domain or are at least not labeled as belonging to it. In this paper, it is proposed that the best solution tends to embrace a complementary or integrated decision-making approach. An integrated view seems to gather the best of each theoretical stream and use them to develop a comprehensive model that embraces the features of both analytic and intuitive decision making methods.

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### 1. introduction

In an attempt to come to grips with a world of dynamic change and globalization, organizations today are searching for new management approaches to decision making. In complex, uncertain and time-pressured decision environments where information about alternatives may be unavailable, incomplete, or overwhelming, rational decision making is bounded both by the complexity of the task and by the information processing capacities of decision-makers (Simon, 1997). In classical decision theory a decision maker is considered rational if he/she chooses the most preferred decision, defined usually as maximizing his/her utility or value function. The theory of rational decision making, requires that a rational person should anticipate the consequences of their decisions, estimating the probability and utility of various outcomes, combining the two to calculate the *expected utility* of each action, and then choosing the action that maximizes this quantity (von Neumann & Morgenstern, 1944). In nowadays complex and changing environment, one cannot expect that only the rational approach works as a panacea to all managerial problems. Actually, organizational decision-making sometimes requires other resources. Authors such as Hayward and Preston (1998) argue that linear rational models do not perform satisfactorily for businesses operating under rising pressure and ambiguity (Andersen, 2000). In the arena of managerial decision making, for example, Nutt (1999) reported that rational decision-making strategies struggle to reach the 50% success mark. Since many of the requirements for bounded rationality are becoming more difficult to satisfy (Langley et al., 1995), Wally and Baum (1994) suggest that organizations have begun to embrace more holistic approaches to non-

programmed decisions. In particular, their new openness to investigate alternative decision-making methods has been facilitated by the threat of high decision costs (Tomer, 1996). The impact is further exacerbated by increased time pressure (Kuo, 1998), inadequate information (Goodman, 1993), and fast-paced change (Andersen, 2000), along with other factors triggered by new economic and technological forces since the 1980s (Hunt, 2000). These factors have led management researchers to question the effectiveness of rational decision making as the only viable alternative. Eisenhardt and Zbaracki (Eisenhardt and Zbaracki, 1992) stress the importance of a multidimensional approach to decision making, encompassing bounded rationality as well as heuristics, insight and intuition. Eisenhardt (1999) argues in particular that intuition seems to give managers a better grasp of the changing dynamics in which they have to operate nowadays. In this paper, it is proposed that the best solution tends to embrace a complementary or integrated decision-making approach. Such a view is fully aligned with several researchers' work (Sinclair and Ashkanasy, 2005) toward an integrated model where both approaches are employed through an iterative way. In this light, managers also demonstrate that they feel comfortable falling back on an intuition tool (Parikh et al., 2003).

### 2. Intuition

Intuition is a process of problem-solving often described in such terms as "gut feelings," "insight," "sixth sense," and "inner feelings" (Orme and Maggs, 1993). Rew (1986) defined intuition more clearly as, "knowledge of a fact or truth, as a whole; immediate possession of knowledge; and knowledge independent of the linear reasoning process," and

McCormack (1993) followed by similarly defining attributes of intuition. Eason and Wilcockson (1996) believed that intuition is a non-conscious process, and may be understood as :A process of making sense of a situation which often leads to a decision. This process is non-conscious, by-passing linear methods of reasoning and, by western cultural standards, is considered to be irrational.

Essential features of this process are that it is speedy, effortless and cannot be validated. Intuiting is *rapid* (often labelled instantaneous), *spontaneous* (does not require effort and cannot be deliberately controlled) and *alogical* (meaning that it does not necessarily contradict the rules of logic but does not follow them either). The outcome of the intuitive process is *tacit* (in that the intuitives cannot give account of how they arrived at the results), *holistic* (also often called gestalt, as it is concerned with the totality of a situation rather than parts of it), and the intuitor feels *confident* about their intuition (with no apparent reason in terms of evidence).

