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## **Managing change without changing managers: An investigation of influences on decision making performance of public sector managers within novel and complex environments**

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# **Managing Change Without Changing Managers.**

An investigation of influences on decision making performance of  
public sector managers within novel and complex environments

**David Clark-Murphy.**

**Master of Business (Human Resources Management) - Thesis.**

## **Abstract**

*This study examines relationships between the cognitive and decision making styles of individual managers, and their decision making performance , within public sector environments during structural and cultural reform. The main purpose is to develop a more effective means of matching managers to their novel and complex working environments, to minimise staff turnover and improve productivity.*

## Declaration

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher education; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signature

Date 20.2.97

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## CONTENTS

<b>Abstract</b>	2
<b>Declaration</b>	3
<b>Acknowledgments</b>	4
<b>Introduction</b>	6
<b>Objectives</b>	10
<b>Hypotheses</b>	11
• Conceptual basis	11
• Research hypotheses	16
<b>Literature review</b>	17
• Introduction	17
• Organisational environment as an influence on individual decision making performance.	19
• Public sector environmental influences.	27
• Individual perception and decision style as influences on decision making preferences.	34
• Individual cognitive style as an influence on decision making performance.	40
• Decision makers in the public sector	42
• Measuring performance through simulation	44
• Summary and points of departure	46
<b>Method rationale</b>	49
<b>Method</b>	54
<b>Results</b>	63
<b>Analysis</b>	65
<b>Analysis summary</b>	95
<b>Hypothesis Results and Conclusions</b>	101
<b>Discussion</b>	104
<b>Further research</b>	109
<b>Bibliography</b>	113
<b>Appendix A</b>	132
<b>Appendix B</b>	146
<b>Appendix C</b>	151



## **Introduction**

This study examines relationships between the decision making outcomes of individual managers, and their cognitive and decision making styles, within the novel and complex working environment of a public sector undergoing structural and cultural reform.

In this study, subjects are government managers operating outside their substantive positions, acting in positions within unfamiliar working environments. Subject managers make decisions from a novel set of situational cues, of varying degrees of complexity, within a simulated organisation. The research design uses a simulated (computerised) organisation (Wood & Bailey, 1985) to minimise potential influences of confounding variables from the subjects' prior working experiences, in naturalistic settings.

Relationships between two variables, cognitive style and decision making styles, are compared with decision making performance within novel environments of varying complexity. Cognitive style is in the form of adaptive - innovation tendencies (Kirton, 1976), and dominant decision styles (Rowe and Mason, 1987; Nutt, 1989; Rowe & Boulgarides, 1992).

Decision making performance is measured in terms of the relative effectiveness, measured in percentages of benchmark, of subjects' judgements about the use of human resources at optimal costs.

If strategic prescriptions for organisational change are sensitive to contrasting styles of individual public sector managers, being able to predict their performance may be a human resource initiative in the public interest. The ability to optimally match public sector managers to appropriate working environments may contribute to increased effectiveness in the management of public resources (Wood & Bandura, 1989). Being able to effectively assess and select suitable managers against more relevant criteria than previously, then becomes a human resource management facility with significant strategic and societal implications (Uhr, 1990).

Rationale for this study comes from both historical, and more recent political initiatives to modify public sector structures and cultures (Coombs, 1976; Smith & Weller, 1978; Heald, 1983; Savas, 1987; Keating, 1988; Alford, 1989; Kouzmin & Scott, 1990; Shaw, 1990; Weller et al, 1993; Karpin, 1995). These initiatives have created a situation where large numbers of public sector managers now operate within unfamiliar and complex environments (Codd, 1987; Codd, 1991; Fisher et al, 1993). ' In this new era, public servants are becoming more mobile and performing different jobs in different agencies' (Commission on Government, 1995). Their decision making performance inevitably impacts upon other public sector employees, the organisations in which they work, and society at large (Hamilton, 1990; Lane & Wolf, 1992; Weller et al, 1993)

Research into decision-making embraces much of the organisation theory literature and includes such diverse concepts as cognitive structure (Scott,

1969), information processing (Schroder, Driver & Streufert, 1967), rationality (Bernoulli, 1954; Morgan, 1986), culture (Deal & Kennedy, 1982), technology (Johnston, 1982), and social structure (Leavitt, 1965).

The perceived benefits of improved organisational fortunes through training managers to make better decisions has produced a substantial body of work in this field (Peters & Waterman, 1982). The competent functioning of managers and the success of organisations is seen as a concern not only for executives and scientists, but for society itself (Streufert & Swezey, 1986). Although the fate of organisations is determined at least in part by external, market based forces, the quality of management decisions is still seen as being a key factor in the fortunes of organisations (Peters & Waterman 1982).

Despite attempts to design programmes for improving individual management decision-making, the question of feasibility of such programmes has yet to be satisfied (Griffin, 1986). Management skills, including decision-making, are not easy to identify and may become quickly obsolescent with rapid changes in the organisation's external environment making acquired skills obsolete (Griffin, 1986).

Typically researchers have examined what successful executives and organisations do, what decisions they make or do not make, and what they do differently compared with managers and organisations that fail (Streufert & Swezey, 1986). However, analysing the content of management decisions may not lead to understanding decision-making principles (Streufert & Swezey, 1986).

The validity of a content approach is questioned on two grounds: differences between individuals, and organisations of different sizes operating within different markets, different trades, and different leadership styles, etc. (Peters & Waterman,1982). That being so, effective decisions in one situation may be inappropriate in another, and decisions on similar problems may be differently made by different individuals or in different contexts (Hickson et al, 1986). Different contexts may be external, as in structural and cultural, or internal, as in patterns of sporadic, fluid and constricted decision making processes (Hickson & Miller, 1992; Rodrigues & Hickson 1995 ).

Unfortunately, the mechanisms and outcomes of managerial decision making do not lend themselves readily to experimental analysis in real organisational settings. There are usually too many interacting factors that are difficult to identify and over which it is even more difficult to exercise experimental control.

Advances in this complex field have been achieved by experimental analyses of decision making in simulated organisational environments. These simulated environments allow systematic variation of theoretically relevant factors whilst controlling for naturalistic influences (Wood & Bandura, 1989).

## Objectives

Unlike much of the literature concerning managerial decision making, (Cyert, 1956; Cyert, 1963; Daft, 1983; Delkey, 1969; Dickson, 1983; Drucker, 1967; Morgan, 1986; Miller, 1990) this study is directed specifically towards public sector issues, rather than the primarily commercial interests of the private sector. The broad objective of the investigation is to provide insights that contribute to the development of a predictive model of managerial performance in the public sector. Primarily, the study assesses the predicability of decision making performance of public sector managers within novel and complex environments. Predictions are derived from analysing measures of cognitive style, decision style, and subjects' scores of managerial performance compared with a benchmark.

Specifically the objectives are to:

- Identify subjects' choice styles from Nutt's (1989) decision style inventory
- Assess subjects' cognitive styles with Kirton's Adaption-Innovation Inventory KAI (1976).
- Measure subjects' decision making performance using interactive computer software, "The Furniture Factory" (Wood & Bailey, 1985), within different levels of environmental complexity.
- Analyse resultant variances to provide a predictive instrument of decision making performance within novel environments of differing complexity.

The study is seen as a contribution to the development of a multi-faceted, predictive model of public sector managerial performance. Development of a full model is seen as significantly beyond the scope of this study, although suggestions for possible further research are discussed (page 104).

## **Hypotheses: Conceptual Basis**

Descriptions of characteristics of cognitive and decision styles provide some contradictions and counter intuitive conclusions about decision making performance. A shortage of directly comparative studies demands that any hypothesis be drawn from disparate investigations.

As a result, the hypotheses of this study were based on references to:

- Stabell's (1978) investigation of managerial decision making performance compared with perceptions of information environments.
- Streufert & Driver's (1967) investigation into the effects of information load on managerial responses.
- The Office of Naval Research (U.S.A.) (1981) technical reporting of stress and information search in complex decision making.
- Wood & Bandura's (1989) social cognitive theory concerning the effects on decision making performance of individuals' perceived controllability of organisational influences within complex environments.
- Kirton's (1961) (1976) adaption-innovation inventory.

- Foxall & Payne's (1989) cross cultural study of managers' cognitive styles
- Mintzberg's (1976) performance differences correlated to cognitive style
- Zaleznick's (1970) power and decision making.
- Nutt's (1989) decision styles
- Clough's (1984) judgment, cognition, and choice.
- Harrison's (1987) judgment and choice of information sources and use.
- Rowe & Boulgarides' (1992) review of explanations of decision style, cognitive style, and their relationships.

These sources are outlined in this section, and examined more fully in the literature review which follows:

- Stabell's (1978) investigation into relationships between cognitive complexity and individual use of information environments suggests that elements of cognitive style correlate positively with a decision maker's search for alternative problems and solutions. Although Stabell's (1978) level of analysis was individual cognitive complexity related to information environment perceptions and information use, the conclusions support a broad association of cognitive style and decision making performance.
- Streufert & Driver's (1967) similarly related cognitive characteristics and decision making performance with perceptions of environmental complexity.

- The Office of Naval Research ,U.S.A. ( Streufert & Streufert, 1981) investigations supported the existence of positive correlations between cognitive style and complexity with decision making performance under increasingly complex and stressful situations.
- Wood & Bandura's (1989) study investigating cognitive style, in the form of perceptions of ability as a stable or acquired skill, broadly supports association of cognition and performance and limited ability to be transferred between organisational environments.
- Kirton (1961) observed that people arrived at different solutions to similar problems and posited an adaptor-innovator continuum of stereotype to explain such differences. This early work forms the broad focus of the hypotheses.
- Kirton's (1976) behaviour descriptions on an adaptor-innovation scale were related to bureaucratic structures (Weber, 1948) and the nature of change (Bright, 1964). The relevance of this latter research is reflected in the use of Kirton's (1976) descriptive instrument.
- Foxall & Payne (1989) provide a cross cultural perspective and confirmation of relationships between cognitive style and decision making performance within alternative contexts.
- Mintzberg's (1976) explanation of differences in individual abilities to master certain mental activities and yet fail in others, focuses on



cognitive style. Mintzberg (1976) also links cognitive styles with behavioural styles of managers. Comparisons are analysed in terms of biological left brain - right brain tendencies manifest in managerial activities at work, including decision making style.

- Zaleznick's (1970) observations related to cognitive style and the use of power in decision making also parallels Stabell's (1978) interest in the two dimensions of cognitive bias between the selection of goals and the orientation towards action.
- Similar links are also suggested between aspects of decision making performance and the behavioural elements of decision style (Nutt, 1989). Some descriptions of decision styles and cognitive styles display similarities.
- A comprehensive approach by Clough (1984), describes decisions in terms of judgement and inference, and ways in which cognition may influence choice. Aspects of contextual implication are also discussed in terms of judgmental fixations, preconceptions and intuition. Although not specifically addressing alternative private and public sector contextual implications, aspects of this work broadly encompass such issues.
- Harrison (1987) reflects Stabell's (1978) conclusions about influences on information search and use, although from the perspective of personal judgement rather than cognitive complexity.

- Rowe & Boulgarides (1992) decision making review compares models of decision style and cognition to provide an understanding of performance predictors, and their implications for heuristics.
- Lists of heuristics and biases have been developed by: Tversky & Kahnemann (1974); Taylor (1975); Slovic, Fishchhoff and Lichtenstein (1977); Hogarth (1980); Hogarth & Makridakis (1981); Schwenk (1988); although few reviews and comparisons have provided similarities amongst their results.

## **Hypotheses: Research Hypotheses**

Emerging from this developing body of knowledge is the theory that individual managers will respond in more or less effective ways depending on the context. This is tested with the following hypotheses:

### Hypothesis 1

That more cognitively innovative subjects will outperform more adaptively styled subjects within novel environments of high complexity.

### Hypothesis 2

That more cognitively adaptive subjects will outperform more innovatively styled subjects within novel environments of lower complexity.

### Hypothesis 3

That relationships between decision styles and performance will support the findings of Hypothesis 1 and Hypothesis 2

## Literature Review

### Introduction

There is a plethora of views about decision making *per se*, within the literature, though many are not relevant to the specific objectives of this study. Many are concerned with explaining decision making through the use of models such as: Systems Analysis (Strauss, 1962; Jackson & Keys, 1987; Flood, 1988); The Carnegie Model (March & Simon, 1958); The Garbage Can Model (Cohen, March & Olsen, 1972). These are described more fully later (page 16). Others consider alternative foci, such as decisions by organisations and groups; and within alternative personnel structures.

The literature abounds with research into decision making within private sector organisations, perhaps motivated by the potential for improved commercial performance. As there is support for the argument that environmental factors such as structure, culture, heuristics and biases, may influence decision making, conclusions from research into private sector decision making may not be transferable to the public sector.

Unfortunately studies of public sector decision making are rare. Rarity is accentuated for this study which specifically focuses on managerial decision making within a public sector undergoing reform.

Instead of examining decision making within a specified naturalistic context, this study concentrates on more generic factors that influence

decision making performance. Examining generic factors may allow predictions of decision making outcomes to be transferable across naturalistic settings.

This study specifically focuses on decision making by managers within a public sector undergoing reform. To address these objectives, the literature is reviewed with special regard to aspects of individual decision style and cognitive style through which managers process environmental cues to produce decision outcomes. As decision outcomes require measurement for comparison, the literature is also reviewed for suitable instruments to provide those measurements within environments of differential complexity.

The relevant environmental cues being considered here are the complex organisational environments within a public sector undergoing reform towards a more commercial style. In order to understand individual decision making, a number of issues require examination, including:

- Organisational environment as an influence on individual decision making performance.
- Individual perception and decision style as influences on decision making preferences.
- Individual cognitive style as an influence on decision making performance.

- **Organisational Environment As An Influence On Individual Decision Making Performance.**

Firstly, a review of more generic issues about influences on individual managerial decision making from organisational environments, followed by comparisons between private and public sector environments. The more general literature dates from the 1960s, 1970s and 1980s, whereas literature related to the public sector is relatively current.

Attempts to develop theories and principles about relationships between individual decision making behaviour and the subsequent effectiveness of organisations have been a focus of attention since the industrial revolution of the early 19th century (Stoner, 1985). The facility of being able to predict influences on organisational effectiveness as an attractive commercial and societal prospect is discussed extensively in the literature by Owen, Babbage, Taylor, Weber, Mayo, Mintzberg, and many others. This literature is wide ranging, with specific focus on many different influences.

This study, however, concentrates on the investigation of specific human behaviour within public sector organisations - managerial decision making. "Relationships between individual managerial decision making and the relative effectiveness of organisations has been of particular interest, not only for executives and scientists, but for society itself" (Streufert & Swezey, 1986).

Some theories emphasise the influence of individual managerial decision makers on organisational decisions (Peters & Waterman, 1982; Starbuck, 1973; Beyer, 1981). Others question the extent to which managerial decisions influence organisational decisions (Pfeffer, 1978; Weick, 1983; Walton, 1985; Morgan, 1986).

The literature contains an abundance of research reporting interactive relationships between individual decision making and contextual environments (Leavitt, 1958; Stabell, 1978; Hogarth, 1981, Liedtka, 1989; Chako, 1991). Research findings about interactive relationships suggest that environmental factors within organisations, and individual decision making, are mutually influential (Pfeffer, 1982; Liedtka, 1989).

Although many studies examining the content of decisions by individual managers may have been intuitively comfortable, subsequent attempts to replicate these studies have frequently proved fruitless (Kahneman & Tversky, 1979; Schein, 1984; Rowe, 1989). Individual decision-makers do not operate in a void (Streufert, 1986), they make decisions within organisational environments that contain objective information and people who operate within a structure and set of established processes (Hogarth, 1981). The degrees of influence of contextual cues, depend upon the specific context in which individual decision making occurs (Kahneman & Tversky, 1979; Rowe, 1989; Hickson et al, 1986).

A review of organisational environments has identified several alternative models about contextual structures and processes that may influence individual decisions. They include:

- Systems Analysis (Strauss, 1962; Ward, 1964; Jackson & Keys, 1987; Flood, 1988);
- The Carnegie Model (March & Simon, 1958);
- The Science of Muddling Through (Linblom, 1959)
- The Incremental Decision Process Model (Mintzberg, Rasinghani & Thoret, 1976);
- The Garbage Can Model (Cohen, March, & Olsen, 1972);
- Organisational Rites And Ceremonies (Ouchi, 1981);
- Organisations as Paradigms And Processes (Brown, 1978);
- Organisations as Information Environments (Silverman, 1970);
- Organisations as Interpretation Systems (Pondy & Mitroff, 1979);
- Organisations as Political Systems (Hickson et al, 1986; Mintzberg, 1983)

Systems analysis (Strauss, 1962; Ward, 1964), was originally developed to overcome situations where urgent and large-scale problems were beyond the capability of individual decision makers (Leavitt et al, 1973). Problems may be beyond the capacity of individual decision makers through a combination of information complexity and response requirements of the organisation. In such circumstances individual decision makers may tend to satisfice, to find the optimally best and easiest solution, when the standard of decision making performance required should be of the highest quantitative and qualitative standard.



However, critics argue that systems analysis is concerned more with the technological processing of information rather than with social structures and information processing amongst individuals within organisations (Rogers 1976). Subsequent research emphasises the integration of human and technological processes for improved creative problem solving and decision making ( Jackson & Keys, 1987; Flood, 1988).

The Carnegie model (March & Simon, 1958) concentrates on political coalitions that form when problem identification is ambiguous, and there is disagreement amongst decision-makers. Discussion, coalition-building and negotiation are then required to reach agreement about priorities, and to identify the problems. The final decision is based upon an alliance, or coalition among several decision-makers who agree about organisational goals and problem priorities. Members of the coalition need not be members of the organisation but could include financiers, suppliers, creditors, interest groups, etc. These decision makers form coalitions of agreement because organisational goals are often ambiguous and inconsistent, and problem identification is frequently difficult (Cyert & March, 1963).

The incremental decision process model describes a sequence of small choices within an organisation that culminate in a major organisational decision (Mintzberg et al, 1976; Lindblom, 1959). The process described by Mintzberg et al (1976) is modelled in three main phases: identification, development, and selection. Identification includes recognition and diagnosis of the problem or opportunity; development includes searching

for standard solutions and procedures; and selection, when the solution is chosen by judgment, analysis, or bargaining. Authorisation of the ultimate choice is included in the selection phase, as some decisions may be rejected due to implications identified by senior managers that were not anticipated by lower level decision makers. The incremental approach to decision making is more concerned with the sequence of activities from discovering the problem to its ultimate solution than with the social and political factors associated with the Carnegie model (Daft, 1983).

A more radical description of organisational decision making is proposed by the garbage can model (Cohen, March & Olsen, 1972). This model of decision making describes a random interception of four constituent elements: problems, solutions, participants, and choice opportunities. The four elements exist independently within an organisation and only intercept on a random basis. This means that problems may exist without being solved, solutions may exist without being identified, decision makers may not identify problems, problems though identified, may or may not be solved. Solutions are seen as a flow of ideas and exist independently of problems. Choice opportunities are occasions when decisions are made, and are usually precipitated by urgent events or problems (Cohen, March & Olsen, 1972).

