THE EFFECTIVENESS OF COMPUTER-BASED INFORMATION SYSTEMS: DEFINITION AND MEASUREMENT

by

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THIS THESIS IS DEDICATED TO

Alyce, Joanna and Lorien

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Since this is a thesis about information systems effectiveness, it is worth noting that source text and data have been prepared using Multimate, LOTUS 123 and Harvard Graphics. Ventura has been used for final typesetting of the output from all of these sources and the entire document is now electronically recorded. My thanks to Professor Paul Sulcas for making the facilities of the Graduate School of Business at UCT available and to Mr Mark Davies who brought an unusual blend of creativity and computer expertise to the desktop publishing phase and showed special willingness to work exceptionally long hours to get the job done.

THE EFFECTIVENESS OF COMPUTER-BASED INFORMATION SYSTEMS: DEFINITION AND MEASUREMENT

ABSTRACT

Determining and enhancing the effectiveness of computer-based information systems (I/S) in organisations remains a top priority of managers. This study shows that the essential nature and role of I/S is changing and that classic views of I/S effectiveness have become increasingly inappropriate. Drawing on the organisational effectiveness literature, it is argued that user perceptions provide a practical alternative and a conceptually sound basis for defining and measuring I/S effectiveness. A popular measure - User Information Satisfaction - is examined and empirical studies using this measure are critiqued. This reveals limited theoretical grounding or convergence but a growing emphasis on behavioural theory.

Based on prior empirical work by the author and expectancy and motivation theory, a model of I/S behaviours is offered. The model suggests that fit between the needs of the organisation and the capability of I/S to satisfy these needs is essential to achieving I/S effectiveness. Several hypotheses are formulated.

The development and validation of a particular measurement instrument is traced. The instrument addresses 37 facets of the overall information systems function and respondents complete perceptual scales tapping the relative importance of these facets and how well each is performed. The instrument is used in a field survey of 1025 managers and I/S staff in eleven large organisations. Attitudes towards I/S are found to correlate with perceptions of fit between organisational needs and I/S capabilities. The survey is complemented by management interviews, document analysis and an assessment of the dynamics of the relevant I/S groups. Cultural and other features associated with perceived I/S success are found.

It is concluded that perceptions of organisational members are central to the meaning of information systems effectiveness, but that the user information satisfaction construct and purely attitudinal measures are inadequate. Based on the notion of fit, a new definition of I/S effectiveness is proposed. Guidelines for measurement are presented and it is argued that the instrument used in this study is a satisfactory tool. Specific recommendations for management are made and rich opportunities for future research are identified.

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CHAPTER ONE

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CHAPTER ONE

INTRODUCTION

"As soon as a company takes the first tentative steps from data to information, its decision processes, management structure, and even the way its work gets done begin to be transformed." (Drucker 1988, p.46)

1.1 OVERVIEW

Three decades ago computer issues were technically challenging, but straightforward from an organisational point of view. How could managers best use a powerful new technology to automate the costly and tedious processing of basic accounting, stock, payroll and other corporate data and thus reduce costs and improve efficiency. Today computing and communications technology is applied over the total organisation. Many organisations have indeed made the transition from data to information as conceived by Drucker in the above quote, and have experienced a transformation in the nature of their work and managerial decision-making, the products and services they supply and the relationship between themselves and other firms. Realised benefits from information technology now include cost reductions, job enhancement, better decision-making, new products and services, competitive advantage, organisational flexibility and many others.

Inevitably management of computers has also changed greatly. Despite the much publicised successes, managers are now confronted with a wide range of problems that seem to get in the way of effective use of the technology. Coping with the complexity of modern information technology has become a behavioural and organisational issue as well as a technical one. In addition to cost overruns, slipped schedules and systems that do not deliver the benefits desired, managers have to deal with user resistance, political infighting, demoralised data processing staff and many other problems of an individual and group nature. A common concern is that management has lost control of data processing.

Concomitant with the evolution of computer applications has been a burgeoning academic literature on the subject. In keeping with the changing nature of the practical problems, so the nature of conceptual thinking and empirical research has changed too. Where computer science was the early discipline area with its origins in mathematical thinking and general systems theory, a discipline area is now emerging that draws strongly on organisational and behavioural sciences as well.

In this chapter the evolving nature of computers in organisations is described and important paradigms for information systems presented. This is a necessary introduction to the specific problem of information systems effectiveness which is introduced next. The questions to be addressed in this research are then stated and followed by an overview of the structure of the thesis. Assumptions and limitations of the work are noted and the chapter concludes with a statement of the contribution to be made by the research.

