

**STUDENT CONTRIBUTION**

**Theories of clinical judgment and decision-making: A review of the theoretical literature**

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**ABSTRACT**

This paper provides a survey of the terrain of theories of human judgment and decision-making (JDM). It provides an introduction, overview, and some insight into the understanding of some conceptual theories, frameworks, and the literature of JDM. This paper is in no way an exhaustive meta-analysis of the literature on JDM, nor is it intended to be. It does not seek to categorise and compare existing theories of judgment and decision-making or critically evaluate each in terms of others, nor does it seek to reclassify existing categories. Indeed much of the debate in the literature is about that very issue—how researchers and theorists view, characterise, categorise and apply existing theory of JDM in existing philosophies, ‘schools-of-thought’, and professional domains. The problematic, controversial, and, in the view of some researchers, inappropriate attempts to do so are well-documented [1-4]. This paper will provide an overview of the competing accounts that various theories and philosophies place on judgment and decision-making.

**INTRODUCTION**

There is a well-developed and growing body on judgment and decision-making (JDM). Considerable debate exists about the constructs and definitions of judgment and decision-making. Much work has been done in an attempt to define the constructs of human clinical judgment [3, 5-10]. Several authors have sought to describe JDM using a number of different expressions and constructs essentially to describe the same phenomena [1]. There is no one universal or ‘true’ definition of JDM, with descriptions of JDM varying considerably across disciplines, professions and philosophies. Other representations of the constructs of judgment and decision-making include clinical decision-making [1, 11-13], clinical judgement [1, 5, 6, 14, 15], clinical inference [16], clinical reasoning [17, 18], and diagnostic reasoning [19, 20].

In a professional clinical context, judgment is viewed as a “professional choice rather than tasks: real life practice rather than imagined activities of those who see professional status as a good in its own right rather than a means to a desirable, namely the higher quality care and treatment of patients” [1, p. 7]. Dowie [21] defines judgment as ‘the assessment of the alternative’, the ‘choosing between alternatives’, and argues that judgments are always in some way an assessment of the future. In proposing this, Dowie argues that if a decision is to be considered sensible then surely some knowledge of what the future might look like after the decision is made is required. Individuals predict the future when making decisions all the time; otherwise choices would be made with no thought as to the likely consequences of the decision. When making choices, individuals draw on a variety of sources of information:

experience, the 'first principles' of stored knowledge or facts, the expertise of others, and occasionally the experiences of tens, hundreds, even thousands, of others in the form of research evidence [1]. Decisions are not always made with 'complete' or 'true' objectivity, and indeed many wage an argument that complete and objective judgment providing the 'truth' is always, on some level, biased. Sadler [22] and others argue that no consideration of the nature of qualitative judgments proceeds far before the matters of subjectivity and objectivity are raised. Others insist that the notion of uncertainty is an underestimated component of JDM processes, particularly in stressful circumstances and contexts [10, 23]. Hammond [10] suggests there exists a level of irreducible uncertainty in all JDM, particularly in the context of social policy, and argues that all judgments and decisions are flawed and fallible on some level. Thompson and Dowding [1] claim that individuals' experiences are commonly distorted with hindsight, and people can be selective in providing the information they think is needed where first principles often have to be recast as new knowledge replaces old.

### **'CLASSICAL' DECISION-MAKING PARADIGM**

In a broad context, theories of human judgment and decision-making may be viewed from a number of different positions and philosophies. Decision-making, as a scientific inquiry, was first established in the early 1950s by Edwards [24] and Hammond [25]. This work was continued and through the work of Tversky, Kahneman and others, it has flourished. One of the original paradigms of JDM, referred to as 'classical decision-making' (CDM), views the decision maker as acting in a world of complete certainty [3]. The classical decision maker faces a clearly defined problem, knows all possible action alternatives and their consequences, and chooses the optimum alternative. Often used in management, CDM theory has been applied in multiple contexts in the health professions, although Chapman [3] and others note that CDM may not fit well in chaotic worlds, uncontrolled environments, or critical situations. CDM models are often used in controlled settings and environments in purely theoretical and non-applied constructs. Most predominantly found in laboratory settings, CDM models and theories seek to prescribe the correct way to make a decision in an ideal situation, environment or world.