Carl jung noted that intuition doesn't denote something contrary to reason, but something outside the province of reason. It is neither a magical sixth sense nor a paranormal process. Intuition is not the opposite of rationality, nor is it a random process of guessing. It is a sophisticated form of reasoning based on "chunking" than an expert hones over years of job specific experience. (prietula & simon, 1989). Intuition does not come easily; it requires years of experience in problem solving and is found upon a solid and complete grasp of the details of experience (seebo, 1993). To the extent that the lessons of experience are logical and well founded, so is intuition( Isenberg, 1984). Intuition means " being able to bear on situation everything you have seen, felt, tasted, and experienced in an industry". (H. ross perot, 1990).

What certainly appears to be the case is that intuition, at least good intuition, appears where there is high level of expertise (Kahneman and Klein, 2009).

Higher level of expertise certainly entails both better intuition and better analysis. But there is something important about the relationship between intuition and the level of expertise that when one achieves a high level of expertise, intuition naturally emerges and at the highest level it becomes the dominant form of knowledge (Gobet and Chassy, 2009). Therefore we agree with Dane and Pratt (2009: 5, 6) that expertise is an antecedent to trustworthy intuition and hence we are only interested in intuition in those with a high level of expertise, what Sadler-Smith and Shefy (2004) call 'intuition-as-expertise', Kahneman and Klein (2009) call 'intuitive expertise' and Salas et al. (2010) call

'expertise-based intuition'. Many years of preparation and work provide raw materials and conditions for incubation of ideas in the subconscious (ray & myers, 1990). Although the realization or intuitive flash may arrive at a seemingly magical moment, it comes usually after a long, hard pondering of a problem (rowan, 1990).

Thus in this definition intuition is not a magical sixth sense or a paranormal process; nor does it signify either random and whimsical decision making or the opposite of reason. Rather, intuition is a highly complex and highly developed form of reasoning that is based on years of experience and learning, and on facts, patterns, concepts, procedures and abstractions stored in one's head. it seems exaggeration to consider intuition as knowledge obtained without rational thought as suggested by Rowan(1989), given that when it happens, recipients are consciously searching for answers, inspirations, and paths to solve their concrete problems and challenges.

Intuition is a "synthetic" psychological function in that it apprehends the totality of a given situation (Vaughan, 1990); it allows us to synthesize isolated bits of data and experiences into an integrated picture. It is a holistic perception of reality that transcends rational ways of knowing. To understand intuition we need to understand its important properties. intuitive processing could be likened to a non-conscious scanning of internal (in memory) and external (in environment) resources in a non-logical, non-temporal manner in order to identify relevant pieces of information that are fitted into the 'solution picture' in a seemingly haphazard way.

### 3. Theories of intuition

Researchers infields beyond business and management have made considerable empirical and theoretical advances concerning the nature of, and mechanisms underpinning, intuitive judgement. Three specific theoretical and empirical advances may be singled out: dual-process theories, and most notably Cognitive-Experiential Self-Theory (CEST); naturalistic decision making (NDM), and in particular the Recognition- Primed Decision (RPD) model; and the Somatic Marker Hypothesis (SMH). Management researchers have drawn on these and other theories in attempting to formulate a better understanding of managerial intuition (Hodgkinson et al., 2008).

Dual-process theories, the RPD model, and the SMH, along with other related research (e.g. acquisition of expertise), have been assimilated into management intuition research in pursuit of conceptual integration (e.g., Dane and Pratt, 2007; Sadler-Smith and Shefy, 2004; Sinclair and Ashkanasy, 2005) and understanding its relevance in particular contexts such as strategic decision making

(e.g. Hodgkinson et al., 2009) and management learning and education (Burke and Sadler-Smith, 2006; Sadler-Smith and Shefy, 2007).

### 3.1. Dual process model

Dual-process models come in different flavours. Most models postulate that people rely either on deliberate (conscious, controlled) or intuitive (automatic, unconscious) reasoning, or on certain combinations of both (Evans, 2007, 2008; Weber & Johnson, 2009).

