Descriptive Decision Making: Comparing Theory with Practice

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Abstract

Classical theories of choice emphasise decision making as a rational process. In general, these theories fail to recognise the formulation stages of a decision and typically can only be applied to problems comprising two or more measurable alternatives. In response to such limitations, numerous descriptive theories have been developed over the last forty years, intended to describe how decisions are made. This paper presents a framework that classifies descriptive theories using a theme of comparison; comparisons involving attributes, alternatives and situations. The paper also reports on research undertaken within a New Zealand local authority. Twenty three senior managers were interviewed about their decision making with the aim of comparing the responses of participants with how the descriptive decision making literature purports decisions are made. Evidence of behaviour consistent with recognised descriptive theories was also investigated. It was found that few managers exhibited behaviour consistent with what is described in the literature. The major difference appears to be the lack of decision formulation contained within most descriptive theories. Descriptive theories are, in general, theories of choice and few decisions described by participants contained a distinct choice phase.

1 Introduction

"Classical theories of choice in organisations emphasise decision making as the making of rational choices on the basis of expectations about the consequences of action for prior objectives, and organisational forms as instruments for making those choices" [14]. It is likely that most organisations would like to think they and their employees follow such rational processes; in practice it is unlikely to be frequently achieved.

The gap between descriptive (what we are observed to do) and normative (what we should do) decision making is extensive and in fact has widened over recent years [12]. There are potentially two paths by which the gap may be narrowed. Firstly, and the view Payne *et al.* [15] appear to take, is to attempt to persuade decision makers to adopt more normative techniques. Although this could certainly improve decision making, convincing decision makers to do so is likely to be a significant hurdle. Conversely, normative theories may be "humanised" by incorporating aspects of human limitations and behaviour.

This paper briefly reviews the descriptive decision making literature and presents a framework that classifies descriptive models. It also reports on the results of an empirical investigation into managerial decision processes.

2 A Review of the Field

The way people can and do make decisions varies considerably. Much early research has focused on the way we are observed to make decisions and the way in which we should theoretically make decisions, and as a result, the range and diverseness of theory is vast. From this theory, an array of decision making models have emerged. Depending on their methodological foundation, these models can be classified as either descriptive, prescriptive or normative.

2.1 Descriptive, Prescriptive, and Normative Modes of Decision Making

As research has evolved, the distinction between descriptive and normative theories has become fuzzy. Normative theories have been refined so that they better "describe" decision making, e.g., Prospect Theory [9], Subjective Expected Utility [26] etc. Similarly, theories descriptive in nature have sought to introduce normative axioms, e.g., the Advantage Model [18]. It is, however, important that the distinction between descriptive and normative remains clear; the distinction acts as a useful reference point when attempting to improve managerial decision making processes. More recently, a third classifier has been introduced which better describes models such as the Advantage Model and Prospect Theory. A prescriptive model is one which can and should be used by a real decision maker and is tuned to both the specific situation, and needs of the decision maker. Prescriptive models are based on both the strong theoretical foundation of normative theory in combination with the observations of descriptive theory. A simple way of distinguishing between these modes of decision making is:

Descriptive: What people actually do, or have done.
Prescriptive: What people should and can do.
Normative: What people should do (in theory).

The focus of this paper is descriptive decision making and the processes employed by real decision makers. Simon [21] proposed a three phase trichotomy of decision processes. These three phases he termed Intelligence, Design and Choice (see Figure 1).
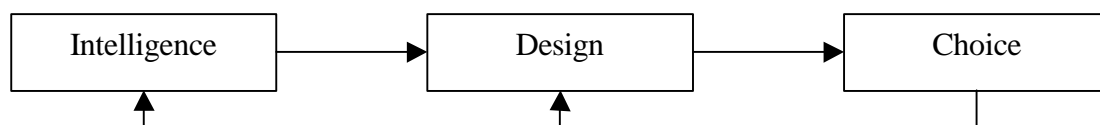
1. Simon's Model of the Decision Process

Intelligence (which was borrowed from and based upon the military meaning of the same word) involves identifying the need for a decision or as Simon put it, "searching the environment." Once the environment has been searched, i.e., the need for a decision identified, the design phase commences. This comprises investigating and developing the problem domain and alternatives. Simon's final phase is that of choice, which describes the activity of selecting the most appropriate course of action from the alternatives previously generated. The cycle of the stages is quite complex. Each phase in making a particular decision is itself a complex decision making process [22]. For example, the design phase may call for further Intelligence, and any phase can generate new problems which themselves have Intelligence, Design and Choice phases.