### **'NATURALISTIC' DECISION-MAKING PARADIGM**

During the mid-1980s, growing criticism of CDM led to a reframing of thinking on JDM theory. A new philosophical paradigm referred to as 'naturalistic (or behavioural) decision-making' (NDM) was developed [26]. NDM recognises that human beings operate with cognitive limitations in bounded rationality. Orasanu and Connolly [27] describe characteristics of decision-making in naturalistic environments as those presenting with ill-structured problems in uncertain, dynamic environments with shifting, ill-defined, and competing goals. In these ecologies, time constraint is a significant factor, requiring assessment, interpretation and assimilation of multiple data from multiple sources, often in high stakes settings. Organisational norms, goals, and expectations are often balanced against the decision maker's personal choice. The naturalistic decision maker faces a problem that is not clearly defined, has limited knowledge of possible action alternatives and their consequences, and chooses a satisfactory alternative [26]. It assumes that the decision maker acts only in terms of what they perceive about a given situation. This model of decision-making is more appropriate in the contexts of chaotic environments with uncertain conditions and limited information. Individuals rely primarily on their experience in making naturalistic decisions [28].

## **DESCRIPTIVE THEORIES**

Descriptive theories, naturalistic and behavioural in nature, originate from the philosophies and professions of psychology and behavioural science [2]. Specifically, descriptive theories are interested in understanding how individuals actually do make judgments and decisions. Descriptive theories place no restriction on whether the individual is rational and logical or irrational and illogical, and seek to understand how individuals make judgments and decisions in the real world, focusing on the actual conditions, contexts, ecologies, and environments in which they are made [1]. Irrationality in this context refers to instances where individuals have not given any thought to the process of judgment or decision-making, and, even if they have, are unable to implement the desired process [2]. These theories seek to understand the learning and cognitive capabilities of 'ordinary people' and aim to determine if their behaviour is consistent 'rational' [2]. Context, interactions, and ecology are central to the interpretation and study of descriptive JDM theory.

Arguably the most influential and frequently used descriptive theory or model used in nursing and the midwifery is that of 'information processing theory' (IPT) [29]. Information processing theory, also referred to as 'hypothetico-deductive approach', suggests that human judgment and the reality of reasoning are 'bounded' and limited to the capacity of the human memory [29]. IPT suggests that individuals, in making decisions, go through a number of stages that are guided predominately by the acquisition of cues from the environment [1]. Many authors have proposed variations of essentially the same phenomena with this theory [20, 30-32]. Descriptive models and theories of JDM place significant emphasis on investigating, heuristics, uncertainty, biases, and error in JDM. Heuristics are simplifying strategies or 'rules of thumb' used to make decisions, and make it easier to deal with uncertainty and limited information. Thompson and Dowding [1] describe a number of categories of heuristics. 'Availability heuristics' base decisions on recent events that relate to the situation at hand. 'Representativeness heuristics' base a decision on similarities between the situation at hand and stereotypes of similar occurrences [26]. 'Anchoring and adjustment heuristics' base a decision on incremental adjustments to an initial value determined by historical precedent or some reference point. Although useful when dealing with uncertainty, heuristics often lead to systematic errors that affect the quality and/or ethics of decisions [1].

Descriptive theories as methods of inquiry have been applied to multiple professions for nearly half a decade. Large bodies of descriptive theory research have been conducted, particularly in the nursing profession [1, 33]. A distinct feature of descriptive theories is that they are not concerned with the quality of the judgment or the outcome of the decision in any qualitative way. How the individuals arrive at a judgment or decision, regardless of how good or bad it may be, is paramount. Evaluation of judgments and decisions within this philosophy is based on the empirical validity or extent to which the model observed corresponds to the observed choices in the judgment or decision.