Ouchi, (1981) describes a set of rites and ceremonies used by organisations to transmit information about the values of the organisation to members. Those organisational values in turn influence individual decision makers through factors such as cognitive dissonance (Festinger, 1965), the Carnegie

model (March & Simon, 1958), the incremental decision approach (Mintzberg, Rasinghani & Thoret, 1976) and organisations as information environments (Silverman, 1970).

Similar influences are illustrated by Brown's (1978) paradigms and processes model. This model illustrates a social constructionist view of organisations where process-orientated views are not confined to an individual level of analysis. Instead of being subject to specific analysis, organisations are conceptualised as paradigms. Paradigms refer to the shared understanding and exemplars (Kuhn, 1970). A paradigm is thus a way of doing things, a way of looking at the world (Pfeffer, 1982).

These shared understandings constrain subsequent action and the development of meaning (Sproull, Kiesler & Zubrow, 1981). Thus socially objectified, typified meanings and ways of doing things serve to constrain subsequent behaviour, resisting change (Sproull, 1981; Festinger, 1965). This pattern of doing things becomes institutionalised such that much organisational behaviour becomes mindless, being used over time without being evaluated or questioned (Pfeffer, 1982) so that performance practices develop as a way of economising on information (March & Simon, 1958).

As these practices and the paradigms in which they are established, become relatively stable, organisational behaviour may become predictable through an understanding of those paradigms and processes (Pfeffer, 1982).

As Peters & Waterman (1982) suggest, "in excellent companies, you either buy into their norms or get out".

Understanding of organisations may be gained by viewing them as information environments (Silverman, 1970) though information use in organisations tends to rely on information that is familiar, readily available, mainly local, and limited (Cyert & March, 1963).

Secondary decisions such as information search, are frequently not conscious but are performed as automatic judgements rather than as considered choices (Cyert & March, 1963). Individuals within organisations also apply knowledge structures to understanding their environments (Nisbett & Ross, 1980). They range from broad propositional ideas to more schematic representations of objects, events and people, and allow for a quick, coherent but occasionally erroneous interpretation of novel experiences.

An alternative view is described by Pondy & Mitroff's (1979) interpretation systems model. This model parallels examination of the cognitive structure of an individual but at an organisational level of analysis. Organisations are seen as vast, fragmented, multi dimensional, and highly complex operating systems (Pondy & Mitroff, 1979), and appear to be far too complex to be modelled effectively by current research techniques (Weick, 1983).

Hickson et al (1986) describe organisations as political systems in which decision styles, subject complexity, and political and cultural influences produce differing approaches within and amongst different organisations.

Different topics within one organisation may then follow different decision processes, yet similar topics may follow similar processes amongst different organisations. Processes are typified as sporadic, fluid, or constricted, depending upon their topic. These processes within organisational settings may influence the perception of subjects in terms of complexity and politicality for decision makers (Hickson & Miller, 1992; Rodrigues & Hickson, 1995). These analyses from the Bradford studies, a behaviourally orientated and outcome based longitudinal program, concluded that no clear explanation of decision making processes were achieved.

Alternatively, Cyert & March (1963) observe that models of decision making processes consist of a theory of search and a theory of choice. Decision makers are not presented with problems and alternative solutions, as in a rational model, but must search for them. This means distinguishing between primary and secondary decisions, a distinction between a choice of what source of information to use, and making a decision using information from the source chosen (White, 1975). Information search itself may then be considered a decision problem (Stabell, 1978).

In an organisational setting, managers must deal with problem situations, with incomplete knowledge of the decision environment (Taylor, 1984). In a naturalistic environment, managers call upon knowledge structures and experience of their organisational and societal environments in order to cope with uncertainty (Nisbett & Ross, 1980).

If most decisions made within an organisational environment involve partial knowledge, then a decision maker must gamble with those elements of the problem where objective probabilities are not known. Where objective probabilities are not known, a decision maker assigns subjective probabilities, gambling in uncertain situations using strategies that represent the best bet (Taylor, 1984). Decision makers may then gamble with objective probabilities that are available, but of sufficient number or complexity to be assigned subjective probabilities.

- **Public Sector Environmental Influences**

Anecdotal evidence suggests that public sector organisations have different cultures from those in the private sector. If so, those contextual differences would render the transfer of research conclusions from the private sector to the public sector invalid (Hogarth, 1981; Rowe, 1989; Hickson et al, 1986; Cook, 1990). As this study specifically investigates decision making issues within the public sector, characteristics and complexities of public organisations are of particular relevance. Any assumptions about the transferability of private sector research results to public sector organisations cannot be assumed here.

Literature concerning public sector characteristics is sparse in comparison with studies of commercial entities, and infrequently relates to influences on individual decision making. Concerns for restructuring, re-organising,

and redefining objectives, rationale and responsibilities absorb most reports about government agencies, e.g. restructuring the public service (Coombs, 1976), restructuring public sector finance (FMIP, 1990), and structural and procedural reforms (Gardner, 1993). These concerns require discussion in relation to the organisational contexts in which public sector managers make decisions.

Main differences between the two sectors, private and public, are seen as:

- the political environment of the public sector which structures the role of public sector management;
- community related programmes rather than profit motives;
- recognition of interaction between different public sector activities;
- definitions of efficiency, effectiveness and productivity which are exclusively related to the equity and accountability of public sector activities (Shaw, 1990).

Significant differences are recognised between the operation of public and private sectors (Cook, 1990) though specific references identifying cultural differences are rare. Identification of differences in contextual complexity levels may be intuitively acceptable, though not confirmed, through recognition of the aggregated layers of both political and operational commitments within the public sector. "In the end you are accountable to your superiors, your Minister, the Government, Parliament, the Age, the Sydney Morning Herald, "A Current Affair", and "Hinch at Seven"" (Abrehart, 1989).

Historically the public sector has been characterised by centralised control, hierarchical management structures, and structured division of labour (Savas, 1987). The need for reform was recognised about twenty five years ago with the establishment of the Corbett Inquiry (1973) of South Australia and the Bland Inquiry (1973) into the Victorian Public Service. Reform of the public sector requires specific examination of the needs for public sector activity and development of effective ways to met those needs.

Those earlier reports and the Coombs Report (1976) recommended devolution of responsibilities. The Wilenski Review of New South Wales (1977), and The Review of Tasmanian Government Administration (1978), similarly recommended change and general reform to a public sector that would display more private sector management characteristics.

More recently, Karpin (1995) emphasised the need for management accountability, supported by training appropriate to a public sector undergoing reform in parallel with contemporary changes of democratic process. Increased environmental complexity within the public sector was also recorded as emanating from expansion in information generation, higher management mobility compared with historical record, and the novel and complex transition towards more commercial structures, processes and cultures (O'Malley, 1995).

Although some aspects of these private sector related management techniques, introduced under the "managerialism" school of thought



(Alford, 1989; Davis et al, 1989; Keating, 1988), may be seen as a panacea for public sector management, some modification may be needed to suit the aims and objectives of public sector activity, and the diversity within the public sector itself (Shaw, 1990).

Thus, according to successive reports, reviews and reform Acts (Reid Review, 1982; Public Service Reform Act, 1984; Public Service Legislation (Streamlining) Act 1986; Codd, 1987; Hawke, 1987; Federal Administrative Arrangements Act, 1987; Keating, 1988; Hamilton, 1990 ) the intention of public sector reform has been to:

- provide more effective goods and services to society;
- improve accountability and responsiveness to government policy;
- increase public accessibility to decision making processes;
- create a highly skilled workforce committed to achieving specified objectives.

This view has been widely promulgated, though not without opposition. March and Olsen (1983) and Hood, Huby and Dunsire (1985) concluded that changing structures did not necessarily change the public service but that any "reorganisation had little observable effect on bureaucratic structures and working... 'An iron law of inertia' prevailed". This may be because differences of accountability and outcomes between public and private sector organisations may influence their respective cultures and decision making environments (Keating, 1988).

Organisational complexity may also significantly influence decision making (Robbins, 1993). Complexity refers to the degree of vertical, horizontal and spatial differentiation within an organisation, i.e.

- the depth of hierarchy;
- the number of different functions;
- and the geographical dispersal of an organisation. (Robbins, 1993)

Any political or societal motivation to engage in public sector reform over the last twenty years may well have come from the relatively high degree of structural complexity within public organisations, and its subsequent high cost (Shaw, 1990).

A review of major bibliographies referenced in government publications related to public sector reform, provides insight into the perspective and levels of analysis (Royal Commission on Australian Government Administration, 1976; Smith & Weller, 1978; Heald, 1983; Wilenski, 1986; Tregillis, Shane & Shaw, 1987; Wiltshire, 1990). Subjects covered in these collections of studies include: technical issues, reform implementation, efficiency, equity, operational effectiveness, financial management, regionalisation, business relationships, devolution, technology, and public administration ethics. Additional features of public sector organisations which may be of concern are high formalisation, the standardisation of jobs, and high centralisation of decision making.

There are conflicting issues here in relation to the complexity of decision making environments. Although public organisations had high vertical, horizontal and spatial complexity factors, people working within them had highly formalised jobs and limited decision making scope in such highly centralised structures (Weller et al, 1992; Savas, 1987). This apparent contradiction of influences is noted here and addressed in later discussion. (page 99)

Major changes to the structure of public sector organisations may well have impacted upon working culture, but the emphasis towards public organisations working to satisfy the needs of people marks a radical departure from historical attitudes (Savas, 1987). Because organisational outcomes must be achieved through the concerted efforts of others, managerial decisions are concerned with how to use human talent and how to guide and motivate human effort. This criteria has become more significant during changes to public sector organisations that emphasise commercial principles.

Changes to public organisations have produced structures where people operate in lower organisational complexity in terms of the vertical, horizontal and spatial factors, but in greater decision making environmental complexity due to the reduction in centralised authority, and lower formalisation of jobs. Further, the character of decision making environments have altered due to the extended scope of individual jobs and responsibilities, the reduction in hierarchical status, and reductions in horizontal differentiation through multi-skilling. An explosion in work

related legislation, reductions in clearly identifiable career paths, and growing demands for political correctness and accountability have also increased the complexity of decision making environments (Weller et al, 1992).

When the impact of economic pressures on the public sector coincides with public resistance to higher taxes, there are usually only four alternative courses of responsive action available to the public sector (Savas, 1987):

- Creative book-keeping,
- Borrowing,
- Reduced Activities,
- Greater Productivity.

There are potential constraints on each of these courses of action:

- The introduction of accrual accounting and performance based budgeting,
- Reductions in the willingness of capital markets to fund government spending,
- General unwillingness, for political reasons, to reduce activity.

This leaves increased productivity as generally the only acceptable alternative (Savas, 1987, 1990; Keating, 1988). As part of the drive for productivity, programmes of commercialisation and privatisation of the

public sector have been and are being introduced. The subsequent effects of such radical departures from historical structural and cultural paradigms then become part of the decision making environments of public sector managers (Savas, 1987).

- Individual Perception and Decision Style As Influences On Decision Making Preferences.

If external influences on individual decision making depend upon their specific contexts, it may be that it is not the objective nature of organisational environments that influences individual decision making, rather it is the subjective interpretation of those contextual cues (Wood & Bailey, 1985; Rowe, 1989 ). Prescriptions drawn from excellence in one organisation may not be effective or appropriate in another. Such prescriptions may not be effective, as task demands and organisational environments differ widely. With such diversity of task demands and environments, management styles and decision making styles, vary (Peters & Waterman, 1982; Streufert & Swezey, 1986).

Decision styles result from unconscious preferences and reasoning that influence managers to use particular decision procedures - how they make choices and take action (Nutt, 1979, 1986). Preferred, or choice styles are then combinations of sensation or intuition preferences for gathering information, and thinking or feeling preferences for processing information. Managers tend to gather information by sensation or

intuition, and to process that information through thinking or feeling, providing such choice styles as systematic, speculative, judicial or heuristic. The thinking/sensation style is called systematic; the thinking/intuition style is speculative; the feeling/sensation style is judicial; and the feeling/intuition style, heuristic.

Managers using systematic decision styles tend to use a structured approach, like mathematical modelling, supported by hard data and analysis. Those using speculative decision styles tend to use data analysis to test alternatives, and like systematic managers, use structure rather than intuition or judgement. Judicial decision makers rely on consensus, focusing on agreed interpretations of facts and a variety of information sources, before negotiating decision choices. Managers using an heuristic style attempt to balance claims, and any moral or political concerns posed by alternatives, relying on cues related to their experiences to make decisions.

Having made unconscious choices about information gathering and processing, managers then have action preferences - the type and focus of preferred action. These preferences are used to identify managers' decision implementation styles.

According to Jung (1970), these alternatives fall within extroversion or introversion and judgement or perception continua. As these are really cognitive terms, Nutt (1989) calls them externals and internals in recognition of the behavioural nature of the descriptions. Individuals

with an internal action focus tend to prefer ideas whereas externals tend towards people and things. Similarly, judging individuals attempt to regulate and control others, whereas perceivers attempt to understand and adapt. These combinations of preferences about action focus and action type describe an individual manager's preferred decision implementation style as an influencer, tuner, persuader, or broker:

- Influencers are internally focussed, judges
- Tuners are internally focussed perceivers
- Persuaders are externally focussed judges
- Brokers are externally focussed perceivers.

These unconsciously motivated action foci and type, and the previously noted dominant considerations of thinking, feeling, sensation and intuition, also translate through a secondary process to sixteen paired externally and internally (respectively) focussed decision styles. Although the secondary process is not specifically addressed in this study, the sixteen decision styles may provide explanation for differences in behaviour of internals in naturalistic settings, whose observable behaviour often fails to illustrate the process they use to reach decisions. Similarly, the secondary process may also be used to qualify the decision making behaviour of externals.

The sixteen decision styles relate to the four preferred implementation styles, of internally or externally focussed, judging or perceiving action types, are shown as follows (Table 1) :

**Table 1: Decision Styles, their Foci and Subsequent Implementation Styles**

Procedural	thinking	Persuasion
Evaluative		
Political	feeling	Persuasion
Mediator		
Visionary	intuition	Brokering
Proselytising		
Traditional	sensation	Brokering
Relational		
Flexible	feeling	Tuning
Committed		
Ordered	thinking	Tuning
Intellectual		
Empirical	sensation	Influencing
Anecdotal		
Iconoclastic	intuition	Influencing
Cooperative		



These four preferred decision implementation styles (Nutt, 1989) may then be examined in relation to innovation/adaption cognitive styles (Kirton, 1976) and managers' decision making performance within environments of different complexity within naturalistic settings.

Although managers may have preferred decision implementation styles, in naturalistic settings there are many environmental influences that may evoke alternative styles of decision making behaviour by managers (Nutt, 1989). An instrument to avoid such confounding variables within naturalistic settings is then needed to examine managers' choice decision styles.

Environmental influences may impact upon decision styles through a variety of means, including cognitive dissonance (Festinger, 1965), problem framing within an organisational context (Kahneman & Tversky, 1979), rites and ceremonies (Ouchi, 1981), and politicality (Hickson, 1986). Cognitive dissonance is described by Festinger (1965), as pressure to conform to group norms, so that individual judgments may be subsumed to achieve equity with a perceived and disparate group judgment.

An alternative focus is postulated by Kahneman & Tversky (1979) where perception of a problem depends upon the way in which it is framed for presentation to the individual decision maker e.g. one person's terrorist is another's freedom fighter. Subsequent replication and extension by Bazerman (1984) also suggests that decision makers may be more risk averse to problems framed in a positive direction and vice versa.

Similarly, Ouchi (1981) illustrates the effect of organisational behaviour in terms of rites and ceremonial habits that influence problem framing and thence decision making.

Encompassing these aspects, Hickson et al (1986) describes environments in terms of differential perceptions of political influence that impact upon decision making. The focus of interest is on power, and the distribution of power within organisations through effective decision making that copes with uncertainty. Hickson et al (1986) then address issues of dynamic environmental contexts in which power relationships may affect risk aversion, and cognitions of problems; and be influenced by organisational habits. Different managers may then adopt decision styles according to perceptions of their environments, perceptions of the problem content, its importance and its relevance to political influences within the decision making environment.

Performance equated with decision style may be insufficient correlation alone to account for the more complex issues inherent within this study of public sector organisations involved in the dynamics of structural and cultural upheaval. Complex decision making is a motivated cognitive process, especially in dynamic organisational environments (Wood & Bandura, 1989). Thus, decision making in such environments requires complex integration of multiple sources of information (Mintzberg, 1973).

Decision making style (Nutt, 1989) may be considered to be a dependent variable of cognitive style (Foxall & Payne, 1990). Decision making style may also be considered as much a function of environmental influences as an individual's underlying cognitive structure and processes (Sproull, 1981; Festinger, 1965). If decision making style is influenced by cognitive style and environmental influences, then a review of cognitive styles is relevant.

- **Individual Cognitive Style As An Influence On Decision Making Performance.**

Because decision making style is a product of contextual cues and cognitive style (Nutt, 1989), examining differences in individual cognitive style and organisational environments is relevant. As organisational contexts differ widely, influences on decision making similarly differ. Public sector organisations are undergoing structural and cultural change, so significant contextual influences result from such changes (Cook, 1990). If decision style is a result of the combined influences of contextual cues and cognitive style, measuring cognitive style is directly relevant to an investigation into decision making performance within the changing public sector.

Cognitive style, how people think, is selected as an independent variable, primarily because of its relative stability in humans (Sauser & Pond, 1981). Thus, any prediction of decision making performance from cognitive style within a neutral environment describes a capacity for that performance.

Differences between decision making performance and capacity can then be analysed in terms of environmental factors within a naturalistic setting (Wood & Bailey, 1985).

Cognitive style is addressed within the literature along several levels of analysis including:

- Bieri (1966), individual cognitive complexity and judgement
- Driver (1969), individuals as information processing systems
- Kirton (1976), managers as adaptors and innovators
- Hogarth (1981), aspects of judgmental heuristics
- Nutt (1986 and 1989), managerial decision styles
- Streufert (1986), complex decision making and cognitive complexity
- Foxall & Payne, (1990), cross cultural studies of cognitive styles of managerial functions.

Despite these interesting approaches, the aspect of cognitive style to be examined requires justification in relation to the specific objectives of this study. The specific objectives here require demonstration of direct relevance between cognitive style and characteristics of private and public sector organisations. Any investigation of cognitive styles relevant to decision making within a public sector undergoing reform needs to address the implications of such dynamic organisational contexts.