One of the central themes of descriptive decision making literature is the idea of Bounded Rationality, also known as Limited Rationality which was first proposed by Simon [19]. The basic tenet of Bounded Rationality is that all intendedly rational behaviour occurs within constraints, including cognitive ones [17]. Rational behaviour is typified by a decision maker who has a *well-organised and stable system of preferences and a skill in computation that enables him to calculate, for the alternative courses of action that are available to him, which of these will permit him to reach the highest attainable point on his preference scale*" [19]. Simon first made mention of human "physiological and psychological limitations" in his work on rational choice [19]. He states "the maximum speed at which an organism can move establishes a boundary on the set of its available behaviour alternatives", which interprets simply to mean, humans have limits which they cannot exceed.

A central distinction among different decision making strategies (theories/models) is the extent to which they make trades-offs among attributes [15]. A model is deemed Non-Compensatory if "surpluses on subsequent dimensions cannot compensate for deficiencies uncovered at an early stage of the evaluation process; since the alternative will have already been eliminated" [17]. What this means is that those models which screen or eliminate alternatives through sequential comparison or assessment of their attributes are classified as being Non-Compensatory if, once they have been eliminated based upon the single attribute evaluation, they cannot be assessed on any other attribute regardless of their performance on these subsequent attributes. Conversely, being Compensatory "implies that a decision maker will trade-off between a high value on one dimension of an alternative and a low value on another dimension." [16]. The most common Compensatory model is the Additive Model [25] which is described later. Descriptive models are generally Non-Compensatory while Prescriptive and Normative models are typically regarded as being Compensatory.

Another useful comparative measure of descriptive decision making theories involves determining whether they employ Holistic or Non-Holistic evaluative strategies. Holistic simply refers to looking at a subject as a whole rather than a number of components. It may, however, involve a more detailed analysis in order to obtain some overall value or measure. In behavioural choice theory, a Holistic model is one which assesses or compares an alternative or situation[1] as a single item and evaluates each alternative in a non-sequential manner. In contrast, a Non-Holistic model is one that compares or evaluates an alternative on an attribute-by-attribute basis. This may involve looking at every minute detail of a particular alternative and comparing it with another alternative or some threshold, a threshold being a maximum or minimum value with which a given attribute must reach or exceed.

2.2 Descriptive Models

Possibly the oldest descriptive theory is the Satisficing model, which emerged around the same time, and is linked, to the idea of Bounded Rationality. First reported by Simon [20], this theory posits that decision makers choose an alternative that exceeds some criterion or standard. Behaviour of organisations in learning and choice situations fall far short of the idea of "maximising" postulated in economic theory, "…organisations adapt well enough to satisfice, they do not, in general, optimise" [20]. Simon's argument is

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[1] In this paper, a situation is defined as the nature, type and environment of a decision problem.

centred around the fact that decision makers do not and cannot maximise in most situations.

Cohen *et al.*, [3] developed the Garbage Can model in response to what they termed organised anarchies. Organised anarchies, also referred to as decision situations, are characterised by three general properties: Problematic Preferences, Unclear Technology and Fluid Participation. Within an organised anarchy, it is difficult to assign preferences to a specific decision problem. This is due, in part, to the fact that the organisation consists of a loose, ill-defined group of ideas rather than a clear set of preferences. The organised anarchy is characterised by its ambiguous operating procedures and a "learn from our mistakes" philosophy. The Garbage Can model is fundamentally distinct from other published descriptive theories. When most decision situations arise, conventional practice is to determine the most appropriate action by whatever means. Garbage Can theory states that the organised anarchy is faced with a number of choices, for which compatible problems are sought. "To understand processes within an organisation, one can view a choice opportunity as a garbage can into which various kinds of problems and solutions are dumped by participants as they are generated. [3].