## **NORMATIVE THEORIES**

Normative theories of JDM, classical and positivist in nature, were born from the statistical, mathematical, and economic philosophies [2]. In this domain, researchers (often referred to as decision theorists) seek to propose rational procedures for decision-making that are logical and may be theorised. The focus of normative theory is to discover how rational people make decisions with the aim of determining how decisions should be made in an ideal or optimal world, where decisions are based on logical and known conclusions supported by clear or probable evidence. Normative theories, often based on statistics and probabilities within the positivist domain, propose to evaluate how good judgments should be made and how good outcomes should be achieved [1]. Normative theories give little or no consideration to how judgments are made by 'ordinary people' in reality and everyday

practice, and place little or no emphasis on the context or ecology of the judgment [2]. They are concerned only with optimal conditions and environments, and assume that decision makers are 'superrational' [34], with little or no emphasis on how JDM occurs in the 'real' world.

'Expected utility theory' (EU) and 'subjective expected utility theory' (SEU) are the normative approaches of choice, often referred to as the gold standard for optimal decision-making. Subjective expected utility theory is a normative approach that takes into account the decision-makers values or beliefs in a 'rational' context and calculates the probability of various outcomes occurring before identifying the optimum decision for that individual [3]. 'Multi-attribute utility theory' is the normative theory of decision-making with multiple goals. A common normative approach to JDM is 'Bayes Theorem for Judgments'. A central tenant of normative theories is the assessment and explication of risk. In order to determine how judgments and decisions should be made, comprehensive risk analysis must be undertaken and all possible risks are explicated and weighted [1]. Decision analysis is the direct implementation of these theories to specific decisions. Decision analysis and the use of decision trees based on the predicability of event probability and statistics occurrence is commonly used to assist in JDM in medicine [1]. Clinical decision analysis uses techniques to make the decision-making process explicit by breaking it down into processes and components so the effect of different observations, actions, probabilities, and utilities can be analysed [21]. Decision trees work by breaking down problems into smaller decisions and choices and adding numerical values such as the probability of the events to each part of the decision. Once each choice has been assigned a probability, based on the assumption that this is possible, the option with the highest utility for the decision maker can be calculated [1]. Often referred to as 'expected utility theory', the model attempts to quantify the probability of the most likely and most desirable event in an attempt to assist the individual or group in making that judgment or decision by making it known. Decision analysis has been applied in multiple settings [1]: assisting women to make decisions to continue with a pregnancy with risk of Down's Syndrome in childbirth [1, 35], and deciding on the types of intervention that should be used for psychiatric patients with violent tendencies [36]. Chapman and Sonnenberg [3] criticise the use of decision analysis in instances where probabilities are based on cultural or societal norms from areas and locations outside of the use area.

Judgment and decision-making in the context of uncertainty, stress, and social policy has been the focus of much of the work of Hammond [10, 23] and many others. Large bodies of statistical and probabilistic theory, such as Bayes Theorem, seek to manage or redress this uncertainty and stress in judgment making. Reason [37] and Vincent [38] have examined errors and slips in JDM, proposing that human error is based on one or more of, or a combination of, skills-based failure, rule-based failure, and failure at knowledge-based level. They and others have examined the use of rule-applications processes in an attempt to limit bias and error in JDM [39, 40]. Risks assessments, tools, scales, and measurements have been in use in medicine for years and are prolific in the medical, psychological and scientific literature [1]. Such instruments seek to quantify risk and, in doing so, aim to make all risks known.

A major criticism of normative theoretical approaches is that they fail to capture the reality of most decision situations in health-care, particularly in nursing, that are characterised by incomplete knowledge of all available alternatives, a lack of reliable probabilistic data of the consequences of these alternatives, and few readily acceptable techniques for reliably gauging patient utility [41]. Normative theories rely on the quantification of risk in complete and known ways, which many have argued is not possible [1, 3]. Hastie and Dawes [42]

suggest that good decisions are those in which the process follows the laws of logic and probability theory. Others have argued that it is not possible to identify, assign relative probabilistic weight to, and account for all aspects of risk, particularly in medicine and health care [10, 23, 25]. Attempts to do so provide an analysis that is only valid for one point in time with significant, unrepresented, and unaccounted bias.