## Decision Makers in the Public Sector

The departure from historical structural and cultural paradigms within the public sector, to a more private sector styled context, becomes part of the decision making environments of public sector managers. Public sector organisations historically lean towards being relatively stable and predictable (Keating, 1988; Alford, 1989; Shaw, 1990). In these more mechanistically structured organisations, appropriate managerial skills emphasise continuity and efficiency. Managers within such organisations tend to include a high proportion of adaptors, those who typically prefer to improve current working arrangements and who make decisions bounded by existing systems and practices (Kirton, 1976; Foxall & Payne, 1989).

Over two decades of reform process in the public sector, with stringent economic rationalism, accountability mandates emphasising customer orientation, and decentralisation of traditional authority, requires a more innovative managerial approach. An era of public sector reform, including reassessment of problems, their frames of reference, current operating procedures and perhaps reformulations of organisational objectives (Savas, 1990; Kirton, 1976), places pressure upon public sector managers to become more innovative, a style more aligned with the new environment. Pressure to conform may not be the case today. Thus the nature of public sector organisations is inclined to demand a more private sector managerial style. This requires a different way of thinking, an alternative cognitive style (Savas, 1990).

Unfortunately, cognitive styles may be inherent (Nutt, 1989) and experienced managers tend to gravitate towards organisational styles that suit their individual cognitive styles (Kirton and McCarthy, 1988). If so, the public sector may be disproportionately inhabited by more adaptor styled managers, compared with the private sector that tends to attract more innovator styled managers (Kirton and McCarthy, 1988). This is especially so when it has been increasingly difficult for innovators to co-habit with adaptor styles within the public sector (Kirton & McCarthy, 1988).

Nevertheless, because of environmental pressures, observed managerial behaviour does not necessarily conform to an individual's preferred pattern of behaviour. Innovators may attempt to behave more like adaptors when constrained by the organisational rules and culture (Kirton & McCarthy, 1988).

## Measuring Performance Through Simulation

Complex managerial decision making may not lend itself readily to experimental analysis within naturalistic workplace settings (Beach, Barnes, & Christensen-Szalanski, 1986). There is extensive reporting in the literature that processes involved in decision making may be influenced by interacting and complex factors that defy identification and experimental control (Wood & Bandura, 1989). Confounding influences such as framing (Kahnemann & Tversky, 1979), politicality (Hickson et al, 1976; Schwenk, 1989), and environments of diverse factors (Morgan, 1986) are examples of such influences.

Earlier efforts to analyse decision making within discrete and controlled environments were subject to criticisms of validity and reliability. Much of this past research included studies involving single trials of problems within static organisational environments (Beach, Barnes, & Christensen-Szalanski, 1986). Results from such studies did not provide sufficient basis for either descriptive or normative models of decision making that had integrity within naturalistic environments (Wood & Bailey, 1985).

To address these criticisms, organisational simulations were developed with complexity levels more closely matching those of the naturalistic environments they simulated (Wood & Bandura, 1989). There now exists substantial support in the literature that experimental analysis of decision making may be achieved through the use of complex simulated

organisational environments ( Jin, Levitt, Kunz, & Christiansen, 1995; Vakilzadian, 1995; and Barton & Schruben, 1995). These simulated environments allow manipulation of variables and precise assessment of their impact on decision making performance.

In complex naturalistic environments, decision rules are discovered through the systematic application of analytic strategies (Bourne, 1965; Bruner, Goodnow, & Austin, 1956). Decision makers start by drawing on existing knowledge, which they test by varying factors one at a time, then by assessing variations to the performance outcomes. Less skilled decision makers formulate relatively vague rules, tend to alter more than one factor at a time, and make less use of performance feedback to modify their strategies (Brehmer, Hagafors, & Johansson, 1980).

Validation of this approach is supported in the literature by Jin et al (1995), Vakilzadian (1995), and Barton & Schruben (1995). Similarly, simulation programs for the education of entrepreneurs (Kessel, 1989) strongly supports a format of repetitive trials of simulated activity with feedback.

Empirical support for this approach comes from Bandura & Dweck (1987), where abilities are described along a continuum of incremental skill at one pole, and fixed entity, at the other. The incremental skill perspective allows that a decision maker may continually enhance the performance outcome by acquiring knowledge and perfecting competencies. The fixed entity perspective argues that ability is more or less fixed, and that decision



making performance is relatively unchanging within an environment of given complexity (Nicholls, 1984).

Providing a simulated organisation with multiple trials then addresses both criticisms of studies involving single trials of problems within static organisational environments (Beach, Barnes, & Christensen-Szalanski, 1986), and provides a theoretical justification supported by self regulatory mechanism (Wood & Bandura, 1989).

### Summary and Points of Departure

Despite a substantial body of research into decision making over several decades, definitive conclusions seem elusive. Many early studies proposed causal relationships between the content of decisions, their outcomes, and subsequent commercial success. Replication of these studies has provided inconclusive results, making the transfer of decision characteristics between different contexts, questionable. Many excellent ideas about decision making seem to have foundered on the shores of alternative cultures and contexts. An alternative approach emphasises more internal factors, of individual cognition and perceptions of organisational environments, as influences on decision making performance.

An historical review of organisational models about contextual structures and processes identified several alternatives about contextual cues for individual decision making. The degrees of influence of contextual cues,

as external determinants of individual decision making, are seen to depend upon the specific context in which individual decision making occurs. However, organisational contexts differ widely. If the influence of external determinants on individual decision making depend upon their specific contexts, it may be that it is not the objective nature of external influences that determines differences in individual decision making but the subjective interpretation of contextual cues.

These subjective responses to external influences depend upon, and may be predictable through, the cognitive style and preferred decision style of an individual decision maker. Kirton & McCarthy (1988) concluded that decision styles derive from the combined influences of cognitive style and environmental pressures. If cognitive style is influenced by values and attitudes, and subsequently produces observable decision styles, attempting to match cognitive and decision styles appears appropriate. If positive correlations between established measures of cognitive and decision styles are supported, comparison between those styles and decision making performance outcomes should provide a predictor for individual decision making performance within a neutral environment.

But managers at work do not make decisions within neutral contexts, nor do they necessarily feel comfortable in their decision making environments. Individual decision makers' cognitive styles may be at variance with their organisational norms (Wood & Bandura, 1986; Beyer, 1981). Organisations may be of differing cultures, complexities, and operating styles compared with individual decision makers (Liedtka, 1989).

Similarly with the current state of the public sector which has historically been regarded as highly stable and formalised. Rather than being a stable, albeit complex environment, a public sector under structural and cultural reform provides the decision maker with higher levels of environmental complexity than previously experienced. A decision maker's subjective responses may be less predictable within the dynamic context of a public sector undergoing change by externally mandated reform.

Because individual accommodation to a conflicting culture is difficult, individuals may refuse to compromise for more than a short time, and may eventually leave a workplace that conflicts with their preferred cognitive style. Within this context, it seems essential for any qualitative investigation into individual decision making to minimise these environmental confounding variables. Support for the use of an organisational simulation to measure decision making performance is well founded in the literature. Reducing environmental pressures through the use of a computerised organisational simulation, a neutral environment, may then allow examination of relationships between decision style and cognitive style through the measure of standardised decision making performance.

It is frequently reported that the public sector has historically been inhabited by more adaptively styled managers. If so, those more innovatively styled managers, being introduced during a reform process, may feel uncomfortable within such established cultures (Savas, 1990;

Liedtka, 1989). The public sector currently undergoing reform may be over represented with more adaptively styled decision makers, that are resistant to innovators, thus slowing or defeating the reform process.

More recent studies display support for a compromising stance, with suggestions for increased productivity and reduced stress through the improved matching of individuals to their working environments.

### **Method rationale**

Whilst decision making style, as an independent variable, (Rowe & Mason, 1987; Nutt, 1989; Rowe & Boulgarides, 1990) may be a seductive choice, it is considered to be a symptom of cognitive style (Kirton, 1976; Foxall & Payne, 1990) and a derivative of personality (Nutt, 1989).

Environmental influences may impact upon decision styles through a variety of means, including cognitive dissonance, problem framing within an organisational context, rites and ceremonies, and issues previously discussed. To select decision making style *per se* as an independent variable within this study, would then cause results to lack reliability, because different managers may adopt decision styles according to their environments. Thus, enacted decision making style may be considered as much a function of environmental influences as an individual's underlying cognitive style (Sproull et al, 1981; Festinger, 1965).

The simulated decision making environment is used to reduce naturalistic confounding influences, such as social pressures and politicality that may prompt individuals to use an alternative decision style to cope. By surveying respondents within a designed context that is apolitical they are expected to adopt their naturally preferred decision style.

Cognitive style, how people think, is selected as an independent variable, primarily because of its relative stability in humans (Kelly, 1955; Kirton, 1976; Sauser & Pond, 1981; Rowe & Mason, 1987). Kirton's (1976) theory is essentially value free, where high or low scores are irrelevant. It is the manner, not the level of effectiveness that is of concern (Kirton, 1989; Goldsmith, 1989).

Any prediction of decision making performance within an environment sterile of naturalistic influences, describes a capacity for that performance. Differences between actual decision making performance at work, and a demonstrated capacity, can then be analysed in terms of environmental factors, or the subjective interpretation of those factors.

If contextual framing has significant impact upon outcomes (Hogarth, 1981), then any research instruments used should avoid directives. Avoiding directives may be achieved through combining questionnaires in grouped and balanced segments, and seeking responses without a title or explanation of expected results (Platek, 1985).

Decision styles and cognitive styles may be related to some degree. Aspects of decision style, such as externality and perception that produce implementation styles of persuasion and brokering, may correlate with aspects of cognitive style like extroversion and vision. If so, the use of instruments to examine both naturally preferred decision styles and cognitive styles provides comparative measures. This combination also allows later comparisons between predicted decision making capacity and actual performance in naturalistic settings.

Replications and referenced support for Kirton's (1976) Adaption-Innovation Inventory provides scope for further discussion (Streufer, 1986; Foxall & Payne, 1989. Kirton, 1989). Similarly, the literature provides substantial support for aspects of cognitive style related to decision style (Rowe & Mason, 1987; Nutt 1986, 1989; Begley & Springen, 1986, Nutt & Backoff, 1992 ). This support encourages an experimental design combining aspects of decision style and cognitive style.

Discovering an individual's capacity for decision making also requires control of potentially variable environmental factors during performance trials. Any differences between experimental trials of subject managers would confound the performance results. Previous experience in a working environment would similarly constitute a methodological error. If subjects gain prior experience at making decisions in "The Furniture Factory" (Wood & Bailey, 1985), their ability to respond in line with their individual cognitive and decision styles, may become tainted. Results may

be interpreted, at least partially, as dependent upon individual ability to progressively learn decision rules.

In replication of Wood & Bailey (1985), subjects are introduced to the computer simulation, allowed one trial run for operational comfort, then directed to proceed for ten consecutive performance trials at a single predetermined level of organisational complexity. Each subject undertakes ten trials at one of three levels of complexity. This formula provides a constant environment for each individual subject, and allows minimal cognitive assimilation of the game's rules, before starting the experiment. Additionally, this method also allows direct replication and comparison with several Wood & Bailey (1985) experimental data sets. Variables attributable to differences of culture, gender, socio-economic, and occupational groupings, are reduced by confining the sample to male public sector managers, working within novel and complex environments.

Part of this study included a replication of Kirton (1976). Its scope required *prima facie* acceptance of the Kirton (1976) methodology and analysis, although some critical aspects of the KAI (Kirton, 1976) analysis appears in the literature.

Nutt's (1989) Decision Style Inventory, an instrument to determine preferred decision styles, was included in this study by being integrated with Kirton's (1976) Adaption - Innovation Inventory (KAI) into a grouped combination questionnaire.

Based on studies by Kirton (1976), Foxall & Payne (1989), Rowe & Boulgarides (1992), Holland (1987) and Hayward & Everett (1983), and others, it was expected that this investigation into public sector managers would provide similar results. This was particularly so with Hayward & Everett's (1983) replication of Kirton's (1976) KAI within a local authority setting where an overwhelming population of predominantly adaptors was discovered. Similar results were expected from this sample.

This sample was not drawn from a cross section of a general population. Subjects were male, experienced, public sector managers, with tertiary qualifications. Standard statistics for this sample would be perhaps, better compared with Kirton's (1987) KAI mean score of 101 for tertiary qualified males, not the mean point of 95. Thus a consistent behaviour of innovative tendency should have been expected of this sample.



## Method

Thirty male subjects, public sector middle managers, defined by public sector employee levels 5-8, were introduced to the program. It was explained that the study intended to contribute to an improved method of matching managers more closely with the characteristics of their working environments. Advantages for them should include a reduction in work-related stress, and greater job satisfaction (Streufert & Streufert, 1981; Streufert & Driver, 1986). Advantages to the organisation should eventually include improved productivity.

Each cycle of the experimental design took approximately 40 minutes. Subjects were asked to complete a questionnaire, and to participate in one practice decision making cycle before a measured performance assessment of ten decision making cycles. The decision making cycles were at a preset (and discrete) complexity level, within a simulated (computerised) organisation. Subjects were assured of confidentiality and had the option of a debriefing interview to discuss their results. The instruments used, in order, were a questionnaire and an interactive computer simulated organisation:

- A combined 64 response questionnaire (Appendix A) consisting of:
  - (1) Kirton's (1976) Adaption-Innovation Inventory;  
A 32, 5-point scaled response, pencil and paper questionnaire, to assess subject's cognitive styles, compared with a known mean.

- (2) Nutt's (1989) Decision Style Inventory of 32 questions, each requiring alternative responses, differentiating amongst four preferred decision styles: systematic, speculative, heuristic, and judicial. (approximately 20 minutes)
- The Furniture Factory (Wood & Bailey, 1985), a simulation in which subjects made decisions about orders they receive for the production of furniture items, along with a roster of available employees. By making correct decisions about matching employees skills and aptitude to production requirements, subjects can attain a higher level of performance than if employees are poorly matched to jobs. To enhance the performance, subjects have to learn the decision rule for setting the optimal level of challenge for each employee (Wood & Bandura, 1989). Decision making performance is measured in terms of percentage scores against a benchmark of optimal performance over ten cycles, each of a predetermined complexity level.  
(approximately 20 minutes)

## Questionnaire

To minimise the opportunity for subjects to learn response rules, anticipate response expectations, and be differentially influenced by question chronology, a combined questionnaire format was used. Blocks of questions, some based on a five point scale, some on a selection of

alternative responses. Decision style (Nutt, 1989) questions required a true/false response to 32 behavioural questions. Responses were analysed into four dominant style alternatives and differentiated into a profile of intuition/sensation and thinking/feeling. These in turn were translated into observable choice decision styles of systematic, speculative, heuristic and judicial.

Cognitive style (Kirton, 1976), contains a mixture of 32 statements related to behaviour, values, and attitudes, requiring a five point scale of response. Analysis allows a broad tendency descriptor of adaptor/innovator. Adaptors tend to include characteristics such as dogmatic, inflexible and conservative. Innovators may be similarly described as extroverted, insensitive, and 'ideas people'. Analysis relates only to style, not to a level of effect.

## Simulation

To simulate a novel and complex decision making environment to match inexperienced acting managers within public sector organisations, an established instrument, The Furniture Factory was utilised (Wood & Bailey, 1985). The introductory information describes the simulation as one in which subjects make decisions as manager of a special order department of a furniture factory. As manager, they receive weekly orders for the production of furniture items, along with a roster of available employees. The manufacture of the furniture items in each of the orders requires eight different production jobs: milling the timber; preparing the timber for assembly; assembling the parts; staining and sealing the assembled frame; cutting the upholstery to pattern; sewing the upholstery; upholstering the furniture; and preparing the finished products for shipment.

Subjects are assigned to one of three levels of task complexity, determined by the number of employees assigned to them out of the ten available, and other variable options related to goal setting, social rewards and instructive feedback.

The subject's managerial decision making task is to allocate employees from the roster to the eight different production jobs, in order to complete the work assignment within an optimal time period. By making correct decisions about matching employees skills and aptitude to production

requirements, subjects can attain a higher level of performance (faster output) than if employees are poorly matched to jobs. Assistance is provided through descriptions of the effort and skill required for each of the production jobs, and the characteristics of each employee. The employees' information describes their skills, experience, motivational level, preference for routine or challenging work assignments, and standards of work quality. Employees' profile descriptions are provided at the beginning of the simulation, but subjects can refer to them at any time during the decision making task.

In addition to allocating employees to jobs, subjects need to make decisions about how to use a set of motivational factors to optimise the group's performance. They have to decide how to use motivational factors such as goals, instructive feedback, and social rewards to enhance the job performance of each employee in the group. For each of these motivational factors, subjects have a set of options representing the types of actions that managers could take in an actual organisation.

In performing the managerial role, subjects allocate the employees to the various jobs for each manufacturing order. They have scope to change employee assignments before continuing. After employees have been allocated to jobs, subjects can then assign each employee a production goal from a set of options that include urging employees to do their best, assigning them to one of three specific goals set at above or below the established standard, or no production goal.

Goal assignments for employees influence their performance according to the calculations of the simulation model (Wood & Bailey, 1985) in the manner predicted by goal theory (Locke et al, 1981). Goals that present a moderate challenge lead to higher performance than no goals or instructions urging employees to do their best. However, repeated imposition of goals that exceed an employee's prior performance at a level that renders them unattainable has a negative effect on later performance. Continued imposition of unattainable goals would eventually lead to their rejection and diminished motivation. To enhance the performance of their department, subjects had to learn the decision rule for setting the optimal level of challenge for each employee.

Instructive feedback and social rewards are given after the production order for each trial has been completed. For the feedback decision, subjects can give employees no feedback, or select one of three options that vary in the amount of direction given regarding methods of workmanship and analysis of difficulties. Instructive feedback has a positive effect on employees who perform below the established standard. When an employee performs above the established standard, the continued use of high directive feedback is regarded as over supervision that would have a negative effect on performance. Effective use of the feedback options to improve work performance requires subjects to learn decision rules for optimal adjustment of the level of instructive feedback to performance attainments.

For decisions regarding social rewards, the effects of the three options varies with the type of reward given, compliment, social recognition or note of commendation. Effects of decisions regarding social rewards also varies with the degree to which rewards are contingent upon employees' performance attainments. Subjects also have the option of not making any laudatory comments regarding their employees' work. Social rewards have a positive effect on performance, however, in an organisational setting, the impact of rewards on performance is affected by social comparison processes as well. Therefore, the magnitude of the incentive effect for a given employee depends on the ratio of rewards to attainment for that employee compared with the equivalent ratio for other employees. Subjects therefore, had to learn a compound decision rule combining incentive and equity factors on how best to use social rewards to increase organisational performance.

To optimise work performance, subjects need to match employee attributes to job sub functions. They also need to simultaneously master a complex set of decision rules on how best to guide and motivate their employees. To discover the rules they have to test options, cognitively process the outcome feedback information of their decisions, and continue to apply analytic strategies in ways that reveal the governing rules. To complicate matters further, the motivational factors involve both linear and non linear compound rules, which are especially difficult to learn. Knowing rules does not ensure optimal implementation of them. Subjects also have to gain proficiency in tailoring the application of the rules to

individual employees and to apply them in concert to achieve desired results.