Almost all authors agree on a distinction between processes that are unconscious, rapid, automatic, and high capacity, and those that are conscious, slow, and deliberative. Different authors have proposed a number of names for the two kinds of thinking they contrast, some of which are shown in **Table 1**. Evans (2008, 2009) has argued that the intuitive system (or System 1) is really a multiplicity of systems that take in a wide variety of implicit processing. These multiple systems are of two kinds: autonomous systems that control behaviour directly without the need of controlled attention, and pre-

attentive systems that supply content into working memory (e.g., perception, attention) and thus determine what information enters analytic processes, which in turn control behavior. Stanovich (Stanovich, 2009) labels this multiplicity of type I systems The Autonomous Set of Systems (TASS): a set of multiple processes that function automatically in response to triggering stimuli. Their shared aspects are that they are fast, automatic, and mandatory; their operations yield no conscious experience although their products might; they require no analytic system input. TASS includes domain-general processes of unconscious learning and conditioning; automatic processes of action regulation via emotions; and rules, discriminators, and decision-making principles practised to automaticity. According to Dienes (Scott & Dienes, 2008), intuition in implicit learning uses unconscious structural knowledge.

Structural knowledge is knowledge that enables a judgement, and is distinguished from judgement knowledge, which is knowledge of whether an item has that structure. Both types of knowledge may be conscious and unconscious.

Table 1 Labels attached to dual-processes in the literature

References	System 1	System 2
<b>Schneider &amp;Schiffrin (1977)</b>	Automatic	Controlled
<b>Epstein &amp;Pacini (1999)</b>	Experiential	Rational
<b>Chen &amp;Chaiken (1999)</b>	Heuristic	Systematic
<b>Evans &amp; Over (1996)</b>	Implicit/tacit	Explicit
<b>Evans (2006)</b>	Heuristic	Analytic
<b>Hammond (1996)</b>	Intuitive	Analytic
<b>Stanovich (2004)</b>	System 1 (TASS)	System 2 (Analytic)
<b>Nisbett et al. (2001)</b>	Holistic	Analytic
<b>Wilson (2002)</b>	Adaptive unconscious	Conscious
<b>Strack&amp;Deustch (2004)</b>	Impulsive	Reflective
<b>Toates (2006)</b>	Stimulus bound	Higher order

In table below we compare different features of system 1 and 2 or intuitive v.s. deliberative.

Table 2 attributes associated with dual systems of thinking

System 1	System 2
Unconscious (preconscious)	Conscious
Implicit	Explicit
Automatic	Controlled
Low effort	High effort
Rapid	Slow
High capacity	Low capacity
Default process	Inhibitory
Holistic, perceptual	Analytic, reflective
Shared with animals	Uniquely human
Nonverbal	Linked to language
Associative	Rule based
Domain specific	Domain general
Pragmatic	Logical
Parallel	Sequential
Independent of general	intelligence Linked to general intelligence
Independent of working memory	Limited by working memory capacity

On the basis of Rew's (1986) and Easen and Wilcockson's (1996) definition, intuition is a non-conscious process and have following features:

1. This process is non-conscious, by-passing linear methods of reasoning.
2. This process cannot be presented as a systematic and structural decision making process.
3. The essential features of this process are that it is speedy but effortless.

Compare to this definition of intuition, rational decision making defined as:

1. This process is conscious.
2. This process can be presented as a systematic and structural decision making process.
3. Essential features of this process are that it is slow and difficult.

Research by Isenberg (1984) and Burke and Miller (1999) has provided empirical evidence that, in ambiguous situations decision makers tend to use intuition in conjunction with rational analysis. These findings concur with Behling and Eckel (1991) who suggested that intuition is useful in situations where problems are poorly structured. The results of Parikh et al.'s (1994) study also tell us that managers are more likely to use intuition when solving ill-defined problems without existing precedents, which is usually associated with non-routine decisions (Simon, 1960). Agor (1984) arrived at a similar conclusion; that intuition is most useful when the manager is faced with conflicting facts or inadequate information. Other factors leading to non-sequential information processing associated with intuition have to do with the perceived importance of the decision (Goodman, 1993) and its potential impact on the decision maker (Kriger and Barnes, 1992).