1.2 THE EVOLVING NATURE OF COMPUTER-BASED I/S [1]

The first commercial uses of computers were in the late 1950's when basic functional processes such as accounting, stock control and payroll administration were automated. As described by Rockart (1988), this represented the *"accounting era"* of data processing and was characterised by large central mainframe computers programmed and managed by technical specialists. The programmes and procedures mirrored underlying manual procedures.

Computerisation of key processes such as order entry and manufacturing control were a feature of the next era, the *"operations era"*. Here applications merged basic systems such as stock control and cost accounting to enable higher level functions to be automated. New technical features such as central data bases and processing via remote terminals were exploited and clerical and operations personnel participated directly in information systems activity such as entering and validating data and generating reports.

According to Rockart's classification we are now in the *"information era"*, characterised by support for high level management functions via decision support systems, electronic mail and end-user computing. Mainframes are now supplemented by microcomputers and

[1] see endnotes.

internal company data is augmented by external data bases. A wide range of functions related to computers, including systems design and development, training, and routine operations can be and are handled by the end-user, while professional data processing staff devote themselves to the intricacies of data base design and management and communications systems.

Recently Benjamin and Scott Morton have suggested that I/S is entering a fourth era, the *"knowledge era"*. They argue that all I/S to date has been concerned with the processing of data to support basic organisational processes and decision making. The advent of practical applications of Artificial Intelligence in the form of *"expert systems"* represents a new thrust in which qualitative knowledge rather than data is gathered and algorithms are replaced by heuristics as the basis for problem solving (Benjamin & Scott Morton 1986).

Other authors have similarly tracked the widening scope of computer applications and the underlying company functions supported. For instance Sprague and Watson (1979) name four stages, Basic Data Processing, Integrated Data Processing, Management Information Systems and Decision Support Systems, the titles reflecting the progressive integration of data and support of higher levels of management. Perhaps most widely quoted are the "stages of growth of I/S" (Nolan 1979). Nolan argues that individual firms go through various stages of development, with basic cost-reduction applications being the first to be implemented, followed by operational control functions, then management control areas such as budgeting and forecasting and finally the higher level strategic functions of management such as capital investment decisions and strategic planning studies.

Underlying all of these perspectives is a single fundamental set of assumptions, or "paradigm" of organisational functioning. As shown in Figure 1.1, company functions are classified as Operational Control, Management Control, or Strategic Planning and each has specific information requirements. Operational Control relates to day-to-day task management such as stock control. The information required is internally generated, precise, detailed and historical. Management Control refers to practices such as departmental budgeting and requires summarised information that may be both historical and future-orientated, and internal or external to the organisation. Strategic Planning is the non-routine function of determining company direction, deciding on plant expansions,

non-routine function of determining company direction, deciding on plant expansions, organisational restructuring etc. and requires less precise information that spans a long time period, is often externally generated, and relates to the economy and competitive organisations (Anthony 1965).

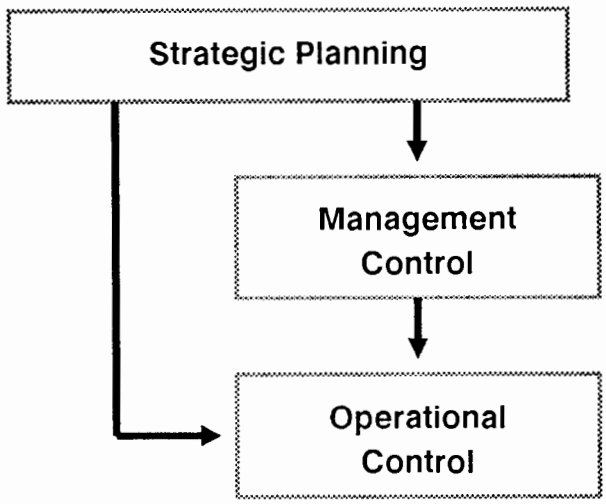


FIGURE 1.1 ANTHONY'S HIERARCHY OF ORGANISATIONAL FUNCTIONS
(Source: Anthony 1965)

Gorry and Scott Morton (1971) have added a second dimension to the paradigm by incorporating Simon's (1960) distinction between "programmed" (repetitive, routine) and "non-programmed" (novel, unstructured, consequential) types of decision. They argue that the level in Anthony's hierarchy *and* the extent to which applications are structured, semi-structured or unstructured should dictate model structures, implementation processes, data base concepts, types of analysts and managers and other factors pertinent to I/S.