The simulated organisation utilised in this study addresses both quantitative and qualitative aspects of decision making, including the evaluation and refinement of controlled situational options. Controls within the experimental design are included to deny differential effects of contextual images by standardising the information environment and mode of information presentation.

This study replicates Wood & Bailey's (1985) experimental conditions within the task complexity game "The Furniture Factory" using means of three complexity levels.

Table 2 illustrates the establishment of the simulation environmental complexity variables to facilitate replication:



Table 2 Keying to Set Up the Simulation

<u>Simulation alternatives</u>			<u>Keyed responses</u>
Number of decision cycles (1-18)			10
Standard order of complexity:			x
low complexity	1-18	3 workers	9
moderate	19-36	5 workers	7
high	37-54	8 workers	45
Goal levels	(0-125%-best)	100%	2
Feedback	all cycles, job time		1
Diagnostic report	all cycles		1
Frequency of self assessment.			1
Help provided	Graphic display		2
Goals proximal or distant			2
Self assessment <i>a priori</i>			1
Standard game numbers:			
low complexity			91
moderate			82
high			73

Subjects are identified with exclusive double digit numbers.

All responses are written to a data output file on the same disk as the game. The file name is of the form: SUB 001 01 OUT.  
 (subject No) (experimental condition)

## Results

Results from the questionnaire and the simulated organisation by the sample of thirty subjects are shown in Table 3:

**TABLE 3** Questionnaire Results

subject	Questionnaire	decision style	Simulation	performance %
	KAI index #		enviro complexity	
1	118	1	1	98
2	86	1	3	150
3	122	3	2	75
4	104	4	2	111
5	84	1	1	131
6	132	2	3	124
7	81	1	1	129
8	138	2	1	161
9	78	1	1	137
10	87	1	2	124
11	115	4	1	98
12	88	1	3	150
13	131	3	2	75
14	122	2	3	127
15	105	4	1	99
16	74	1	3	172
17	135	3	1	140
18	80	1	2	164
19	88	1	2	159
20	70	2	3	170
21	132	3	2	73
22	126	4	1	133
23	94	3	3	143
24	72	1	1	145
25	138	2	3	86
26	96	4	2	113
27	134	3	2	76
28	145	4	3	87
29	141	3	2	75
30	160	3	3	82

There are four variables compared within these results: independent variables, cognitive style, decision style, and environmental complexity; and the dependent variable, decision making performance. Decision making performance is presented in the form of performance percentages according to Wood and Bailey (1985). Performance percentages are inversely represented, i.e. a lower than 100% illustrates performance that is more effective than a Harvard standard. The higher the percentage performance against the 100% standard, the less effective the decision maker's performance. This inversion results from the use of output time as the measure of performance.

Decision styles are represented by single digits as follows;

1= systematic, 2= speculative, 3 = heuristic, and 4 = judicial (Nutt, 1989).

Cognitive style is represented numerically on a scale from 32 to 160, from more adaptive to more innovative styles respectively, according to Kirton's (1976) Adaption-Innovation Inventory (KAI).

Environmental complexity is represented by single digits;

1= low, 2 = medium, 3 = high complexity. These descriptors relate to mean scores of Boulding's (1956) complexity scales in replication of Wood & Bailey (1985).

## **Analysis**

This analysis consists of notes, graphs and tables illustrating relationships amongst variables in the following order, and followed by a summary.

The order is arranged as follows:

- Overall descriptive analysis of data (A-D)
- Regressions of cognitive style and performance within differential complexities (E-G)
- Regressions of decision style and performance within differential complexities (H-L)
- Multiple regression analysis of overall performance according to cognitive style and decision style within differential complexities (M-T)

The headings for each of these precedes the tables, charts and diagrams as shown in Table 4 (overleaf).

**TABLE 4**      **Contents of analysis**

- A Standard statistics of overall decision making performance.
- B Frequency distribution of decision making performance overall.
- C Frequency distribution of cognitive style.
- D Cognitive style and decision making performance overall, by regression and Chi square.
- E Regression of decision making performance and cognitive style within environments of high complexity.
- F Regression of decision making performance and cognitive style within environments of medium complexity.
- G Regression of decision making performance and cognitive style within environments of low complexity.
- H Frequency distribution of implementation decision styles.
- I Decision style and performance overall by regression and Chi square.
- J Regression of decision making performance and decision style within environments of low complexity.
- K Regression of decision making performance and decision style within environments of medium complexity.
- L Regression of decision making performance and decision style within environments of high complexity.
- M Adaptors' overall performance by decision style.
- N Innovators' overall performance by decision style.
- O Adaptors' performance by decision style within low complexity.
- P Adaptors' performance by decision style in medium complexity.
- Q Adaptors' performance by decision style in high complexity.
- R Innovators' performance by decision style in low complexity.
- S Innovators' performance by decision style in medium complexity.
- T Innovators' performance by decision style in high complexity.

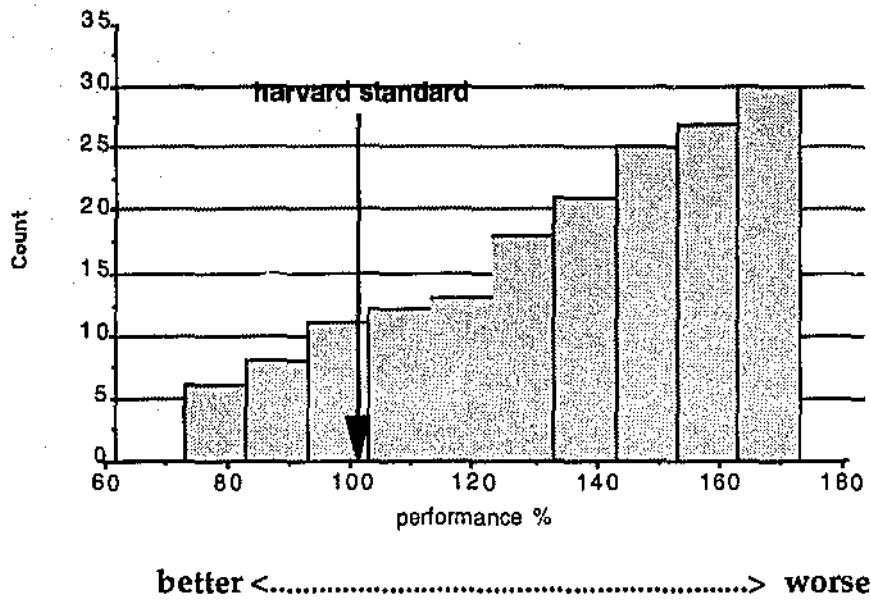
### A Standard statistics of overall decision making performance

X <sub>1</sub> : performance %					
Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
120.2	32.1	5.9	1030.5	26.7	30
Minimum:	Maximum:	Range:	Sum:	Sum Squared:	# Missing:
73	172	99	3607	463565	0

This overview displays the mean decision making performance of the sample across all environmental complexities as 120%, significantly below the Harvard 100% standard, albeit with a high range (99) and standard deviation (32). Such a mean performance difference suggests that this sample of public sector managers exhibit significantly lower decision making performance within novel environments than their Harvard business student counterparts.

Some results for independent variables within different complexities of this methodology may provide balanced overall statistics yet deny better understanding. A frequency distribution of the decision making performance of respondents may provide a clearer view.

### B Frequency distribution of decision making performance overall



This distribution illustrates skewed and lower decision making performance than a general population sample, with less than a third of participants achieving mean (100%) performance overall. Despite their managerial status, the majority of sample respondents performed well below the Harvard management standard implying that some other and additional variable may influence decision making performance.

### C Frequency distribution of cognitive style

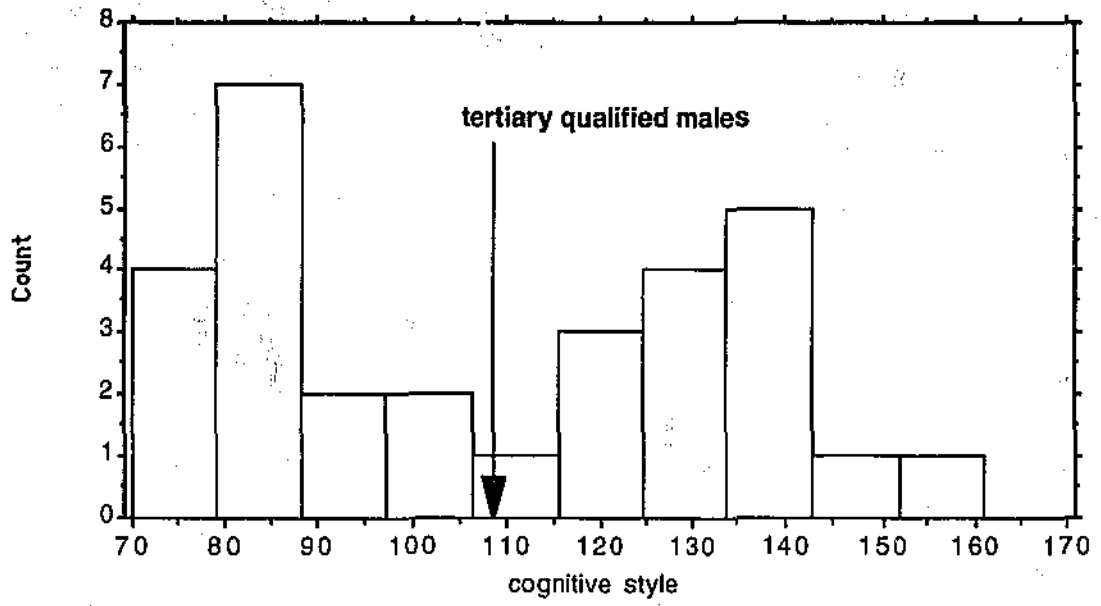
If cognitive style is hypothesised as being a determinant of decision making performance, examination of the frequency distribution of cognitive style within the sample may provide some additional explanation of performance differences.

**X<sub>1</sub> : cognitive style**

Bar:	From: ( $\geq$ )	To: ( $<$ )	Count:	Percent:
1	65	80	4	13.3
2	80	95	8	26.7
3	95	110	3	10
4	110	125	4	13.3
5	125	140	8	26.7
6	140	155	2	6.7



### Frequency distribution of cognitive style



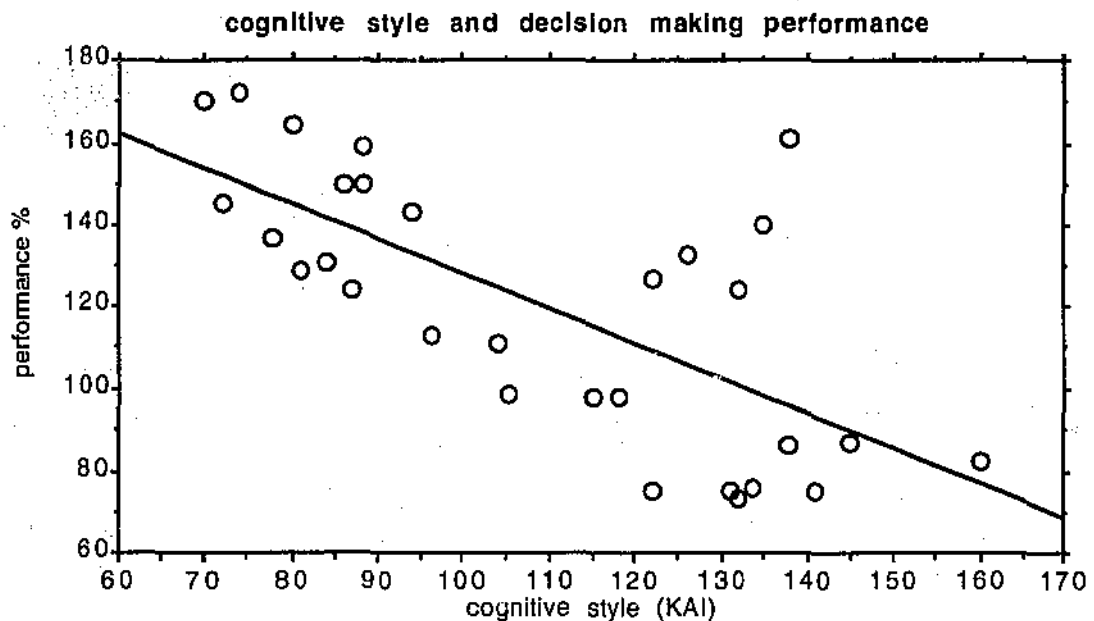
adaptor<.....>innovator

The mean cognitive style score of these respondents was 109, approx 14 points towards the innovative pole from a recognised mean, although with a higher range (90) than Kirton's (1976) 84. The standard deviation of 26 for this sample was high compared with Kirton's (1976) of 18. Overall, KAI scores broadly replicated Kirton's (1985) very similar samples of engineers and public servants in the U.S.A.

The frequency distribution of cognitive styles, represented by KAI scores, illustrates a bi-modal distribution around the mean. This sample displayed a strongly adaptive group and a strongly innovative group, leaving 53% of subjects with KAI scores within one standard deviation of the mean. However this sample was not a 'normal' population, but comprised of male middle managers with primarily engineering and administration backgrounds. Kirton's (1976) study provided a mean score for males (KAI) = 98, and for male engineers = 101 (Kirton, 1987). Support also comes from replications by Love (1985) with a mean (KAI) = 109, for engineers.

Focusing on the first hypothesis about correlations between cognitive style and decision making performance, the analyses "D" to "G" examine both the relationship overall, and then within environments of different complexity.

**D Cognitive style and decision making performance overall, by regression and Chi square.**



**Corr. Coeff. X<sub>1</sub>: cognitive style Y<sub>1</sub>: performance %**

Count:	Covariance:	Correlation:	R-squared:
30	-582.9	-.7	.5

Cognitive style correlated well with decision making performance overall  $R=0.7$  ( $\alpha=.05$ ), providing support for an argument that more innovative managers are able to make decisions more effectively in novel situations, in this case, within a simulated organisation. This correlation result includes a high range of diversification amongst mainly highly innovative

subjects, some of whom performed poorly, comparable with low innovators (adaptors), providing some tentative support for Hypothesis 2.

Chi square test ( $\alpha=.05$ ,  $DF=1$ ) indicates a high significance at 0.0006 related to cognitive style with innovators performing well in high complexity and adaptors performing relatively well in low complexity, supporting regression analysis to that effect. Discussion about possible explanations for such diverse performance is addressed later (page 99).

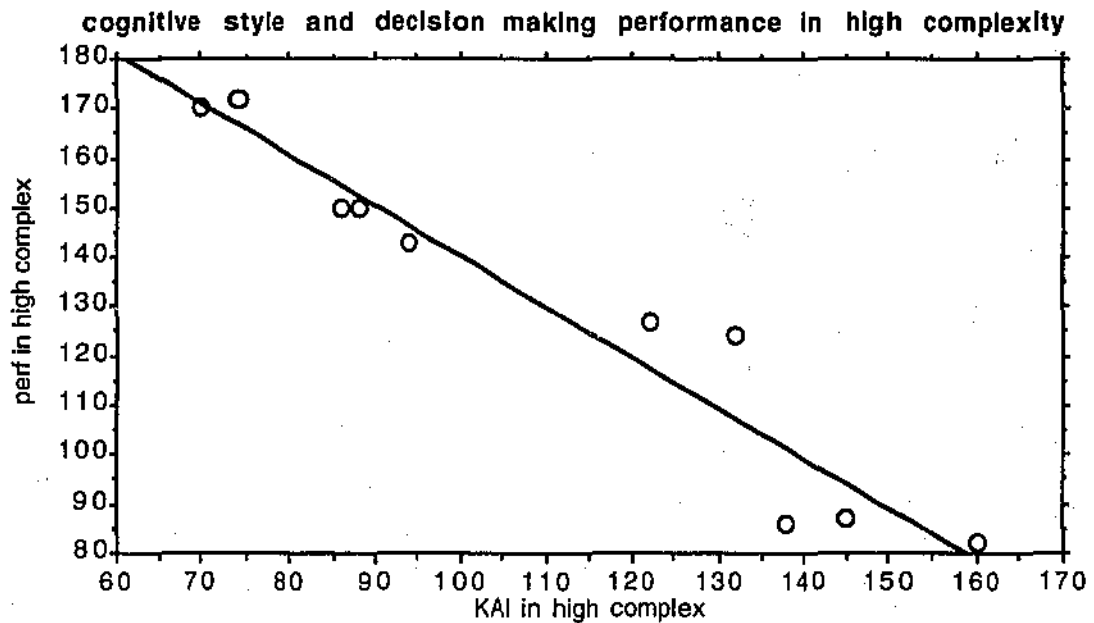
#### Standard statistics for adaptors and innovators' performance.

X <sub>1</sub> : adaptor perf					
Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
143.062	20.59	5.147	423.929	14.392	16
Minimum:	Maximum:	Range:	Sum:	Sum Squared:	# Missing:
99	172	73	2289	333829	14
X <sub>1</sub> : Innovator perf					
Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
103.857	29.168	7.795	850.747	28.084	14
Minimum:	Maximum:	Range:	Sum:	Sum Squared:	# Missing:
73	161	88	1454	162068	16

Comparison of standard statistics displays a significant overall difference in mean performance between innovators (104%) and adaptors (143%), recalling that performance measures are inverse, i.e. lower is better compared with a 100% standard. Such differences may indicate an unequal impact upon subjects, suggesting that the performance simulation utilised may have been disproportionately difficult to master by less innovative subjects. If so, some factor other than cognitive style should be examined.

This analysis of a relationship between cognitive style and decision making performance does not fully address the first hypothesis, "that more cognitively innovative subjects will outperform more adaptively styled subjects within novel environments of higher complexity". This requires examination of relationships between cognitive style and decision making performance within environments of different complexity. For this purpose, relationships between cognitive style and decision making performance are examined within environments of high, medium and low complexity.