Deliberative decision making is cognition based, rule governed, analytical, precise and slow. Deliberating decision makers take their time to thoroughly analyse the positive and negative aspects of different options. Such deliberate decision making can be contrasted to intuitive decision making, which is characterised by a sense that something is right or wrong, or that one option is better than another, without necessarily being able to explain where this “gut feeling” or intuition comes from. We understand intuitive decision making as decision making based on this kind of feelings (Lieberman, 2000). Interestingly, the degree to which people process information deliberately or intuitively has been found to depend on affective states. Advancing on dual-process models of information processing, it has been shown that in a sad mood, individuals are more likely to deliberate than in a happy mood (Martin & Clore, 2001). Furthermore, there is some evidence that happy mood individuals respond more intuitively than those in a sad mood (Goschke, & Kuhl, 2003).

### **3.2. Cognitive-Experiential Self-Theory (CEST) (Epstin, 2008)**

Cognitive-experiential self-theory (CEST) is a broadly integrative theory of personality that is compatible with a variety of other theories. CEST achieves its integrative power primarily through three assumptions. The first is that people process information by two independent, interactive conceptual systems, a preconscious “experiential system” and a conscious “rational system”. The second assumption is that the experiential system is emotionally driven. The third assumption is that four basic needs, each of which is assumed in other theories to be the one most fundamental need, are equally important according to CEST. According to CEST, humans operate by two fundamental information-processing systems, a rational system and an experiential system. The two systems operate in parallel and are interactive. CEST has nothing new to say about the rational system, other than to emphasize the degree to which it is influenced by the experiential system. CEST introduces a new system of unconscious processing in the experiential system that is a substitute for the unconscious system. The word “rational” as used in the rational system refers to a set of analytical principles and has no implications with respect to the reasonableness of the behavior, which is an alternative meaning of the word.

The experiential system operates in a manner that is preconscious, automatic, rapid, effortless, holistic, concrete, associative, primarily nonverbal, and minimally demanding of cognitive resources. It

encodes information in two ways: as memories of individual events, particularly events that were experienced as highly emotionally arousing, and also in a more abstract, general way. The abstract representations are in the form of stimulus generalization, including specific generalization gradients as well as broader generalizations based on a confluence of multiple generalizations, as well as in the form of prototypes, metaphors, and narratives. Although the experiential system is a cognitive system, its operation is intimately related to the experience of affect. It is, in fact, inconceivable that a conceptual system that learns from experience would not be used to facilitate positive affect and avoid negative affect. According to CEST, the experiential system both influences and is influenced by affect. The automatic, preconscious experiential conceptual system that regulates everyday behavior is, of necessity, an emotionally driven, dynamic unconscious system. As affect determines what is attended to and what is reinforced, without affect there would be neither schemas nor motivation in the experiential system, and, therefore, no experiential system. It follows that CEST is as much an emotional as a cognitive theory.

In contrast to the experiential system, the rational system is an inferential system that operates according to a person’s understanding of the rules of reasoning and of evidence, which are mainly culturally transmitted. The rational system, unlike the experiential system, has a very brief evolutionary history. It operates in a manner that is conscious, analytical, effortful, relatively slow, affect-free, and highly demanding of cognitive resources. The rational system, with its use of language, is a much more recent evolutionary development than the experiential system and is unique to the human species. Moreover, it is capable of much higher levels of abstraction and complexity than the experiential system, and it makes possible planning, long-term delay of gratification, complex generalization and discrimination, and comprehension of cause-and-effect relations. These attributes of the rational system have been the source of humankind’s remarkable scientific and technological achievements. Moreover, the rational system can understand the operation of the experiential system whereas the reverse is not true.

According to CEST, the experiential and rational systems operate in parallel and are interactive. As the experiential system is the more rapid system, it is able to bias subsequent processing in the rational system. Because it operates automatically and preconsciously, its influence normally occurs outside of awareness. This prompts people to search for an explanation in their conscious



rational system, which often results in rationalization. Thus, even when people believe their thinking is completely rational, it is likely to have been biased by their experiential processing. The influence of the experiential system on the rational system can be positive as well as negative. As an associative system, the experiential system can be a source of creativity by suggesting ideas that would not otherwise be available to the linear-processing rational system.

Since the experiential system is a learning system, it can be a source of useful information that can be incorporated into the rational system. Most important, the experiential system can provide a source of passion for the rational system that it would otherwise lack.