A relatively modern theory is that of Image Theory developed by Beach and Mitchell over a period of twelve years. Based around the Lexicographic model [24] and the Strategy Selection model [1], Image Theory is a refinement and synthesis of existing ideas applied to real world decision problems. Image Theory attempts to describe two types to decision making: **Progress Decisions**, about whether past decisions are being adequately carried out and, **Adoption Decisions**, making decisions to replace incorrect or unachievable decisions made previously.

Einhorn [7], describes the Conjunctive/Disjunctive model as a combination model in that it works by combining information. The Conjunctive/Disjunctive model has been proposed by a number of authors e.g. [4], [5], and [7]. The Conjunctive model looks to select a solution or a group of potential solutions from a list of alternatives. All alternatives which exceed some threshold or aspiration level become part of this group. Those alternatives which do not exceed this level are eliminated. The Disjunctive model evaluates each alternative with respect to its best attribute rather than all of them. The Conjunctive/Disjunctive models have a similar philosphy to that of Simon's [19] Satisficing model. Rather than try to get the optimal solution, it searches for an adequate solution or solutions. This is achieved by installing either a minimum evaluation function (in the case of the Conjunctive model) or a maximum evaluation function (Disjunctive model).

The naming of the Lexicographic model [25] is derived from the word Lexicon and refers to the ordering of the dimensions of alternatives. The premise for the use of this model is that the decision maker must know of the dimensions (attributes) which make up the alternatives, and must be able to rank them in terms of their importance. This is because each pair of alternatives is compared in terms of each attribute beginning with that deemed as most important, until dominance of one over the other occurs.

Tversky [24], presents a probabilistic model of choice, the Elimination By Aspects (EBA) model which is related to the Lexicographic model in that they both follow intradimensional evaluation strategies [8][15]. Its principal activity is a covert elimination process. Each alternative is viewed as a set of aspects which are sequentially evaluated.

In more recent times, Klein [10] has proposed the Recognition Primed Decisions (RPD) model as a descriptive model of decision making in natural settings; a natural

setting being within some organisational or real life context. The RPD model was developed based on the observation and questioning of 150 professional decision makers. The RPD model contains four major components: Recognising cases as typical, Situational understanding, Serial evaluation and, Mental simulation. The four parts of the RPD model are typically employed in a sequential manner and involve revisiting and comparing previous decisions along with simulating how various options might be carried out and what their outcomes might be.

Two models regularly mentioned in the descriptive literature, also warrant attention. The Additive and Additive Difference models are considered by many to be descriptive e.g., [17]. These models are thought to be good approximations of multiattribute decision behaviour in risk free situations [17], yet are more commonly used by researchers as tools to predict judgements of various experts such as clinical diagnosticians and stockbrokers [6][23]. The Additive Model of choice independently and individually evaluates multidimensional alternatives. It considers each alternative, one at a time, and determines, by whatever means, its rating or performance before going on to the next alternative. The alternatives can then be holistically compared to determine the best. The Additive Difference Model [25], is "based on comparisons of component-wise differences between the alternatives". These comparisons are pair-wise, i.e., they only involve two alternatives at a time. Simply, alternatives are compared over one dimension at a time. Each comparison is multiplied by the difference function (weighting) which determines the advantage or disadvantage for that alternative on that dimension. These advantages and disadvantages are finally summed for both alternatives over every dimension in order to get the final subjective value for that alternative with respect to the one with which it has been compared.

2.3 Synthesising Descriptive Theories

The development of descriptive theories of choice has been one of building on what has gone before. In addition to the development of these models, several authors have developed frameworks with the objective being to better understand and compare existing descriptive theories. Lipshitz [11] proposed that human decision processes comprise at least one of three modes: consequential choice, matching and reassessment. These three modes form an argument-driven integrative framework where the decision making actions are categorised by argument rather than forward-looking choice. Lipshitz [11] posits that traditional choice theory, i.e., choosing from a number of alternatives, rarely describes accurately how decisions are actually made.