**E Regression of decision making performance and cognitive style within environments of high complexity.**

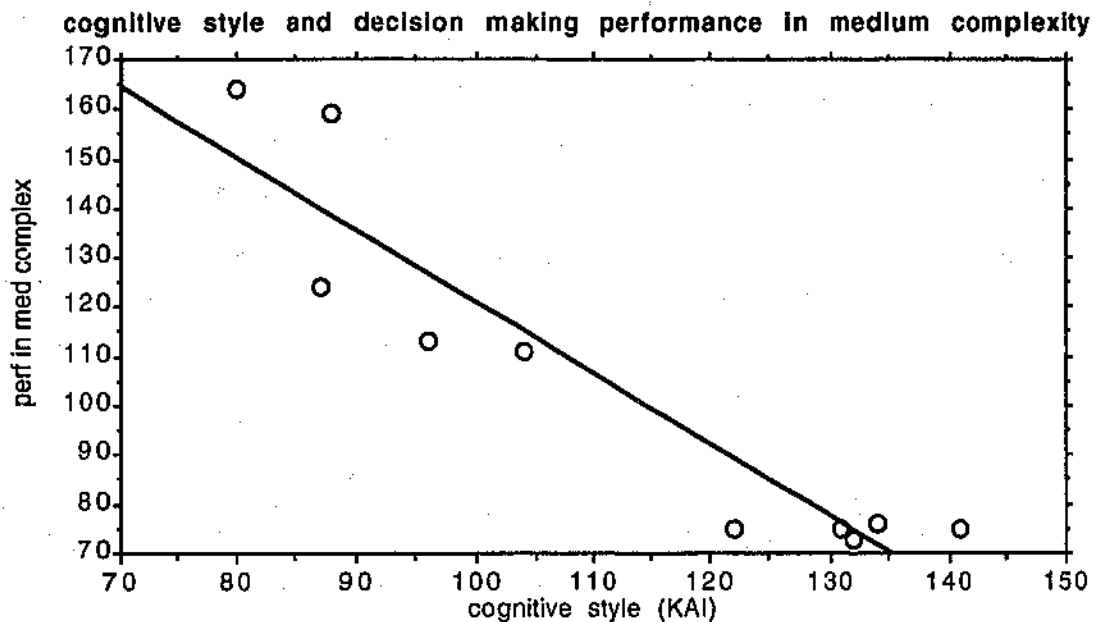


Corr. Coeff. X<sub>1</sub>: KAI in high complex Y<sub>1</sub>: perf in high complex

Count:	Covariance:	Correlation:	R-squared:
10	-1059.656	-.965	.931

These results indicate a high correlation ( $R=0.965$ ,  $\alpha=.05$ ) between decision making performance and cognitive style within high complexity, with more innovative respondents significantly outperforming those less innovative. This provides encouraging support for Hypothesis 1.

**F Regression of decision making performance and cognitive style within environments of medium complexity.**

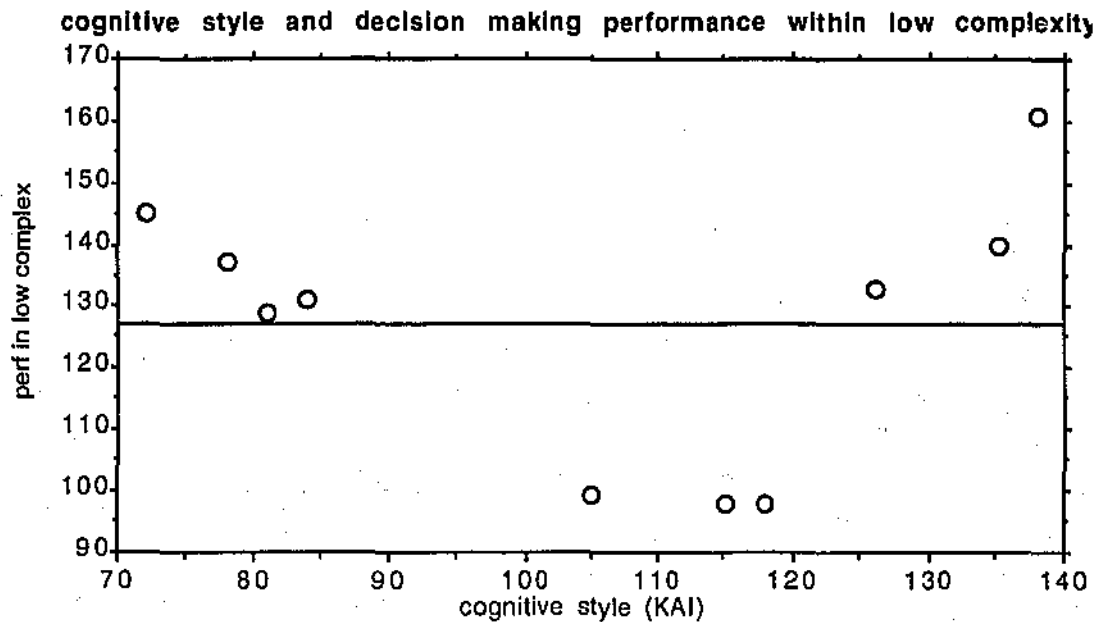


Corr. Coeff. X 1: KAI in medium complex Y 1: perf in med complex

Count:	Covariance:	Correlation:	R-squared:
10	-761.722	-.933	.87

A significant relationship is evident between these two variables ( $R=0.93$ ,  $\alpha=.05$ ), providing for significant predicability between cognitive style and decision making performance within medium complexity environments. In medium complexity environments, high innovators significantly outperformed medium innovators, who in turn significantly outperformed low innovators. This is consistent with the apparently complementary stances of Hypotheses 1 and 2.

**G Regression of decision making performance and cognitive style within environments of low complexity.**



( $\alpha=.05$ )

Corr. Coeff. X    1 : KAI in low complex    Y    1 : perf in low complex

Count:	Covariance:	Correlation:	R-squared:
10	-2.8	-.005	2.687E-5

A curvilinear relationship between cognitive style and decision making performance within environments of low complexity disguises the possible significance of these statistics. Extreme innovators and extreme adaptors both performed well below standard within low complexity, and were significantly outperformed by moderate innovators. These results provide a contradiction to Hypotheses 1 and 2 and require further investigation. Possible reasons for such bi modal results are discussed later (page 104)



## Summary of relationship between cognitive style and decision making performance within environments of different complexity:

The first hypothesis, "that more cognitively innovative subjects will outperform more adaptively styled subjects within novel environments of higher complexity" is generally supported, although not unconditionally. The curvilinear relationship of cognitive style to performance within low environmental complexity meant that those of moderately cognitive style outperformed both the more extreme innovators and adaptors.

In low complexity levels, medium level innovators performed significantly better than low innovators, who in turn performed marginally better than high innovators. This result does not fully support the second hypothesis, "That more cognitively adaptive subjects will outperform more innovatively styled subjects within novel environments of lower complexity", because of the curvilinear relationship between these variables.

In high complexity environments, all performances were significantly reduced in effectiveness, with higher innovators displaying better performance than medium and low innovators.

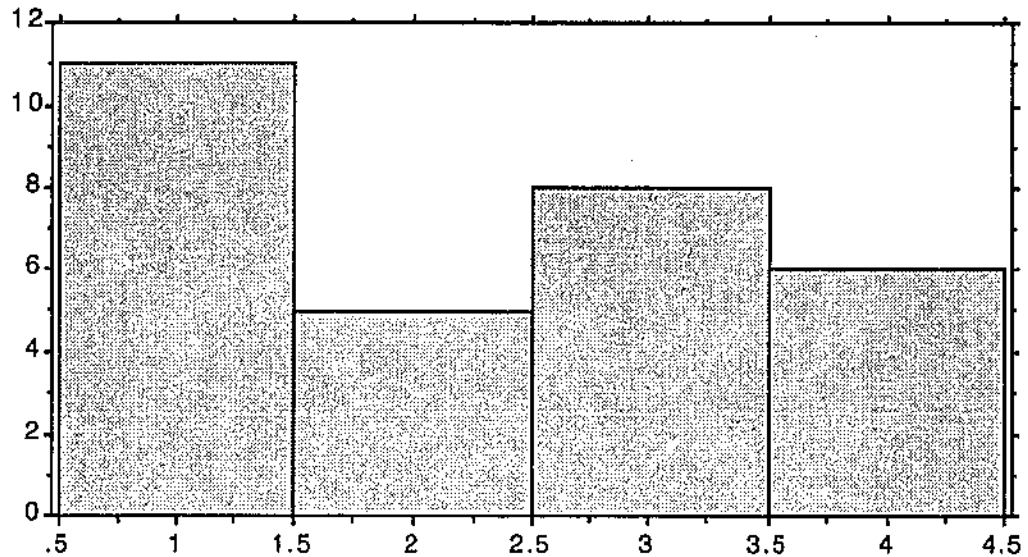
Performance for low innovators was at an extremely low level within high complexity, and displayed similar but more diffuse performance within

medium complexity environments. One explanation may be that the complexity levels of the organisational simulation were generally too difficult for respondents. This suggestion may explain why low innovators (adaptors) performed poorly even in low complexity environments, and were increasingly overwhelmed by environmental complexity during medium and high level complexity environments.

High innovators may have been bored by the relative simplicity of their environments during low complexity decision making but performed better by being increasingly challenged within medium and high complexity. Their reduction in performance within high complexity compared with medium complexity would also support the suggestion that respondents were overly challenged by the standard of the simulation. There is also the possibility that the high innovation scores of these individuals are not matched by their ability to understand this simulated environment. Other factors, such as intelligence or creativity may impact upon these results. This issue is discussed later (page 99).

Having analysed performance related to cognitive style in addressing the first and second hypotheses, the third is addressed by analyses of decision style and performance. Analysis "H" illustrates a frequency distribution of decision style for this sample, followed by more detailed examination of relationships between decision style and performance, both overall and within environments of different complexity.

## H Frequency distribution of decision styles



•choice decision style: 1=systematic, 2=speculative, 3=heuristic, 4=judicial

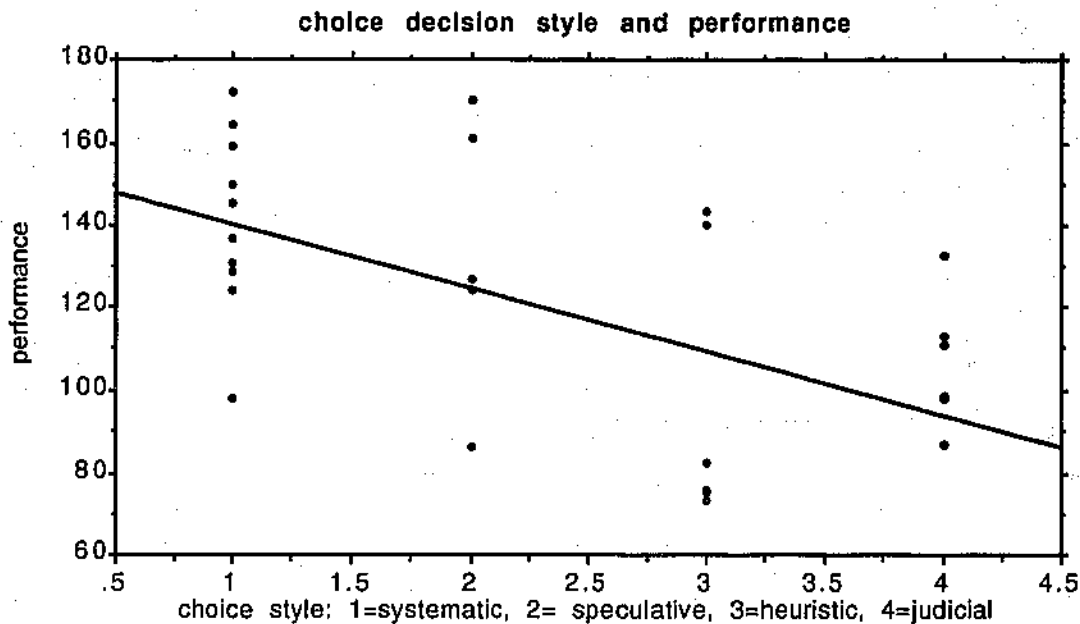
**X<sub>1</sub>: choice style**

Bar:	From: ( $\geq$ )	To: ( $<$ )	Count:	Percent:	
1	.5	1.5	11	36.667	-Mode
2	1.5	2.5	5	16.667	
3	2.5	3.5	8	26.667	
4	3.5	4.5	6	20	

Respondents tended to be mainly systematic (11) a mode of 37%, with (5) 17% speculative, (8) 27% heuristic and (6) 20% judicial.

Analyses "I" to "L" illustrate relationships between decision style and performance overall and within environments of different complexity.

## I Decision style and performance overall



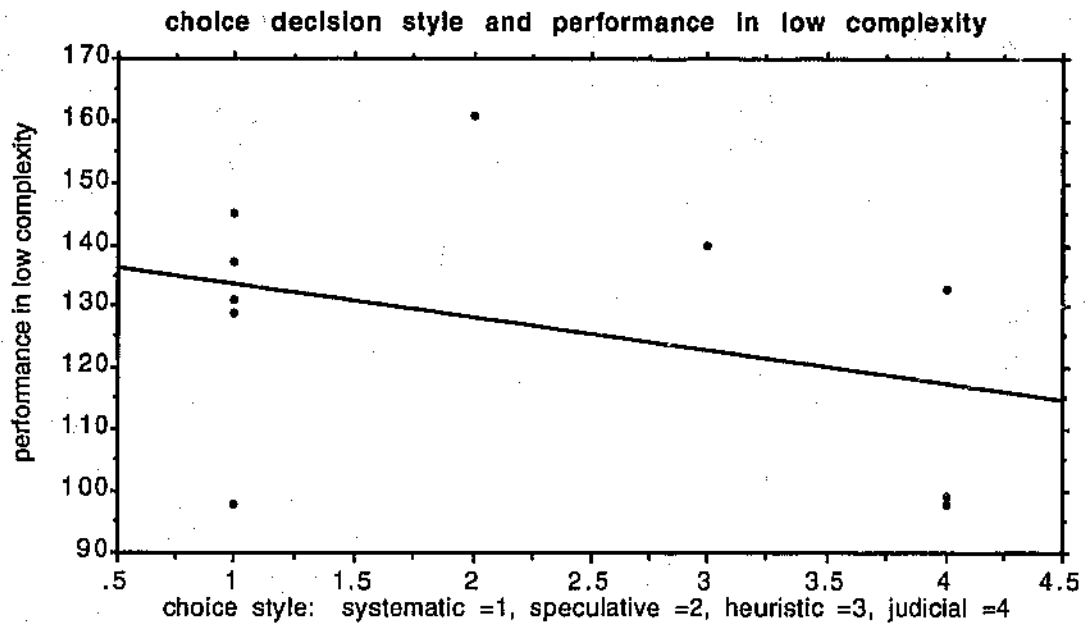
Corr. Coeff.  $X_1$ : choice style  $Y_1$ : performance

Count:	Covariance:	Correlation:	R-squared:
30	-21.4	-.6	.3

At  $R = -0.6$ , ( $p = .05$ ) decision style correlated moderately with performance overall, although satisfaction of hypothesis three necessitates decision style correlating with cognitive style to predict performance within differential complexities. There were insufficient data to provide reliable indications within Chi square and thus, support for Hypothesis 3.

The following results (J-L) illustrate relationships between decision style and performance within different complexities.

**J Regression of decision making performance and decision style within environments of low complexity.**



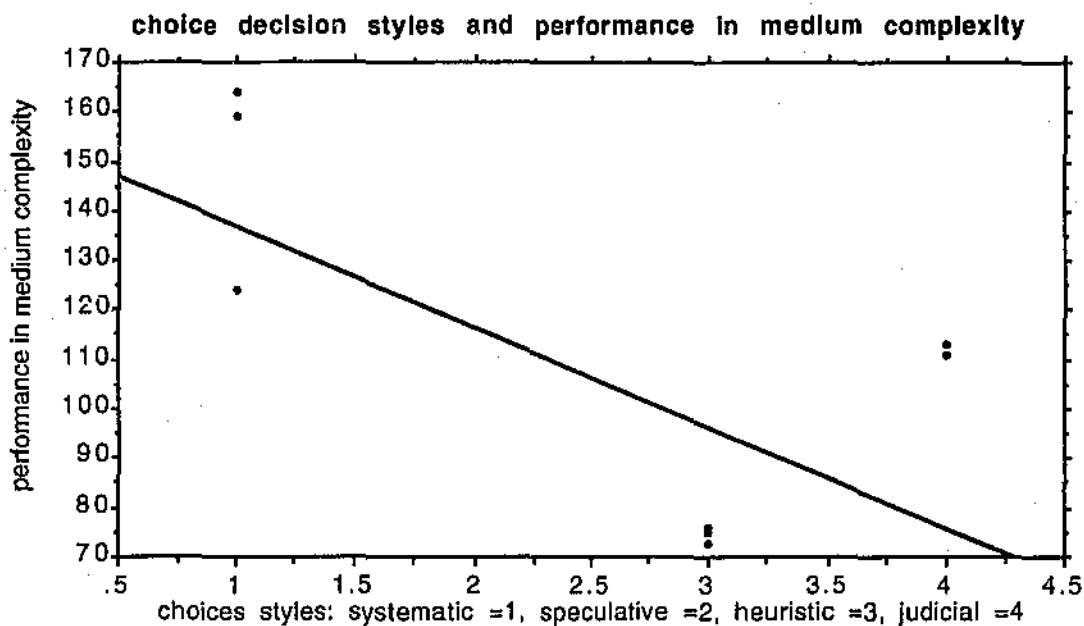
Corr. Coeff. X    1 : choice in low c    Y    1 : perf in low complex

Count:	Covariance:	Correlation:	R-squared:
10	-10.467	-.344	.118

(p=.05)

A combination of diffuse results and low correlation within low complexity provides little indication of a relationship between these variables. Hypothesis 3 anticipates support for a relationship between decision style and cognitive style in predicting performance within differential complexities, and is thus not supported.

**K Regression of decision making performance and decision style within environments of medium complexity**

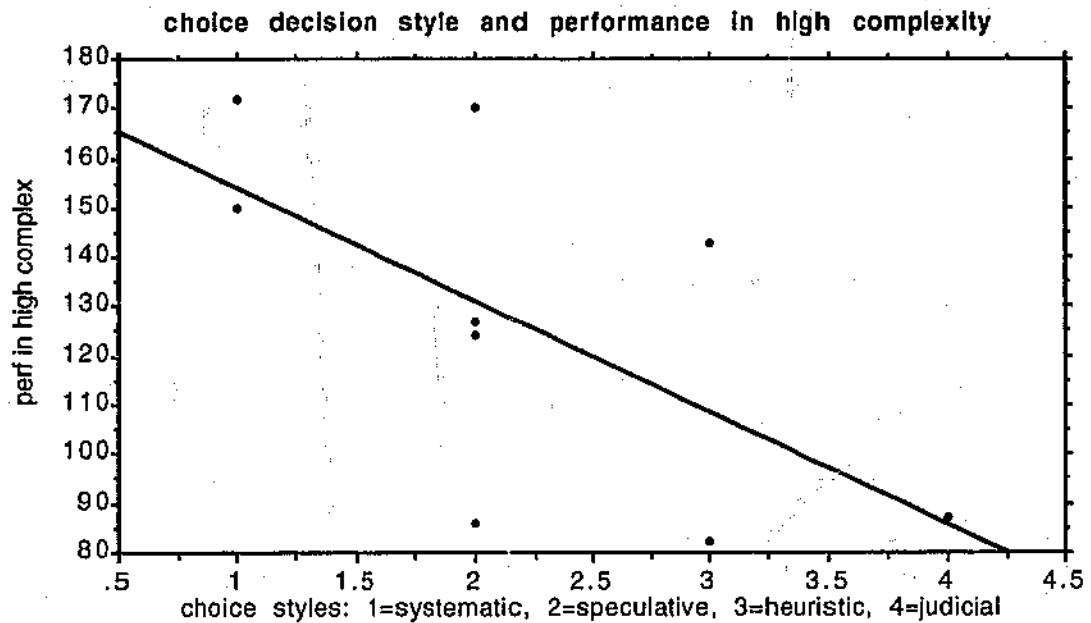


Corr. Coeff. X 1: choices in med c Y 1: perf in med complex

Count:	Covariance:	Correlation:	R-squared:
10	-28	-.67	.448

Comparison of these two variables suggests that decision style may have a moderate influence on performance outcomes ( $R=-0.67$ ,  $\alpha=.05$ ) within medium complexity environments. The small sample size and high ranges of performance scores in each of these conditions indicates need for a prudent approach. No convincing support for Hypothesis 3 is claimed.