The rational system can influence the experiential system in automatic, unintentional ways as well as by its intentional employment. As the experiential system operates in an associative manner, thoughts in the rational system can trigger associations and thereby emotions in the experiential system. Another unintentional way in which the rational system can influence the experiential system is through repetition of thoughts or behavior in the rational system. Through such repetition, thoughts and behavior that were originally under rational control can become habitualized or "proceduralized", with the control shifting from the rational to the experiential system (Smith & DeCoster, 2000). An obvious advantage to this shift in control is that the thought and behavior require fewer cognitive resources and can occur without conscious awareness.

### 3.3. Recognition-primed decision making (RPD)( Klein, 2003)

In this model Klein present a recognitional model of decision making that shows how people can use experience to avoid some of the limitations of analytical strategies. This model explains how people can make decisions without having to compare options. It fuses two processes-situation assessment and mental simulation-and asserts that people use situation assessment to generate a plausible course of action and use mental simulation to evaluate that course of action. He believe this recognitional model describes how decision making is usually carried out in real world settings. He found that recognitional decision malting is much more common than analytical decision making.

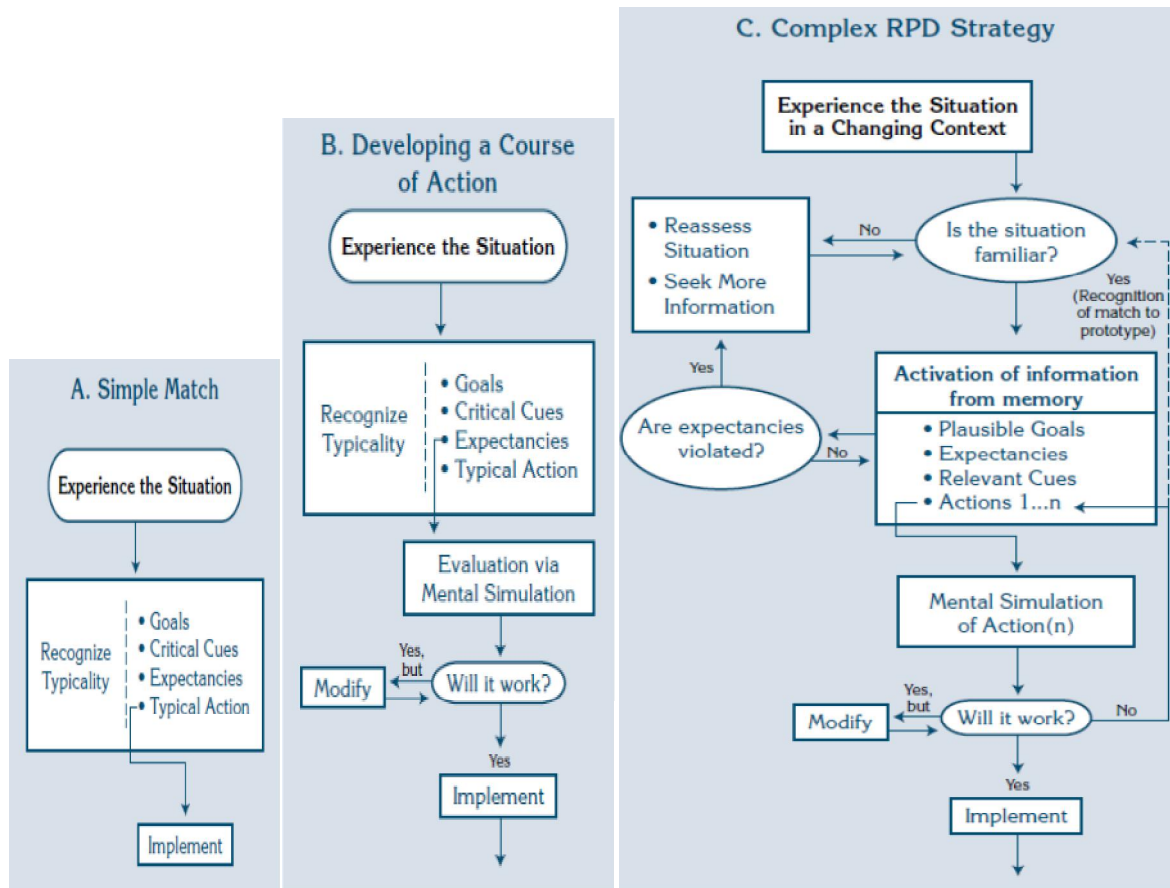
This model describes how people use their experience in the form of a repertoire of patterns. These patterns describe the primary causal factors

operating in the situation. The patterns highlight the most relevant cues, provide expectancies, identify plausible goals, and suggest typical types of reactions in that type of situation. When people need to make a decision they can quickly match the situation to the patterns they have learned. If they find a clear match, they can carry out the most typical course of action. In that way, people can successfully make extremely rapid decisions. The RPD model explains how people can make good decisions without comparing options.