Schoemaker [17] presented a "schematic overview of the various classes of descriptive models that have been proposed". Schoemaker made an initial distinction between models being either Holistic or Non-Holistic. The Non-Holistic models were then classified based on the type of comparison that occurred within each. The three types of comparison are: against some standard, across attributes and, within attributes.

3 A New Framework of Descriptive Theories

All decision making activities include at various stages some form of comparison. These principally include: comparisons between alternatives; comparisons between decision situations and; comparisons between the attributes of different alternatives. The principal distinction within the framework proposed below (Figure 2), is between situation and

non-situation comparisons. Situation comparisons include comparisons between situations and comparisons between situations and alternatives. The non-situation comparisons are of three forms: comparisons between alternatives (or the attributes of alternatives) and a standard; between alternatives and; between attributes of different alternatives. Several of the identified descriptive models contain multiple forms of comparison. In general, those models that contain multiple forms of comparison are typically compensatory (with the exception of the Lexicographic model).

This framework presents little new information, however it does offer a fresh, new view of existing descriptive theories. It provides an instrument for the evaluation and comparison of these theories with respect to their appropriateness in prescribing their use. It allows the similarities to be identified, along with the identification of the possible reasons for their use (or non-use) by real decision makers.

| Models	Situation Comparisons		Non-Situation Comparisons		
	Comparison between Situations	Comparison between Alternatives and Situations	Comparison between an Alternative/ Attribute and some Standard	Comparison between Alternatives	Comparison between Attributes
Satisficing		■			
Garbage Can		■			
Recognition Primed Decisions	■		■		
Image Theory	■		■		
Conjunctive/ Disjunctive			■		
Elimination By Aspects			■		
Additive			■	■	
Lexicographic			■		■
Additive Difference					■

2. Framework of Descriptive Theories

4 Observed Decision Making Behaviour

As a means of complementing the existing literature, 23 senior mangers from a New Zealand based local authority were interview about their decision making. The objective was to establish the degree to which the behaviour presented in the literature was occurring within a New Zealand decision making environment. Each interview participant was given approximately one hour in which to describe their decision making approach to both work and private decisions. They were also asked to describe a 'typical' decision they had recently made. An overview of the more significant results is presented below.

4.1 Compensatory and Holistic Behaviour

All participants were compared with respect to their compensatory and holistic decision making behaviour. These comparisons were made with respect to the participants entire

decision making behaviour, both personal and professional. Results are presented in Figure 3. The models have also been included to indicate where much of the behaviour occurs. Participants who displayed or described behaviour consistent with one of the descriptive models have been positioned over that model. Use of more than one model by a single participant is represented by a dashed line between the relevant models. Those for which it was impossible to identify any behaviour consistent with one or more of the described models were assigned Holistic andCompensatory scores by the author. Scores on each range from 0 (entirely Non-Holistic or Non-Compensatory) to 10 (entirely Holistic or Compensatory).
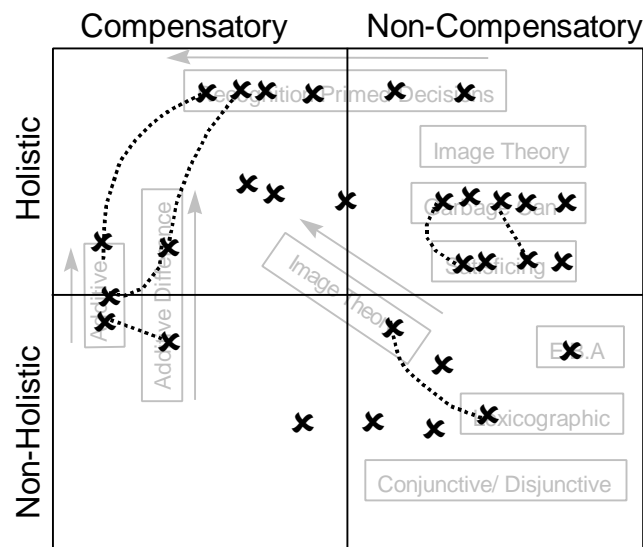