**L Regression of decision making performance and decision style within environments of high complexity.**



Corr. Coeff. X 1: choices in hi c Y 1: perf in high complex

Count:	Covariance:	Correlation:	R-squared:
10	-22.456	-.662	.439

Decision styles within high complexity display moderate overall correlation ( $R=0.66$ ,  $\alpha=.05$ ) with performance. The sparse judicial decision style data within this category reduces the interpretive value of the statistics, as does the high range of performance scores for speculative decision style. No confident claim is made for support of Hypothesis 3; that decision styles correlate with cognitive styles in the prediction of performance.

## Summary of relationship between decision style and decision making performance within environments of different complexity:

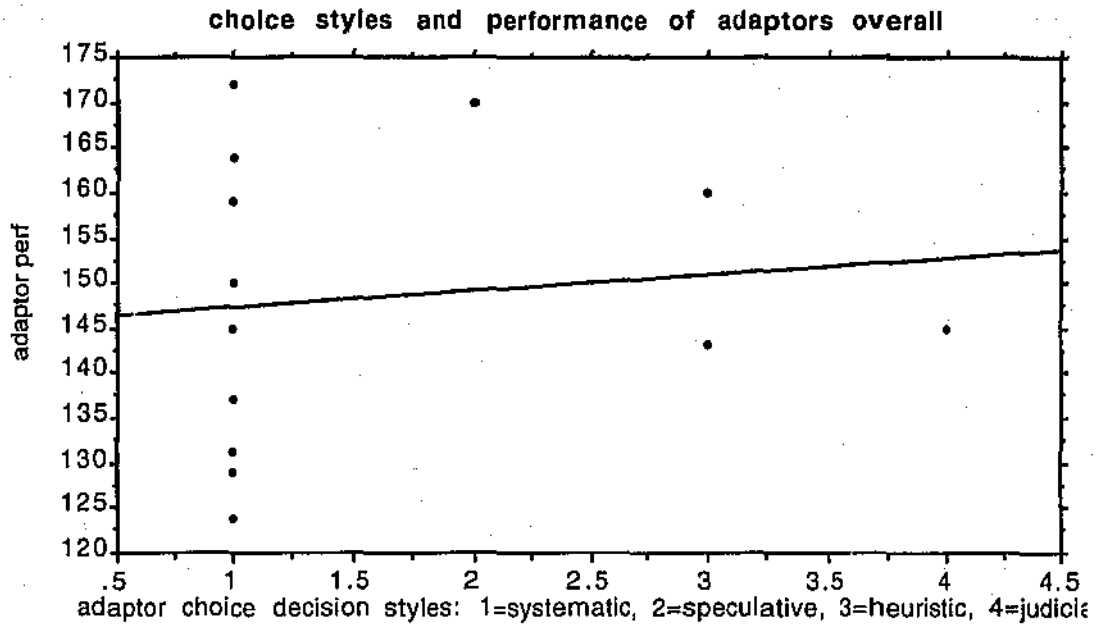
Decision styles correlated moderately with decision making performance within moderate and high levels of environmental complexity .

Addressing the third hypothesis, "that relationships between decision styles and performance will support the findings of Hypothesis 1 and Hypothesis 2" would require closer correlation between cognitive style and decision style. Although suggested in the literature, no significant support has been established here. A larger sample than this study's mean of 2.5 subjects per decision style for each complexity level, may provide more meaningful data for inferential analysis.

Decision style and performance are examined differently in these next analyses, within a framework of adaptive or innovative cognitive styles. The first two analyses, "M" and "N" illustrate performance of more adaptive and innovative respondents, divided by their mean, according to decision styles.



### M Adaptors' overall performance by decision style

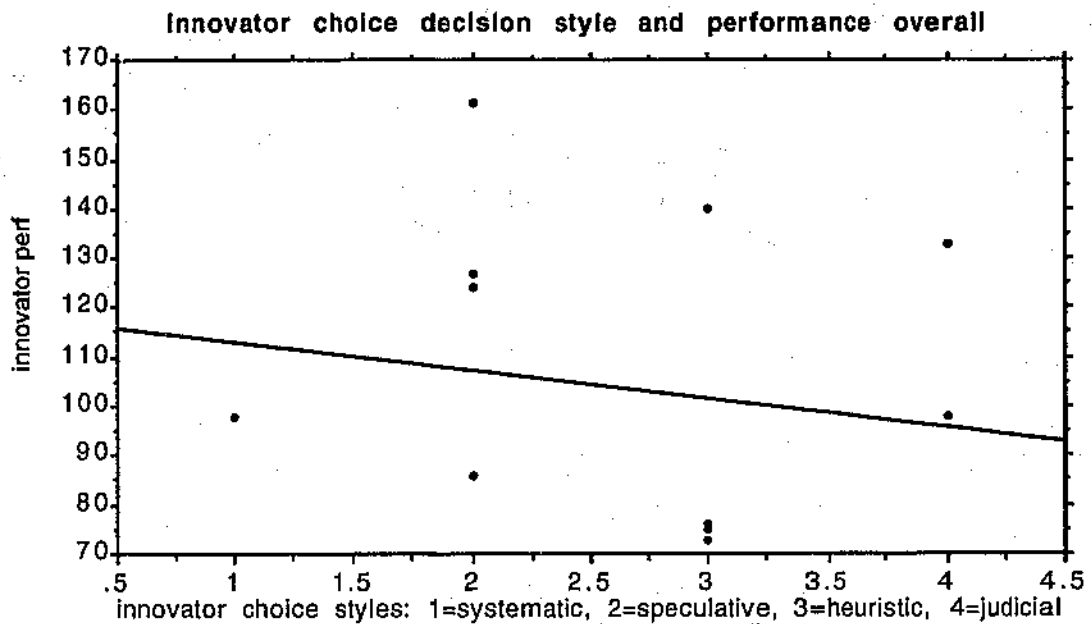


Corr. Coeff. X 1: adaptor styles Y 1: adaptor perf

Count:	Covariance:	Correlation:	R-squared:
15	-11.1	-.409	.167

With a wide range of results for systematic decision styles and few responses within other decision styles, there was only moderate correlation between decision style and overall performance by adaptors. Generally the results provided insufficient clarity to suggest support for Hypothesis 3 to predict performance by decision style.

## N Innovators' overall performance by decision style



Corr. Coeff. X 1: Innovator styles Y 1: Innovator perf

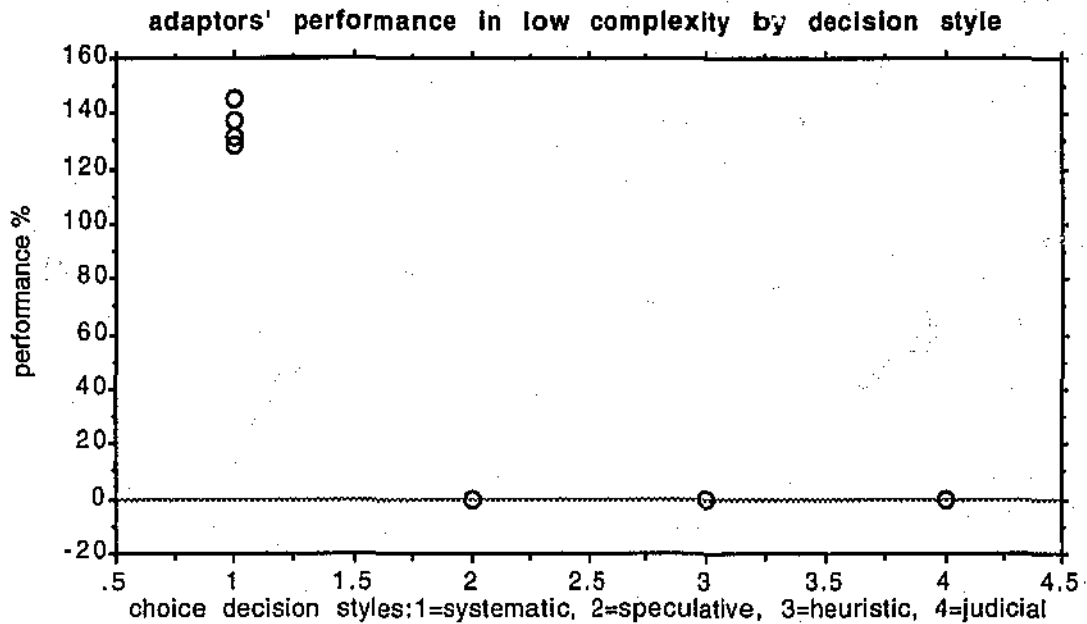
Count:	Covariance:	Correlation:	R-squared:
13	-4.199	-.162	.026

An overall correlation of  $R = 0.16$  ( $\alpha = .05$ ) between decision style and performance by innovators, based on a mean KAI of 109 for this sample, provides little support for the relationship proposed by Hypothesis 3. A greater number of respondents in this group may have contributed to a more meaningful analysis. These results may also add weight to the suggestion that the novel environment simulation was generally too difficult for less innovative, more adaptive respondents.

Graphs "O" to "T" illustrate decision making performance, firstly by more adaptive and then by more innovative respondents, divided by their mean. Performance is tabulated by decision styles of :

1 = systematic, 2 = speculative, 3 = heuristic, 4 = judicial,  
within low, medium, and high complexity environments.

### O Adaptors' performance by decision style within low complexity

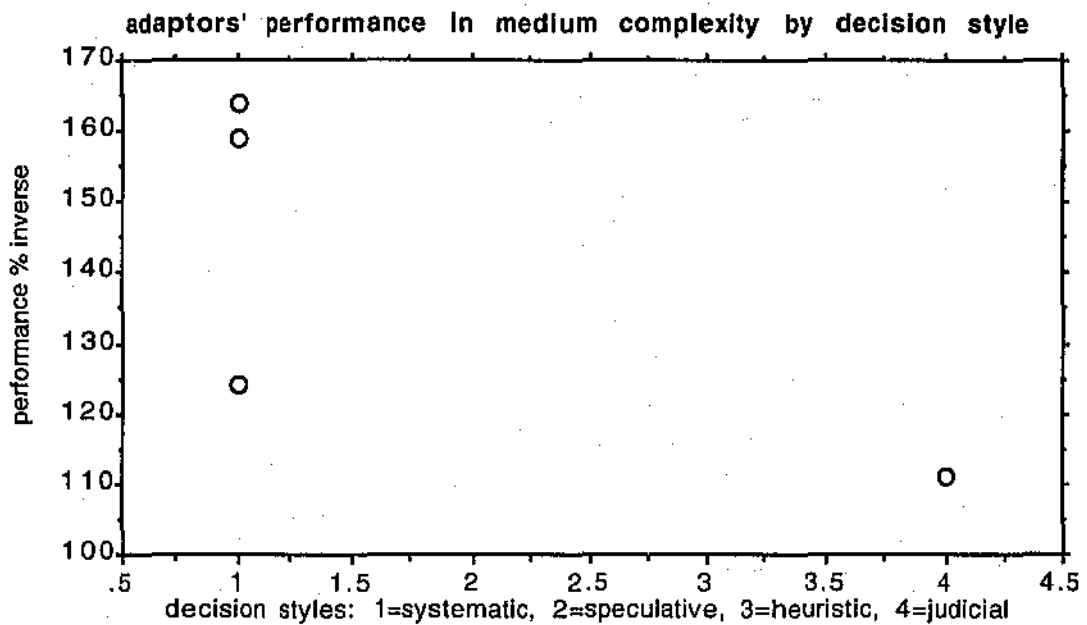


Corr. Coeff. X 1: a. low decstyles Y 1: adapt. low x choice decstyle

Count:	Covariance:	Correlation:	R-squared:
4	0	•	•

The presence of only four respondents in this condition, all systematic style, denies any meaningful correlation between decision style and performance within low complexity. A mean score of 135%, standard deviation of 7, and a range of 16, does provide a description of a low, concentrated and consistent performance by this sample.

## P Adaptors' performance by decision style in medium complexity

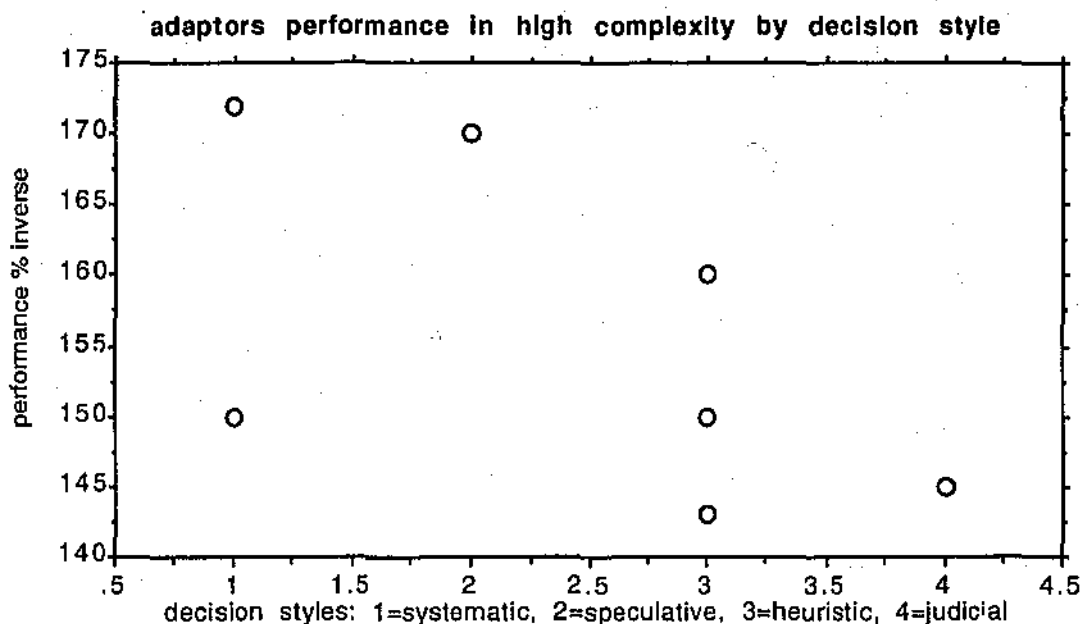


Corr. Coeff. X 1: adapt med decstyles Y 1: adapt. med x choice decstyle

Count:	Covariance:	Correlation:	R-squared:
4	-28.5	-.73	.533

Limited respondents within only judicial and systematic decision styles provide negligible information about relationships between decision styles and performance by adaptors in medium complexity, other than to note poor overall performance at 139.5 %, standard deviation of 26, and a range of 53. These results do not support the propositions of relationships contained in Hypothesis 3.

### Q Adaptors' performance by decision style in high complexity

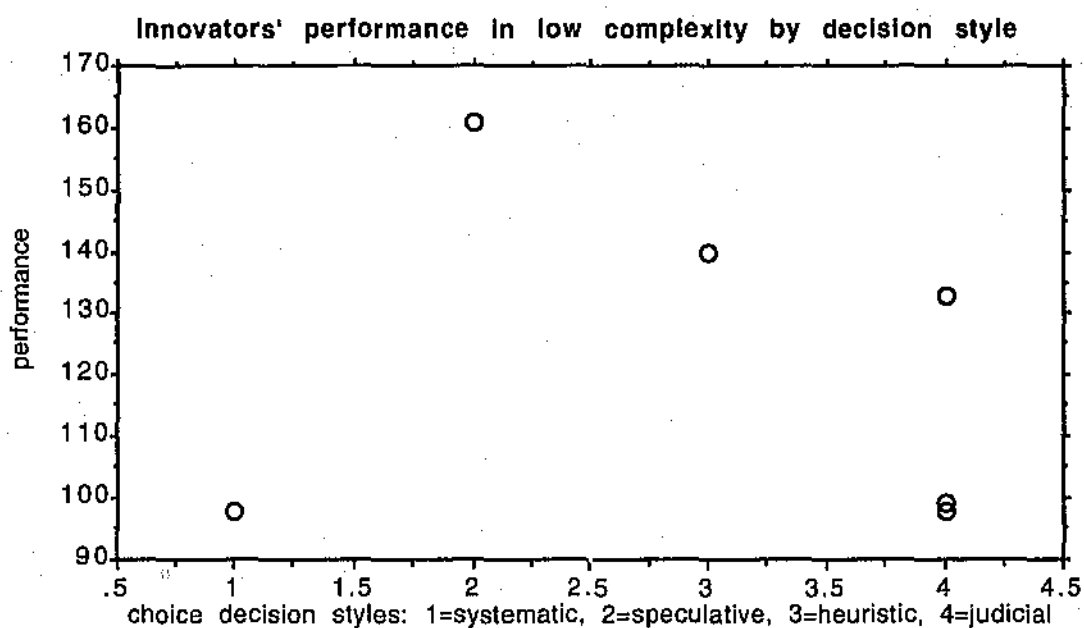


Corr. Coeff. X 1: adapt hl decstyles Y 1: adapt. high x choice decstyles

Count:	Covariance:	Correlation:	R-squared:
7	-7.69	-.577	.333

Despite a correlation of  $R=-0.577$  ( $\alpha=.05$ ), seven adaptive respondent scores dispersed over four decision styles within high complexity provide little information other than a worsening performance with increasing organisational complexity. This sample scored only 155% against the 100% standard, with a standard deviation of 12 and range of 29. No support for Hypothesis 3 was found.