### **PRESCRIPTIVE THEORIES**

In 1982, Bell, Raiffa, and Tversky [2] challenged the dichotomy of normative and descriptive theories. A growing group of individuals had expressed discontent and opposition to the notion of a dichotomy in the theorising and understanding of JDM. Rather than forcing JDM into diametrically opposed philosophies, this group proposed the need for theories to improve the quality of decisions and judgments in practice. In challenging the existing dichotomy, Bell et al. [2] suggested that in fact the central purpose for examining JDM is to help individuals make better decisions. A number of researchers were concerned with devising methods that incorporate the insights gained from normative theories in ways that recognised the cognitive limitation of individuals. Others were concerned with explaining rational models in a manner that would appeal to ordinary people. Bell et al [2] established a third philosophical stance, known as ‘prescriptive theory’, thereby creating a trichotomy. This third philosophy is often used in operational research and the management sciences in an attempt to help people to make good decisions and train them to make better decisions.

Prescriptive theories set out to ‘improve’ the judgments and decisions of individuals by investigating how people make decisions [1, 2]. The focus of prescriptive theories is to ‘help’ or ‘improve’ individual’s judgments. In evaluating the application of prescriptive models and theories that attempt to aid in the JDM process, the central question asked is pragmatic—did it make the judgment any better? Prescriptive theories have been applied in multiple settings and contexts. Decision analysis and decision trees (normative techniques described earlier) are used commonly in prescriptive modelling in medicine to improve clinician JDM [1]. A recently introduced but now common prescriptive model for assisting JDM in clinical settings is the use of clinical guidelines and clinical policies. Clinical guidelines are prescriptive tools used to assist practitioner and patient decisions about appropriate health-care for specific circumstances [1]. They are largely guidelines that outline operational information, procedures, and guidelines with options, and are often referred to as ‘protocols’. Primarily aimed at improving the quality of care or standardising care, guidelines are mechanisms for reducing variations in clinical practice and discouraging practices that are not based on sufficient evidence [1]. While they have been found to provide improvements in the quality of care [43], the effects of their application are significantly variable and the extent to which they are routinely applied is not clear [44].

Woolf et al. [45] argue that clinical guidelines clearly benefit users and patients, although their use is reported to be overtly problematic [46], particularly given that they can contribute to an illusion of a single answer for a complex problem [1, 47]. Guidelines themselves are supposed to, but may not, contain the best available research evidence, and may lead to judgments that may not have otherwise been made because of the absence of a more suitable options. Thompson and Dowding [1] argue that decisions do not occur in a vacuum, and that individuals operate in complex environments having to assess and weigh multiple data on multiple levels at multiple times. Schon [48] argues that clinical guidelines should never (and should never claim to) aim to cover all aspects and possibilities of the JDM process.

Computer-assisted decision-making has also recently been applied to assist with JDM, particularly in the operational areas of industry, science, aviation, and medical and emergency call centres [1]. Computer-assisted decision-making software such as Medical

Priority Dispatch System (MPDS) has been implemented in a number of emergency services nationally and internationally, including in Australia. Farrand et al [49] examined the introduction of a computerised dispatch system into an EMS call centre traditionally staffed with nurses. The study found that while attempting to formalise nurse decision processes using artificial intelligence the complexities of the decision processes were revealed. An assessment of the accuracy of the decision process, using an expert panel review of 1,006 calls, found almost perfect sensitivity with telephone triage and decision whether to send an EMS resource or not. In this instance, the study demonstrated that nurses JDM processes in this setting were sophisticated [1]. Other studies have reported similar findings [50, 51].

## **SOCIAL JUDGMENT THEORY**

An alternative way of looking at judgment is by comparing the ‘quality of the judgment’ and the ‘judgment process’. Accuracy, as a measure of the quality of JDM, is popular across a broad spectrum of disciplines and philosophies. One theoretical framework that provides a mechanism to measure the accuracy of judgment is ‘social judgment theory’ (SJT). The central assumption of SJT is that an individual’s judgment relates to the reality of their social environment and that the environment can be represented by a series of lenses [7].