The RPD model is a blend of intuition and analysis. The pattern matching is the intuitive part, and the mental simulation is the conscious, deliberate, and analytical part. This blend corresponds to the System1 (fast and unconscious)/System 2 (slow and deliberate) account of cognition put forward by Kahneman (2003)and others.

There are a number of features that distinguish the RPD model from classical decision models.

- The RPD model focuses on situation assessment rather than judging one option to be superior to others.
- The RPD model describes how people bring their experience to bear on a decision.
- The RPD model asserts that experienced decision makers can identify a reasonably good option as the first one they consider, rather than treating option generation as a semi-random process, requiring the decision maker to generate many options.
- The RPD model relies on satisficing rather than optimizing-finding the first option that works, not necessarily the best option.
- The RPD model focuses on serial evaluation of options and thereby avoids the requirement for concurrent deliberation between options that marks the focus on the "moment of choice."
- The RPD model asserts that experienced decision makers evaluate an option by conducting mental simulations of a course of action to see if it will work, rather than having to contrast strengths and weaknesses of different options.
- Finally, a recognitional strategy enables the decision maker to be continually prepared to initiate action by committing to the option being evaluated. Formal strategies require the decision maker to wait until the analyses are completed before finding out which option was rated the highest.



3.1. Figure 1. Recognition-primed Decision Model (Klein, 2003)

**3.2. Naturalistic Decision Making (NDM)**

Naturalistic decision making is an attempt to understand how humans actually make decisions in complex real-world settings. The NDM framework emphasizes the role of experience in enabling people to rapidly categorize situations to make effective decisions. This theory wanted to find out how people were able to make tough decisions under difficult conditions such as limited time, uncertainty, high stakes, vague goals, and unstable conditions (Orasanu & Connolly, 1993).

NDM acknowledges the existence of action and feedback loops. Decisions are not discrete events but happen amidst the flow of activity in a system and are impacted by the decisions and activity that precede them. Decision makers must respond in real time to changes in the system. Diagnosis of problems and system control often happen simultaneously. another fact about NDM is that Multiple players interact in the decision-making process. These players may have either shared or different views of the situation. They must cooperate with one another and update each other in order to perform optimally. These players must include both machine and human agents. Interactions between humans and machines

are rife in complex systems. These interactions can lead to situation assessments that result in decisions by either the human or the machine. The domains in which NDM processes are employed often involve high stakes. Examples of these domains include firefighting, military command and control, air traffic control, hospital operating rooms, nuclear power plants, and weather forecasting.

**4. Integrated model of decision making**

One cannot expect that only the rational approach works as a panacea to all managerial problems. Actually, organizational decision-making sometimes requires other resources even when they do not fall in the scientific domain or are at least not labeled as belonging to it. In this paper, it is proposed that the best solution tends to embrace a complementary or integrated decision-making approach. Such a view is fully aligned with several researchers' work (Agor, 1989; Sinclair and Ashkanasy, 2005) toward an integrated model where both approaches are employed through an iterative way. In this light, managers also demonstrate that they feel comfortable falling back on an intuition tool (see Parikh et al., 2003).