## R Innovators' performance by decision style in low complexity

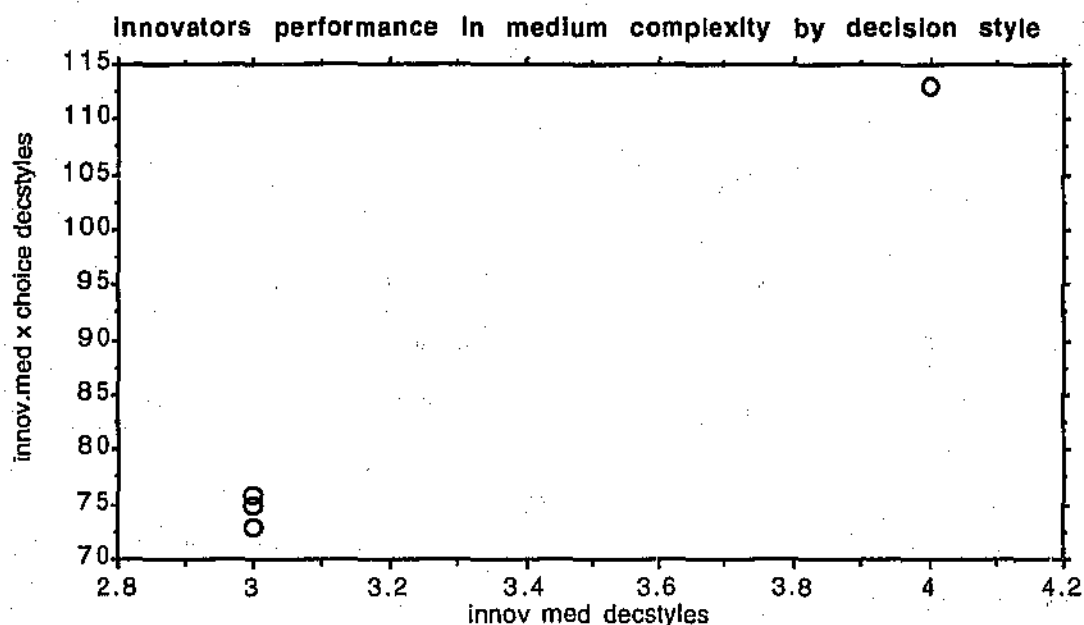


Corr. Coeff. X 1: Innov low decstyles Y 1: innov low x choice decstyle

Count:	Covariance:	Correlation:	R-squared:
6	-5.4	-.2	2.5E-2

With six scores dispersed over four conditions and a low correlation of  $R=-0.2$  ( $\alpha=.05$ ), little relationship between innovators' performance in low complexity by decision style may be discerned, although an indifferent performance overall may be noted at 121%, with a standard deviation of 27, and a range of 63. These results further question the existence of a relationship described in Hypothesis 3.

### S Innovators' performance by decision style in medium complexity



Count:	Covariance:	Correlation:	R-squared:
6	6.367	.998	.996

The overall performance of this group was exceptionally high at 81% with standard deviation 15, and range 40. With respondents in only two of the decision styles, heuristic and judicial, innovators were predominantly represented by heuristic styles in this condition. With few responses and lacking in results from two decision styles, the exceptional performance by predominantly heuristic decision styles within medium complexity is notable. Despite these results, no support for Hypothesis 3 seems evident.



## T Innovators' performance by decision style in high complexity

Corr. Coeff. X  $\rho$  : Innov. hl decstyles Y  $\rho$  : innov. high.x decstyle

Count:	Covariance:	Correlation:	R-squared:
3	0	•	•

This group of three respondents were all speculative decision style innovators who performed reasonably well within high complexity with 112%, standard deviation 23, and range 41. Insufficient data precludes further analysis related to decision styles, and no evidence to support Hypothesis 3 seems apparent.

## Summary

Analysis was primarily through the use of descriptive statistics, there being generally too few data for inferential analysis of this sample of thirty subjects within a matrix of 24 cells representing discrete conditions. Regressions and correlations were supplemented by Chi square tests where appropriate.

Overall decision making performance of this sample, at 120%, was significantly below the Harvard standard, and displayed a skewed distribution with less than 30% of respondents achieving the nominal standard.

With a mean cognitive style of 109, compared with a general population mean of 95, the sample public sector managers were within the upper 30% most innovative category according to Kirton (1987). However with a range of 80, and standard deviation of 26, almost double that of a general population, less consistent results may have been anticipated.

Analysis of the central questions about relationships between cognitive style, decision style and decision making performance provides inconclusive results. These results suggest conditional support for a broadly predictable curvilinear relationship between cognitive style and decision making performance within environments of different complexity.

In both high and medium complexity environments, high innovators significantly outperformed medium innovators who in turn significantly outperformed low innovators. This result, correlated at  $R=0.7$  ( $\alpha=.05$ ), supports the first hypothesis, "That more cognitively innovative subjects will outperform more adaptively styled subjects within novel environments of higher complexity."

Although the reverse may be intuitively comfortable, that low innovators (adaptors) would outperform high innovators within low complexity environments, analysis of results does not support that conclusion. Extreme innovators and extreme adaptors both performed well below standard within low complexity, and were significantly outperformed by moderate innovators, those with cognitive style scores within one standard deviation of the mean.

Explanations for this bi-modal characteristic of performance include suggestions that the simulated novel and complex environment may have been too difficult for the sample, thus reducing all scores. Significant reductions in performance by high and medium innovators, between medium to high environmental complexities, may support this suggestion.

Low performance by high innovators within low complexity, may be explained by a degree of boredom or lack of challenge. Similarly, the superior performance of moderate innovators within low complexity

infers that the environmental complexity represented an optimal challenge for moderate innovators, resulting in their superior performance level to high innovators.

Overall, decision making performance did not correlate significantly with environmental complexity alone at  $R= 0.026$  ( $\alpha=.05$ ). Mean decision making performance scored 127% within low complexity, 105% within medium complexity, and 129% within high complexity environments, recalling that performance scores have inverse measures.

For further explanation, independent variables, cognitive style and decision style, were analysed with decision making performance within different environmental complexities. The regression of decision style and decision making performance within different environmental complexities provided a correlation coefficient of  $R= 0.463$  ( $\alpha=.05$ ).

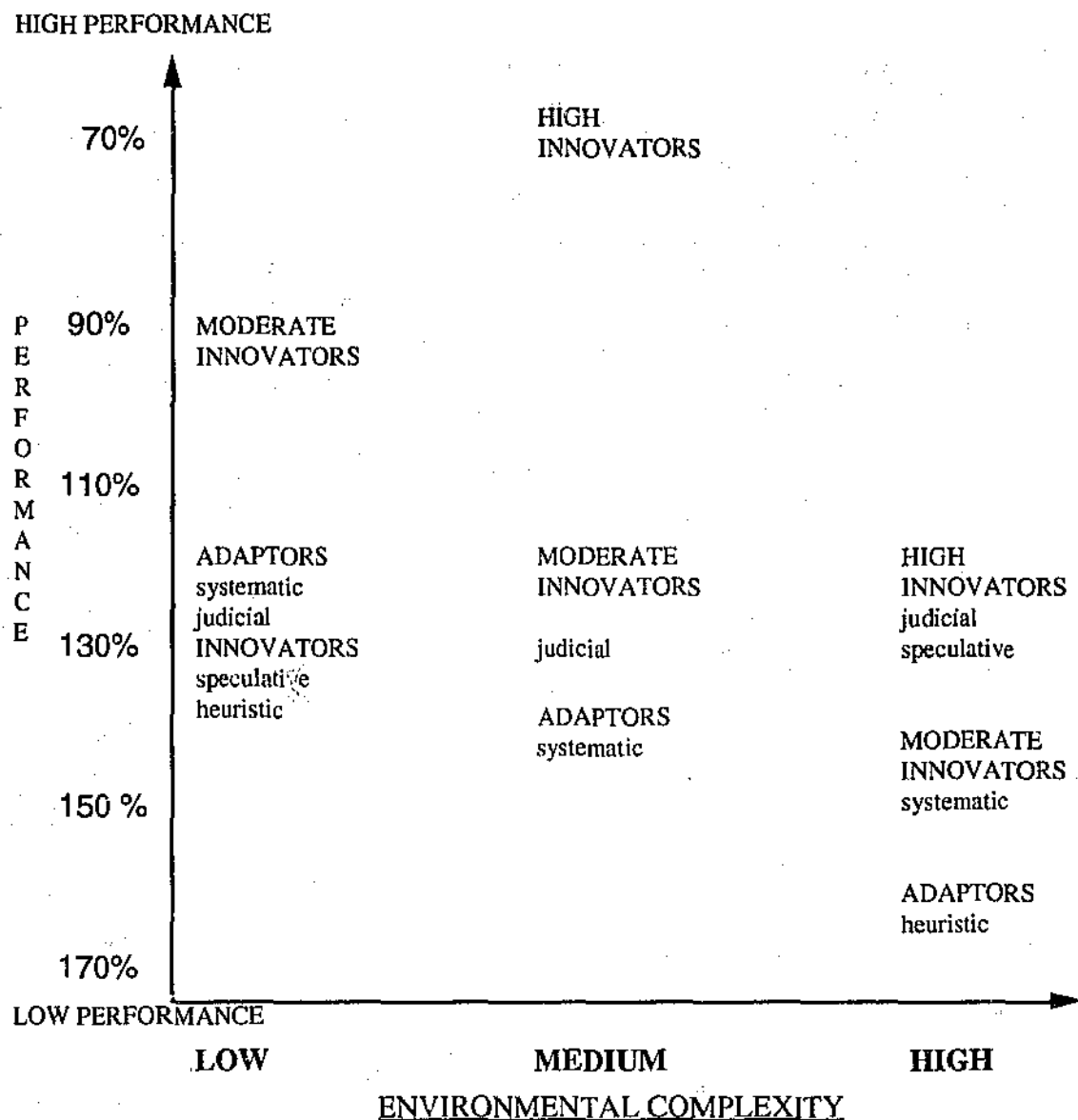
Although not highly correlated, this result provides argument for examining the impact of internal as well as external determinants of decision making performance.

The following Figure 1 displays broad relationships amongst cognitive style, decision style and decision making performance within environments of low, medium and high complexity. Results of decision making performance within three levels of environmental complexity, comparing relationships between decision and cognitive styles, displays their apparently ambivalent relationships.

For clarity,

- Cognitive styles of adaptors, innovators and moderate innovators (within one standard deviation of the mean score) are displayed in upper case.
- Decision styles are displayed in lower case.
- Recall that performance is inverse, i.e. lower percentages are better performances, higher percentages against the benchmark of 100% are worse.

**Figure 1 Comparison of performance with cognitive style and decision style within differential environmental complexities.**



These results show the combined factors of decision style, cognitive style, and environments of different complexity, contributing to a potential for predicting decision making performance. A combined effect of lack of data

and the overlapping ranges of performance results in each condition, particularly amongst decision styles, provided inconclusive results.

For example:

- Within low complexity environments, systematic and judicial decision styles generally outperformed speculative and heuristic.
- Highly innovative cognitive style scores also correlated with heuristic decision styles, scoring poorly (140%) against the 100% standard.
- Within medium complexity environments, heuristic decision style and highly innovative cognitive styles correlated with high performance (75%).
- Moderately innovative cognitive style, within one standard deviation of the mean, performed similarly to judicial decision style.
- The remaining systematic decision style and adaptive cognitive style performed very poorly (above 150%). There were no speculative style responses in this condition.
- Within high complexity environments, highly innovative cognitive styles with judicial and speculative decision styles significantly outperformed systematic decision styles.

Analyses of relationships between decision style and performance within different environmental complexities illustrated a significant systematic style bias of the more adaptive respondents, and a broader spread of speculative, judicial and heuristic styles of the more innovative. Overall performances of adaptive respondents were well below Harvard standard at 143%, compared with innovators at 104%.

Generally, across all complexity levels, dependent variable decision making performance correlated moderately with decision style  $R=0.46$  and more strongly with cognitive style,  $R=0.67$  at significance level  $\alpha=.05$ .



## **Hypothesis Results and Conclusions**

Analysis of the literature supported a theory that individual managers will respond in more or less effective ways depending on their contexts. This was tested against three hypotheses, with the following results:

### Hypothesis 1

"That more cognitively innovative subjects will outperform more adaptively styled subjects within novel environments of high complexity".

The first hypothesis was strongly supported by results of this study, with innovators significantly outperforming adaptors within environments of high complexity (ref Analysis E, page 75)

### Hypothesis 2

"That more cognitively adaptive subjects will outperform more innovatively styled subjects within novel environments of lower complexity".

Although perhaps intuitively comfortable, the second hypothesis was not supported by results of this study. Although extreme adaptors significantly outperformed extreme innovators within environments of low complexity, they were in turn significantly outperformed by moderate innovators, subjects with scores within one standard deviation of the mean on Kirton's scale of cognitive style. (Ref Analyses F, G , page 76,77)

### Hypothesis 3

"That relationships between decision styles and performance will support the findings of Hypothesis 1 and Hypothesis 2."

Correlations amongst decision styles and cognitive styles were moderate ( $R=0.46$ ) and provided ambivalent results (Ref Analyses J,K,L, pages 82-84). Generally, of the four decision styles of systematic, judicial, speculative and heuristic, only the heuristic style matched closely in performance with innovative cognitive style within lower and medium levels of environmental complexity. The other three styles displayed little relationship with cognitive style within different levels of environmental complexity.

This lack of support for Hypotheses 2 and 3 suggests that there may be little predictable relationship between decision style and cognitive style. However, this may not entirely refute the intention of Hypothesis 3, to imply a predictable relationship between decision style and cognitive style. Although decision styles did not appear to support performance predictions on the basis of cognitive style, the impact of complexity on decision style may cause a non linear relationship with cognitive style within such environments of differential complexity.

As correlations between performance and cognitive style were curvilinear with the introduction of differential environmental complexity, as reported in response to Hypothesis 2, it seems intuitively feasible for such

curvilinear relationships to occur between cognitive and decision styles, within similar differential environments.

There is strong support from the literature for correlations between cognitive and decision styles. Results of this study display curvilinear relationships between cognitive style and decision making performance within environments of differential complexity. Although appearing ambivalent, one conclusion from the results of this study proposes the possibility of a similar curvilinear relationship between cognitive and decision styles within environments of differential complexity.

## Discussion

Results of this study did not match examples from the literature.

A confounding influence may be the accelerating impact of public sector reform and the subsequent changing profile of public sector management. Recent recruitment of more commercially orientated management; the impact of customer service charters; and the progressive restructuring of responsibilities to expose managers to accountability monitoring processes; may deny these expectations.

The narrow performance ranges within low complexity environments may be a result of all managers doing just enough within low stimulus situations. There was much greater diversity of results amongst both decision styles and cognitive styles within medium and high complexity environments. This suggests that the level of cognitive demand may have overwhelmed the low innovators. A similar overwhelming phenomena may have occurred with low and medium innovators within high complexity environments. Implications for public sector management could be significant if middle managers perform significantly below the level of a standard established and replicated with business students.

Issues such as historical promotion through seniority may have contributed to the relatively high ranking of subjects with more internally focused decision styles, resulting in a reduced mean performance for this sample compared with subject samples from less structured hierarchical employment backgrounds.

Major differences between anticipated and actual results suggest that variables other than cognitive style, decision style, and environmental complexity influence decision making performance. Despite high innovation scores, respondents performed with ambivalence (see Analysis D, page 74).

Other variables may then be operating that do not correlate closely with innovation, such as intelligence or creativity (Kirton, 1989). Lack of significance between cognitive style, intelligence and creativity is supported within the literature (Witkin & Goodenough, 1977; Kirton, 1978, 1987).

Implications for public sector agencies may include some potential to improve productivity by matching managers more closely with the complexity of their working environments. Managers working in higher complexity environments of change and market interface should ideally be more innovative and externally focused. Those managers working within less complex environments, where adherence and improvements to systems and processes has higher organisational emphasis, should ideally be more adaptive and internally focused.

Rather than a simple dichotomy, a sophisticated and subtle matching of managers within environmental complexities should provide organisations with significant scope to better manage strategic and operational functions.

Despite the limitations of this study, support for the first hypothesis may imply the need for consideration by those responsible for public sector human resources management. Implications for the public sector may include:

- Replacement of senior public sector managers who occupy leading roles with commercial responsibilities, yet exhibit more adaptive cognitive styles and internally focused decision styles.
- How to structure matching responsibilities, pairing more innovative managers with more adaptive managers, for optimal organisational productivity.
- How to address Kirton's (1976, 1987) conclusions that cognitive styles of females are 5-8% less innovative, more adaptive, than similarly described males. The implications for public sector career planning, equity and access employment issues are significant.
- Similar issues related to diminishing innovative tendencies with increasing age, higher scores correlated with increasing educational standards, and occupational status.
- Implications for different influences and determinants of decision making performance within smaller organisational unit sizes and where personal financial risks increase (Gray, 1995).

'Among managers advocating particular changes are some who fail to see possibilities outside the accepted pattern, while others are marked as "people of ideas" who fail to exhibit a knack for getting their notions implemented' (Kirton, 1961). The agents of change implementing public sector reform tend to be more innovative, and will need to share decision making and ultimate management responsibilities with those managers of more adaptive tendencies, in order to have changes implemented.

A complementary organisational profile of both innovative and adaptive decision makers may be required. These profiles may depend upon the degree of commercialisation of the particular agency, and selection of suitable organisational profiles necessary for their operating efficiency and effectiveness.

If transformation of the public sector does not extend to complete privatisation, and accountability to politicians, society, and other regulatory agencies continues, differing organisational profiles of innovation and adaption may be needed to suit each particular situation. Identifying individual tendencies towards adaptive or innovative cognitive styles may then be considered a significant task.

Calls by Peters (1988), Norburn et al (1988) for all managers to be innovative and creative may be an unrealistic demand. Many organisations need only a small number of innovators, requiring mainly adaptors to maintain their systems and directions on a day to day basis.

Further, it may be unrealistic and perhaps unethical, to demand that managers, previously recruited for their adaptive attributes, now behave as innovators.

Perhaps it is more appropriate for organisations to take inventory of their resources, accepting different managerial styles, and to develop the structures and processes to best develop these complementary talents. In this way, public organisations may become responsive, and better able to manage their organisational change within public sector reform. This survey of thirty managers, selected at random from a group of individuals who are undergoing a role change, shows that there exists a wide collection of cognitive styles available for human resources planning.

A perceived dilemma for the public sector will surely be, how to attract and retain innovative managers when their organisations are already dominated by primarily adaptor styled administrators. Further, is there scope for adaptors to become more innovative, or are there severe limitations on their scope to modify decision styles to suit the new environment ?

The dilemma is compounded by concerns for differential cognitive and decision styles attributable to differences of gender, age, race, education and culture. Further, under what sort of conditions may these styles co-exist for the benefit of the organisations that may require their combined talents to manage the current change process?



## Further Research

Many researchers model organisational, group, and individual decision-making within the shadow of an umbrella of external determinants. The approaches follow objectively rational avenues of discovery with objectively rational organisational objectives in mind. However, investigations into the subjective rationality of decisions made by dominant individuals attempting to gain and maintain influence may be more appropriate. Decisions made by dominant individuals may be classed as irrational within the organisational context because they are, e.g. non-economic maximising, may display sound rationality within a context of personal gain by the individual decision-maker. Establishment and perpetuation of corporate paradigms and processes may be for the benefit of the dominant individual regardless of arguments for rationality in the light of organisational objectives.