A central SJT theoretical approach for the study human judgment, proposing scope and theoretical framework constructs for judgment analysis is the ‘Lens Model’. Social judgment approaches use the relationship between the information and the outcomes of interest as the basis for establishing the criterion. The ‘Lens Model’ is an alternative approach for the study of human judgment, proposing scope and theoretical framework constructs for judgment analysis. According to Hammond [2, p.167] “an organism is depicted as a lens; that is, it ‘collects’ the information from the many cues that emanate from an object and refocuses them within the cognitive system of the organism in the form of a judgment about the object”. Cooksey [1] presents a number of variations in ‘Lens Model’ analytic assessment systems, each placing different emphasis on the different aspects, types, and contexts of judgment. The characteristics and application of the ‘Lens Model’ is described in considerable detail elsewhere by Shaban, Wyatt-Smith & Cumming [52].

## **INTUITION**

A popular alternative method for explaining how health-care workers such as nurses and midwives make judgments and decisions has been the notion of intuition [1]. Intuition has been defined in the literature in many ways [1], such as ‘understanding without a rationale’[6] or an ‘immediate knowing of something without the conscious use of reason’ [53], ‘knowledge of a fact or truth, as a whole, with immediate possession of knowledge and an independence from linear reasoning process’ [54]. Although there is no agreement in the literature as to a universal definition of intuition, there is a common assumption about its contextual meaning. A common theme throughout all the definitions of intuition is the notion that the judgment and reasoning process just happens, cannot be explained, and is not rational [1]. Benner [5, 6, 14] first examined the notion of ‘nurse intuition’, establishing that expert nurses display intuitive judgment that is not found in novices. In Benner’s interpretation, the ability to make judgments intuitively characteristically distinguishes experts from novices and, in doing so, expert nurses are no longer reliant on analytic principles to connect their understanding of a situation to an appropriate decision and action [1].

One strength of the intuition is that it acknowledges the ability of individuals to know or readily and quickly recognise the possible outcomes of a given situation—a key element of decision-making in situations of risk and uncertainty [1]. However, this theory has attracted

intense criticism over the last decade, particularly in that experts who rely heavily on intuition demonstrate knowledge constructs that are 'context nature specific', and therefore the nature and applicability of their knowledge is largely limited to narrow, specific contexts [55]. For example, Dowding [7] argues that a major criticism of 'nurse intuition' is that the expertise and 'intuition' is grounded around a specific context and is of a specific nature, and that nurses cannot take their 'intuition', knowledge, or skills and apply them out of that context. Further the notion of intuition has been criticised when contextualised against 'truth' or 'knowing of the truth', in that it disregards the positivist paradigms in which much of medicine and health-care is grounded. Thompson & Dowding [1] argue that expertise is almost entirely connected to a more extensive knowledge base, because experience itself is knowledge.

### **EXPERT-NOVICE THEORY**

Expertise, as a theory for JDM, was first promulgated in the late-1960s largely due to attempts to develop artificial intelligence systems [56]. The definition of 'expertise' is as problematic and controversial as that of judgment. Chi et al. [56], in characterising this expert-novice phenomenon, suggest that experts excel mainly in their own domain/s in which they perceive possess large meaningful patterns of knowledge. Experts are fast; they are faster than novices at performing skills of their domain and they quickly solve problems with little error, demonstrating that experts have superior short-term and long-term memory. Experts see and represent a problem in their domain at a deeper level than novices; novices tend to represent a problem at a superficial level. Experts spend a great deal of time analysing a problem qualitatively and have strong self-monitoring skills.

The expert–novice theory has been widely applied to multiple professions and contexts [14, 56, 57]. Experts achieve better clinical results, where reasoning is based on accurate and technical competence, although Higgs and Jones [58] argue that other outcome dimensions, particularly from that of the patient's perspective, may be lacking in peer-judged contexts. Alexander and Judy [59] argue that individuals who monitor and regulate their cognitive processing during task performance demonstrate expertise. This concept, known as metacognition, is essential to high quality human performance. Experts demonstrate the ability to manage their intellectual resources and possess a wealth of domain-specific knowledge, including propositional knowledge, craft knowledge, and personal knowledge [59]. Expert theories and its immediate extension, expert-novice theory, are theories used widely across multiple disciplines and contexts, particularly in health, education, and the humanities [1].