3. Classification Scheme for Descriptive Models
(✖=Placement of individuals in relation to descriptive models)

Looking firstly at the placement of the models, the majority (as expected) fall into the Non-Compensatory category, with only the composite models, and the more questionable descriptive models deemed as being Compensatory. The Holistic/Non-Holistic split is more even, distinguished by the sequential processes of the Non-Holistic models and the non-sequential processes of the Holistic models. As can be seen in Figure 3, 15 out of the 23 participants (65%) typically follow holistic strategies, which is consistent with what recent authors have noted [1][10][11]. The mix between Compensatory and Non-Compensatory behaviour however was more even, which suggests, for whatever reason, neither Compensatory nor Non-Compensatory decision making predominates in the local governmentdecision making environment. The high number (13) of participants who described behaviour consistent with the RPD model, the Garbage Can model, and Satisficing gives support for the tenet of Bounded Rationality. These three models all follow very simplified processes in which adequate solutions are sought as opposed to optimal ones.

4.2 Analytical Decision Making

Certain types of decision problem require particular approaches to decision making. For example, structured problems are typically well suited to the application of structured decision processes. In a similar vein, analytical decisions are best approached by way of an analytical decision strategy. Observations made in this study challenge this view. The results of this part of the investigation are taken from the decisions described by each of the participants; therefore the results can not be generalised. Each decision described

was assigned a score between 1 and 10, where a 1 indicated a non-analytical problem and a 10 represented a completely analytical problem. The approach taken by the decision makers was also assessed in this way. Figure 4 presents the results of this part of the study. If we introduce the hypothesis that decisions are made in a way that is consistent with the nature of the decision problem, then the lightly shaded quadrants of Figure 4 support the hypothesis while the darker quadrants do not.
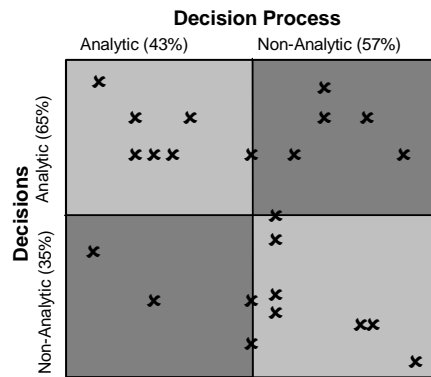
4. Analytic and Non-Analytic Decision Strategies

In summarising the results, 61% of participants approached the decision in a manner, thought by the author, to be consistent with the problem type. The resulting group contained two distinct groups of decision maker, both of which gave little consideration to the problem type. The first group contained those who approached the problem in the way that appeared best at the time, where as the second group contained those who approached all decisions in either an analytic or non-analytic manner. Because only one decision from each participant was analysed, we cannot be certain that the above figures may be accurate for all decisions.

5 Summary and Implications for Prescription

The summarised empirical results do little to support the descriptive research to date, especially with respect to the earlier work. Early researchers were consumed with producing descriptive theories for which all observed decision making could be described. More recently, it is increasingly acknowledged that the vast array of decision making styles and environments makes developing such a theory unachievable. Authors such as Shafir *et al.* [18] and Kahneman and Tversky [9] recognised that accurate descriptive models were possible, but only in describing isolated types of decisions such as choices between monetary lotteries. In addition these theories were purported only to be able to predict the chosen alternative rather than describe the process. The results of this study emphasise the role Bounded Rationality plays in individual decision making.

The value of work such as this lies in the development of better decision techniques and aids for the less than rational decision maker. An understanding of the decision makers behaviour, and more specifically, the reasons for such behaviour, is useful in the advancement of managerial decision making. There is likely to be certain types of decision behaviour that are always going to be present in unaided decision making. Rather than trying to remove some of these apparent inhibitors to "good" decision making, we need to use them to help in the development of more appropriate prescriptive decision making methods.

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