Thus concepts of power, influence and politics may override the more specific attentions of researchers into decision-making. Decision-making may then be seen to relate more to the acquisition and maintenance of individual power and influence within the environment of organisations than to any rational or perceptual responses to stimuli.

These views identify the need for a more complex, comprehensive model of individual decision-making. A more comprehensive model could include several of the concepts not specifically discussed in this paper

including: power, influence, leadership, intelligence, creativity, politics, national cross-cultural differences, physiology, gender, age, education, etc. Integrated models of individual, group, and organisational decision-making within the broader external context of societal influences are also required for the development of understanding about how decisions at all levels are actually made.

Examination of internal determinants, including intelligence, cognitive complexity, personality etc. indicate scope to develop a model of similar complexity to that of organisations themselves. Without a model of comparable complexity, research is denying the highly sophisticated and differentiated sensitivity that exists between an individual and the information environment (Stabell, 1978).

Greater understanding of these issues may be derived from an integrated series of studies along differing foci of decision making determinants.

Investigations within the fields of :

- cognitive compatibility potential between relatively innovative and adaptive decision makers may provide an indication of an organisation's potential to modify the profile of innovative and adaptive managers. High potential would increase the organisation's ability to modify the profile and implement change.

- gender comparisons of cognitive styles and decision styles related to decision making performance may provide insights into alternative styles predicting similar performance. This avenue may provide further understanding about gender differential styles within Kirton's (1976) studies, and provide a more comprehensive examination of gender issues within public sector management.
- cultural and age comparisons of cognitive and decision styles related to decision making performance may provide insights into alternative styles predicting similar performance. This focus of investigation may provide further insights into vocational guidance, career planning, and integrated human resource development.
- individual differences in integrative complexity, the process of relating two or more cognitive constructs from a stimulus to produce a meaning. This issue concerns an individual's perception of a mixed information environment, of people and complex situations.
- These studies may provide further insight into the vocational categorisation of public sector managers, the extent to which any individual manager has inclination to effect management of personnel. This level of investigation may provide greater insight into the performance results of cognitive and decision style, by examining the underlying cognitive structures and processes involved in decision making.

Further research may be required before suggesting that organisations address the need to assess the ability of any individual manager to operate effectively within relatively novel and complex environments. The environments considered have been relatively large, structured and hierarchical, thus to study predictors of decision making performance *per se*, some consideration of alternative organisations and working environments is warranted before any claims of generalisability can be sustained.

Gray (1995) suggests that for entrepreneurs - extreme innovators, predictions of performance and subsequent business success depend mainly upon such variables as locus of control, business strategy and divergent or convergent decision style. Future directions, as discussed, then become more complex. Rather than examining individual characteristics of managers, more comprehensive studies may be needed of their environments, in terms of their physical, financial, political, cultural, and social risk.

The relevance of such issues comes from a growing trend to divide public sector agencies into small business units with associated increases in personal risk for managers on performance contracts. Perhaps before such divisions occur, public sector agencies should consider individual characteristics, as possible determinants of decision making performance, to facilitate managing change without changing managers.

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## **APPENDIX A**

### **The Questionnaire**



## Questionnaire

Thank you for taking part in this study. It is intended to contribute to an improved method of matching managers to characteristics of their working environments for greater comfort, less stress and improved productivity. It should also allow better matching of management styles to make easier and more productive for managers to work together.

There are two parts to this study, a questionnaire and a computer game.

There are no special time limits, and no right nor wrong answers.

- In the questionnaire, just do your best to honestly reflect how you work and how you feel.
- In the computer game, just follow the instructions.

If you decide not to proceed at any point, that's fine. It's important that you feel comfortable. Please feel free to ask questions at any time.

David Clark-Murphy, tel 09 [redacted] or fax 2973123  
or mobile [redacted]

-----  
Please complete these details before turning the page:

Name.....Months in current position.....  
 Gender    Male / Female                      Age group Under 30                      30-44                      45 +  
 (please circle)                                      (please circle)

How long have you lived in Australia?.....years

How would you describe yourself ? (e.g. Vietnamese/Australian, Greek,  
Anglo/Australian, etc) .....

I have read the information above and any questions I have asked have been answered to my satisfaction. I agree to participate in this activity, realising I may withdraw at any time. I also agree that any research data gathered may be analysed and published provided that I am not personally identifiable.

Participant.....Date.....

Researcher.....Date.....

For these next 8 questions, please circle either A or B. If you feel that both A and B are true, decide which one is more like you, even if it is only slightly more true.

- 1 I would rather
  - A Solve a new and complicated problem
  - B Work on something I have done before
  
- 2 I like to
  - A Work alone in a quiet place
  - B Be where "the action" is
  
- 3 I want a boss who
  - A Establishes and applies criteria in decisions
  - B Considers individual needs and makes exceptions
  
- 4 When I work on a project, I
  - A Like to finish it and get some closure
  - B Often leave it open for possible changes
  
- 5 When making a decision, the most important consideration are
  - A Rational thoughts, ideas, and data
  - B People's feelings and values
  
- 6 On a project, I tend to
  - A Think it over before deciding how to proceed
  - B Start working on it right away, thinking about it as I go along
  
- 7 When working on a project, I prefer to
  - A Maintain as much control as possible
  - B Explore various options
  
- 8 In my work, I prefer to
  - A Work on several projects at a time, and learn as much as possible about each one
  - B Have one project which is challenging and keeps me busy

In these next 8 questions, please tick the answer that matches the level of difficulty you feel about each statement.

				very difficult
very easy	easy	neutral	difficult	



For these next 8 questions, please circle either A or B.

If you feel that both A and B are true, decide which one is more like you, even if it is only slightly more true.

- 17 I often
  - A Make lists and plans whenever I start something and may hate to seriously alter my plans
  - B Avoid plans and just let things progress as I work on them
  
- 18 When discussing a problem with colleagues, it is easy for me
  - A To see "the big picture"
  - B To grasp the specifics of the situation
  
- 19 When the phone rings in my office or at home, I usually
  - A Consider it an interruption
  - B Don't mind answering it
  
- 20 Which word describes you better ?
  - A Analytical
  - B Empathetic
  
- 21 When I am working on an assignment, I tend to
  - A Work steadily and consistently
  - B Work in bursts of energy with "down time" in between
  
- 22 When I listen to someone talk on a subject, I usually try to
  - A Relate it to my own experience and see if it fits
  - B Assess and analyse the message
  
- 23 When I come up with new ideas, I generally
  - A "Go for it"
  - B Like to contemplate the ideas some more
  
- 24 When working on a project, I prefer to
  - A Narrow the scope so it is clearly defined
  - B Broaden the scope to include related aspects

In these next 8 questions, please tick the answer that matches the level of difficulty you feel about each statement.

		very easy	easy	neutral	difficult	very difficult
25	I am predictable					
26	I often risk doing things differently					
27	I prefer changes to occur gradually					
28	I need the stimulus of frequent change					
29	I prefer to work on problems one at a time					
30	I like to vary set routines at a moment's notice					
31	I impose strict order on matters within my control					
32	I am consistent					

For these next 8 questions, please circle either A or B.

If you feel that both A and B are true, decide which one is more like you, even if it is only slightly more true.

- 33 When I read something, I usually  
A Confine my thoughts to what is written there  
B Read between the lines and relate the words to other ideas
- 34 When I have to make a decision in a hurry, I often  
A Feel uncomfortable and wish I had more information  
B Am able to do so with available data
- 35 In a meeting I tend to  
A Continue formulating ideas as I talk about them  
B Only speak out after I have carefully thought the issues through
- 36 In work, I prefer spending a great deal of time on issues of  
A Ideas  
B People
- 37 In meetings, I am most often annoyed with people who  
A Come up with many sketchy ideas  
B Lengthen meetings with many practical details
- 38 Are you a  
A Morning person ?  
B Night owl ?
- 39 What is your style in preparing for a meeting ?  
A I am willing to go in and be responsive  
B I like to be fully prepared and usually sketch an outline of the meeting
- 40 In a meeting, would you prefer for people to  
A Display a fuller range of emotions  
B Be more task orientated

In these next 8 questions, please tick the answer that matches the level of difficulty you feel about each statement.

	very easy	easy	neutral	difficult	very difficult
41					
42					
43					
44					
45					
46					
47					
48					

For these next 8 questions, please circle either A or B.  
If you feel that both A and B are true, decide which one is more like you,  
even if it is only slightly more true.

- 49 I would rather work for an organisation where  
A My job was intellectually stimulating  
B I was committed to its goals and missions
- 50 On weekends, I tend to  
A Plan what I will do  
B Just see what happens and decide as I go along
- 51 I am more  
A Outgoing  
B Contemplative
- 52 I would rather work for a boss who is  
A Full of new ideas  
B Practical

In the following, choose the word in each pair which appeals to you more.

- 53 A Social  
B Theoretical
- 54 A Ingenuity  
B Practicality
- 55 A Organised  
B Adaptable
- 56 A Active  
B Concentration



In these next 8 questions, please tick the answer that matches the level of difficulty you feel about each statement.

		very easy	easy	neutral	difficult	very difficult
57	I fit readily into "the system"					
58	I readily agree with the team at work					
59	I prefer colleagues who never "rock the boat"					
60	I can stand out in disagreement against the group					
61	I conform					
62	I never seek to bend or break the rules					
63	I never act without proper authority					
64	I am prudent when dealing with authority					

**End of Questionnaire**

## **APPENDIX B**

### **Scoring Keys for Questionnaire items**

**Decision Style (Nutt, 1989) Items: 1-8, 17-24, 33-40, 49-56.**  
**Cognitive Style (Kirton, 1976) Items: 9-16, 25-32, 41-48, 57-64.**

## Scoring Key for Decision Style Elements of Questionnaire

(Nutt, 1989) Items: 1-8, 17-24, 33-40, 49-56.

Count one point for each item listed below that you circled in the questionnaire.

Score for I	Score for E	Score for S	Score for N
2a	2b	1b	1a
6a	6b	18b	18a
19a	19b	21a	21b
23b	23a	24a	24b
35b	35a	35a	35b
38a	38b	37a	37b
51b	51a	52b	52a
56b	56a	54b	54a
<b>Total=</b>	<b>Total=</b>	<b>Total=</b>	<b>Total =</b>

Circle the one with more points I or E

Circle the one with more points S or N

Score for T	Score for F	Score for J	Score for P
3a	3b	4a	4b
5a	5b	7a	7b
20a	20b	8b	8a
22b	22a	9a	9b
36a	36b	18b	18a
40b	40a	23b	23a
49a	49b	26a	26b
53b	53a	31a	31b
<b>Total =</b>	<b>Total =</b>	<b>Total =</b>	<b>Total =</b>

Circle the one with more points T or F

Circle the one with more points J or P

After totalling:

Score I if $I > E$	Score S if $S > N$
Score E if $E > I$	Score N if $N > S$
Score J if $J > P$	Score T if $T > F$
Score P if $P > J$	Score F if $F > T$
	If $T = F$ and you are male, score F
	If $T = F$ and you are female, score T

List the scores you tallied and circle the letter in each pair with the highest value.  
This is your decision style

I= Internal, N= Intuition, T= Thinking, J=Judgement

E=External, S=Sensation, F=Feeling, P=Perception

Nutt, (1989)

## Scoring Protocol for Innovation/Adaption Inventory items

Cognitive Style (Kirton, 1976) Items: 9-16, 25-32, 41-48, 57-64.

Circle the number in the column corresponding to your answer for each question.

Item	very easy	easy	neutral	difficult	very difficult
9 I have original ideas	5	4	3	2	1
10 I proliferate ideas	5	4	3	2	1
11 I am stimulating	5	4	3	2	1
12 I hold back ideas until they are obviously needed	1	2	3	4	5
13 I cope with several new ideas at the same time	5	4	3	2	1
14 I will always think of something when stuck	5	4	3	2	1
15 I would sooner create than improve	5	4	3	2	1
16 I have fresh perspectives on old problems	5	4	3	2	1
25 I am predictable	1	2	3	4	5
26 I often risk doing things differently	5	4	3	2	1
27 I prefer changes to occur gradually	5	4	3	2	1
28 I need the stimulus of frequent change	5	4	3	2	1
29 I prefer to work on problems one at a time	5	4	3	2	1
30 I like to vary set routines at a moment's notice	5	4	3	2	1
31 I impose strict order on matters within my control	1	2	3	4	5
32 I am consistent	1	2	3	4	5

41	I like the protection of precise instructions	1	2	3	4	5
42	I enjoy detailed work	1	2	3	4	5
43	I master all details painstakingly	1	2	3	4	5
44	I am thorough	1	2	3	4	5
45	I am methodical and systematic	1	2	3	4	5
46	I work without deviation in a prescribed way	1	2	3	4	5
47	I am a steady plodder	1	2	3	4	5
48	I like bosses and work patterns that are consistent	1	2	3	4	5
57	I fit readily into "the system"	1	2	3	4	5
58	I readily agree with the team at work	1	2	3	4	5
59	I prefer colleagues who never "rock the boat"	1	2	3	4	5
60	I can stand out in disagreement against the group	5	4	3	2	1
61	I conform	1	2	3	4	5
62	I never seek to bend or break the rules	1	2	3	4	5
63	I never act without proper authority	1	2	3	4	5
64	I am prudent when dealing with authority	1	2	3	4	5

Total score for identifying cognitive style =

Your total score is the sum of these numbers, and should be between 32 and 160  
Scores nearer 32 indicate more adaptive cognitive styles, nearer 160 indicate more innovative cognitive styles.

Note that cognitive styles do not indicate value, merely an indication of individual style.

## **Appendix C**

**Details of the Simulation "The Furniture Factory"**

**(Wood & Bailey, 1985)**

## Simulation

To simulate a novel and complex decision making environment to match inexperienced acting managers within public sector organisations, an established instrument, The Furniture Factory was utilised (Wood & Bailey, 1985). The introductory information describes the simulation as one in which subjects make decisions as manager of a special order department of a furniture factory. As manager, they receive weekly orders for the production of furniture items, along with a roster of available employees. The manufacture of the furniture items in each of the orders requires eight different production jobs: milling the timber; preparing the timber for assembly; assembling the parts; staining and sealing the assembled frame; cutting the upholstery to pattern; sewing the upholstery; upholstering the furniture; and preparing the finished products for shipment.

Subjects are assigned to one of three levels of task complexity, determined by the number of employees assigned to them out of the ten available, and other variable options related to goal setting, social rewards and instructive feedback.

The subject's managerial decision making task is to allocate employees from the roster to the eight different production jobs, in order to complete the work assignment within an optimal time period. By making correct decisions about matching employees skills and aptitude to production requirements, subjects can attain a higher level of performance (faster



output) than if employees are poorly matched to jobs. Assistance is provided through descriptions of the effort and skill required for each of the production jobs, and the characteristics of each employee. The employees' information describes their skills, experience, motivational level, preference for routine or challenging work assignments, and standards of work quality. Employees' profile descriptions are provided at the beginning of the simulation, but subjects can refer to them at any time during the decision making task.

In addition to allocating employees to jobs, subjects need to make decisions about how to use a set of motivational factors to optimise the group's performance. They have to decide how to use motivational factors such as goals, instructive feedback, and social rewards to enhance the job performance of each employee in the group. For each of these motivational factors, subjects have a set of options representing the types of actions that managers could take in an actual organisation.

In performing the managerial role, subjects allocate the employees to the various jobs for each manufacturing order. They have scope to change employee assignments before continuing. After employees have been allocated to jobs, subjects can then assign each employee a production goal from a set of options that include urging employees to do their best, assigning them to one of three specific goals set at above or below the established standard, or no production goal.

Goal assignments for employees influence their performance according to the calculations of the simulation model (Wood & Bailey, 1985) in the manner predicted by goal theory (Locke et al, 1981). Goals that present a moderate challenge lead to higher performance than no goals or instructions urging employees to do their best. However, repeated imposition of goals that exceed an employee's prior performance at a level that renders them unattainable has a negative effect on later performance. Continued imposition of unattainable goals would eventually lead to their rejection and diminished motivation. To enhance the performance of their department, subjects had to learn the decision rule for setting the optimal level of challenge for each employee.

Instructive feedback and social rewards are given after the production order for each trial has been completed. For the feedback decision, subjects can give employees no feedback, or select one of three options that vary in the amount of direction given regarding methods of workmanship and analysis of difficulties. Instructive feedback has a positive effect on employees who perform below the established standard. When an employee performs above the established standard, the continued use of high directive feedback is regarded as over supervision that would have a negative effect on performance. Effective use of the feedback options to improve work performance requires subjects to learn decision rules for optimal adjustment of the level of instructive feedback to performance attainments.

For decisions regarding social rewards, the effects of the three options varies with the type of reward given, compliment, social recognition or note of commendation. Effects of decisions regarding social rewards also varies with the degree to which rewards are contingent upon employees' performance attainments. Subjects also have the option of not making any laudatory comments regarding their employees' work. Social rewards have a positive effect on performance, however, in an organisational setting, the impact of rewards on performance is affected by social comparison processes as well. Therefore, the magnitude of the incentive effect for a given employee depends on the ratio of rewards to attainment for that employee compared with the equivalent ratio for other employees. Subjects therefore, had to learn a compound decision rule combining incentive and equity factors on how best to use social rewards to increase organisational performance.

To optimise work performance, subjects need to match employee attributes to job sub functions. They also need to simultaneously master a complex set of decision rules on how best to guide and motivate their employees. To discover the rules they have to test options, cognitively process the outcome feedback information of their decisions, and continue to apply analytic strategies in ways that reveal the governing rules. To complicate matters further, the motivational factors involve both linear and non linear compound rules, which are especially difficult to learn. Knowing rules does not ensure optimal implementation of them. Subjects also have to gain proficiency in tailoring the application of the rules to

individual employees and to apply them in concert to achieve desired results.

The simulated organisation utilised in this study addresses both quantitative and qualitative aspects of decision making, including the evaluation and refinement of controlled situational options. Controls within the experimental design are included to deny differential effects of contextual images by standardising the information environment and mode of information presentation.

This study replicates Wood & Bailey's (1985) experimental conditions within the task complexity game "The Furniture Factory" using means of three complexity levels.

Table 5 illustrates the establishment of the simulation environmental complexity variables to facilitate replication:

Table 5

<u>Simulation alternatives</u>			<u>Keyed responses</u>
Number of decision cycles (1-18)			10
Standards order of complexity:			x
low complexity	1-18	3 workers	9
moderate	19-36	5 workers	7
high	37-54	8 workers	45
Goal levels	(0-125%-best)	100%	2
Feedback	all cycles, job time		1
Diagnostic report	all cycles		1
Frequency of self assessment.			1
Help provided:	Graphic display		2
Goals proximal or distant			2
Self assessment <i>a priori</i>			1
Standard game numbers:			
low complexity			91
moderate			82
high			73

Subjects are identified with exclusive double digit numbers.

All responses are written to a data output file on the same disk as the game. The file name is of the form: SUB 001 01 OUT.  
 (subject No) (experimental condition)