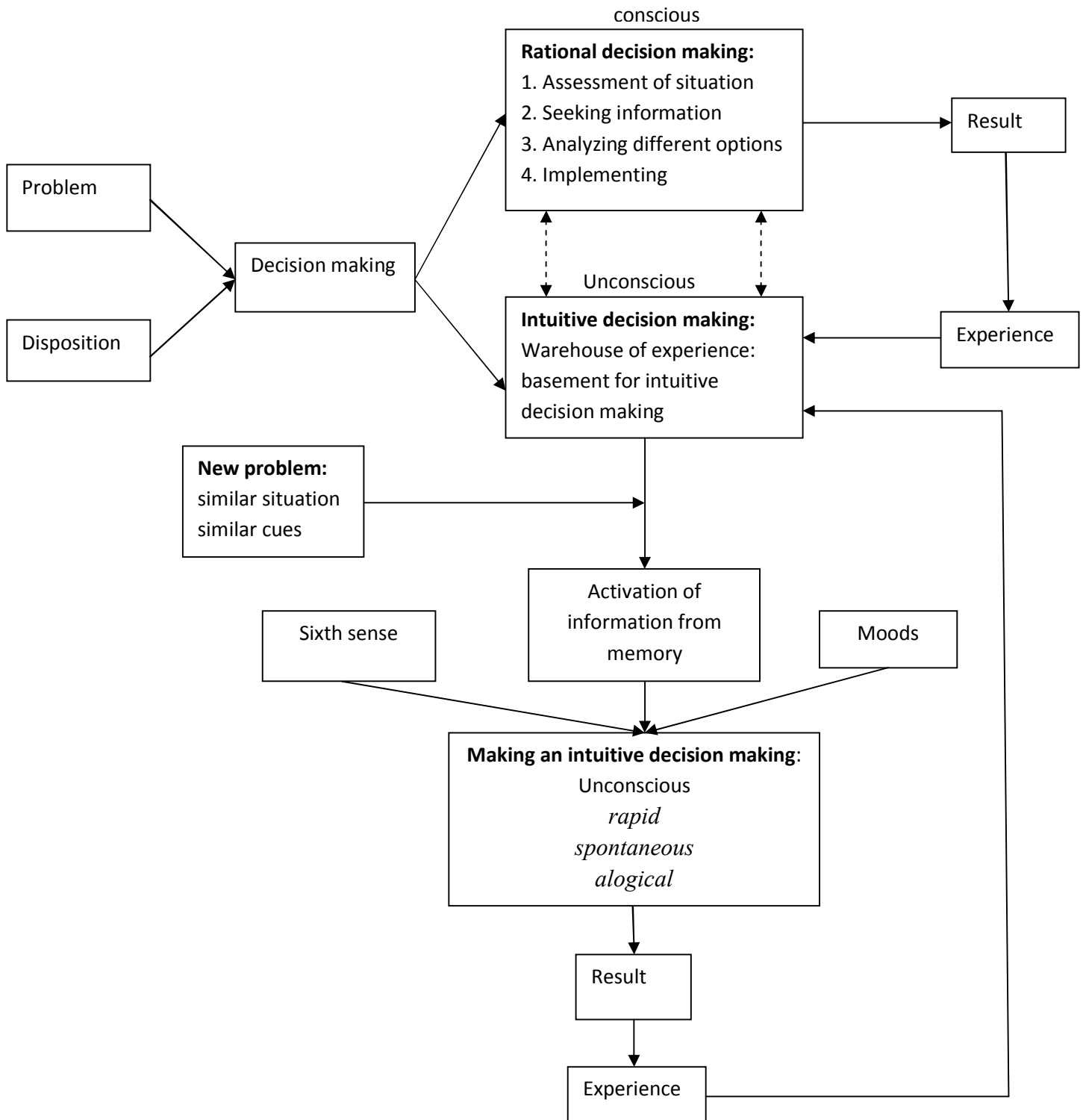


Figure 2: integrated model of intuitive decision making



An integrated view seems to gather the best of each theoretical stream because it equally draws on orthodox and heterodox strengths. Actually, there has been a growing consensus toward such a view. In his seminal work, Barnard (1938) argued in favor of both approaches, because they are “much better than either alone if the conditions permit”. Simon (1987), in turn, claimed that intuition is a process that works well under the analytical frame, and thus both processes act in a synergic way towards an “effective decision making system”. More importantly, he surmised that: It is doubtful that we will find two types of managers (at least, good managers), one of whom relies almost exclusively on intuition, the other on analytic techniques. More likely, we will find a continuum of decision-making styles involving an intimate combination of the two kinds of skill. We will likely also find that the nature of the problem to be solved will be a principal determinant of the mix.

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