### **COGNITIVE CONTINUUM**

A number of researchers and theorists suggest that clinical reasoning practices are based on a combination of IPT stages and intuition. This theory, referred to as 'cognitive continuum', suggests that reasoning is neither purely intuitive nor purely analytical, and that it is located somewhere in between [1]. Cognitive continuum is described as a prescriptive model, as it aims to help people improve their judgments [1]. In order to ascertain what cognitive mode is in use, three factors must be known: the structure of the task, the number of information cues, and the time available to make the judgment or decision. Intuition, in this interpretation, is viewed as the most appropriate form of cognition in instances where a task is poorly structured, multiple information cues available, and there is little time for judgment or decision-making to occur. Conversely, if the task is largely structured, with few information cues available, and much time available for JDM, then an analytical approach is appropriate. Thompson and Dowding [1] suggest that most medical JDM falls between the

two extremes, and therefore suggests that the most appropriate form of cognition for practitioners to use is that of system-aided judgments.

## **SIGNIFICANCE AND LIMITATIONS OF THE THEORETICAL LITERATURE ON JUDGMENT AND DECISION-MAKING**

The literature and theories on judgment and decision-making are as extensive as they are controversial. The fragmented nature of studies to date within the general health disciplines addressing aspects of clinical judgment process has not yet resulted in a comprehensive understanding of the phenomena [1] or a suitable universal model or theoretical framework .

Studies have traditionally followed or engaged one particular JDM paradigm or philosophy exclusively. Few, if any, have sought to view or examine JDM in more than one paradigm, which is a recent and growing criticism of the current body of research [1]. Much of the work to date has applied descriptive approaches, such as information processing theories to judgment processes, in an attempt to contribute greater understanding of how judgments are made. In doing so, these studies, in the main, have provided greater insight into the cognitive process involved, particularly with respect to assessment practices. However, the ecological validity of many of these studies has been questioned [32, 60, 61], particularly with the criticism that they have focused on the representativeness of the judgment tasks presented [1]. Many JDM studies have occurred in contexts and ecologies away from the clinical setting and therefore do not induce the same cognitive strain and commensurate effect on accuracy [1, 60]. Conversely, some studies have focused primarily or exclusively on the accuracy or quality of the judgment or judgment process. To date, these studies have focused on judgment error in particular disciplines, largely the operations and management sciences [38]. A major criticism of these studies, that are normative in nature, is that they negate to value of context, ecology and interaction in examining the JDM processes [1, 62, 63]. Other authors have criticised the methods by which risk, uncertainty, and stress have been quantified, arguing that no matter how quantified, the full effect of such factors can never fully be understood outside the context of the individual [10, 23]. Sources of judgment errors in other contexts and disciplines need to be examined and explored.

The use of prescriptive approaches, which attempt to improve JDM and help individuals to make better judgments, has also been criticised as a single paradigm of inquiry [1, 62]. Used considerably in teaching or instruction contexts and intervention studies, prescriptive models has been used to help individuals make better judgments and improve the quality the JDM process. The use of only prescriptive theoretical approaches significantly limits that ability to interpret findings in other contexts and paradigms, such as descriptive theory [64]. Further, a number of studies have attempted to improve JDM in the absence of any normative or descriptive data or constructs and have failed because of a lack of understanding of the judgment process or the quality of a good judgments [1, 62].

## **CONCLUSION**

The study of JDM has been a focus of psychologists, scientists, and others for more than half a century [1]. Considerable research exists in the literature proposing a variety of theories of JDM. Theories of JDM have long and extensive philosophical foundations, often emanating from specific professions or disciplines. The literature and theories of JDM are as extensive and comprehensive as they are controversial. There is no single way to organise the research and literature on JDM. It is clear that there are differing and competing accounts of JDM in the literature and in research. There exists a dearth of the judgment research in paramedic practice [52]. Much of the research conducted to date carries with it considerable

controversy and conflict even when considered within its own paradigm or context. Many of the studies demonstrate poor ecological validity and a significant potential for overgeneralisation. Thompson and Dowding [1] suggest it is time to consider new approaches to existing knowledge and research on JDM that will make lasting contributions. Additional research, new approaches and rethinking about existing judgment and decision-making and the ways in which they may be applied to professional work is required.

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