The I/S paradigm that follows from the Anthony structure and its extensions has been the mainstay of I/S thought at least until the early 1980s (Wiseman 1988). However, as I/S applications have continued to evolve, and particularly as the cost-performance of traditional technology, the capabilities of communications technology, and the sophistication of software tools has improved, major new opportunities have opened up and made the

traditional I/S paradigm limiting. For instance now that systems can and are being designed to meet needs at all levels, separating the levels of function supported according to the Anthony hierarchy is artificial. Standard data capture and processing routines are supplemented by exception reporting, simple mechanisms for creating ad hoc reports and facilities to enquire into the fundamental data base on request. Markus (1984) adds "communication systems" and "interorganisational systems" to Anthony's categories, arguing that they serve distinct organisational functions.

Perhaps most significant has been the growing body of literature in the 1980s addressing systems to improve the competitive position of the firm (eg Parsons 1983, Ives & Learmonth 1984, Wiseman 1988). The primary intention of such systems is not the specific support of internal managerial activities. Rather strategic systems are intended to materially change the nature of the firm's products or services or its relationships with its suppliers or buyers in an effort to achieve competitive advantage. Best known are the American Hospital Supply Company's ASAP system, Merrill Lynch's CMA system and American Airlines SABRE system. The ASAP system links American Hospital Supply to its customers via on-line terminals. Hospital computers communicate directly with American's computers for the purpose of more efficient stock management and reordering. ASAP fundamentally changed the relationship between the supplying company and its customers. Merrill Lynch developed a new financial product called Cash Management Account (CMA) which permitted customers to transfer money freely from stocks to bonds to money market funds and to write cheques against these funds cost free. This forced other leading firms to offer similar services. American Airlines reservation system (SABRE) provides dramatically greater convenience to airline travellers and travel agents and confers considerable market power to the airline. In each of the above examples, I/S applications resulted in major increases in market share and profitability (Laudon & Laudon 1988).

Most of the theorising in this area finds its origins in the seminal work of Porter on competitive strategy and analysis (Porter 1980, 1985). Figure 1.2 shows Porter's basic paradigm of the competitive business environment and categorises the primary forces within that arena. The diagramme is of special relevance to I/S practitioners since it redirects attention from information flows *within* the organisation to linkages *between* organisations. Further implications relate to the role of information technology in creating

barriers to entry for new competitors and for investing existing products with added, desirable information-related features. A body of literature is now developing to assist practitioners to identify strategic I/S opportunities, evaluate their potential and implement them successfully.

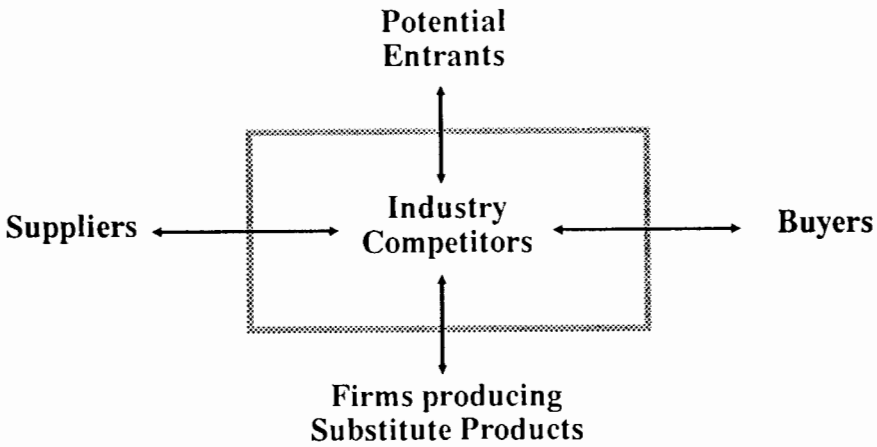


FIGURE 1.2 PORTER'S COMPETITIVE MODEL

(Source: Laudon & Laudon 1988)

The two basic paradigms for I/S discussed so far relate to organisational functioning and the potential contribution of I/S. A third paradigm of particular relevance to this study is due to Ein-Dor and Segev (1981). This paradigm is shown in Figure 1.3 and is seen to have a different and much broader compass than those previously discussed.

The subsystems of this paradigm are the *behavioural,* encompassing executives, users and implementors of I/S and the characteristics and interrelationships between them that affect I/S development; the *procedural,* consisting of those mechanisms necessary to translate an I/S opportunity into reality; the *structural*, being the physical realisation of I/S in terms of data structures, processing rules, the user interface, operational characteristics etc; the *organisational* and *extraorganisational* environment which defines the limits of I/S potential and shapes actual outcomes; and finally, not shown explicitly, *"fit"* being a conceptual measure of the mutual adaptation of the other subsystems in the framework. This paradigm or framework is valuable in making explicit the broad range of elements and influences that bear on I/S and feature prominently in this thesis.

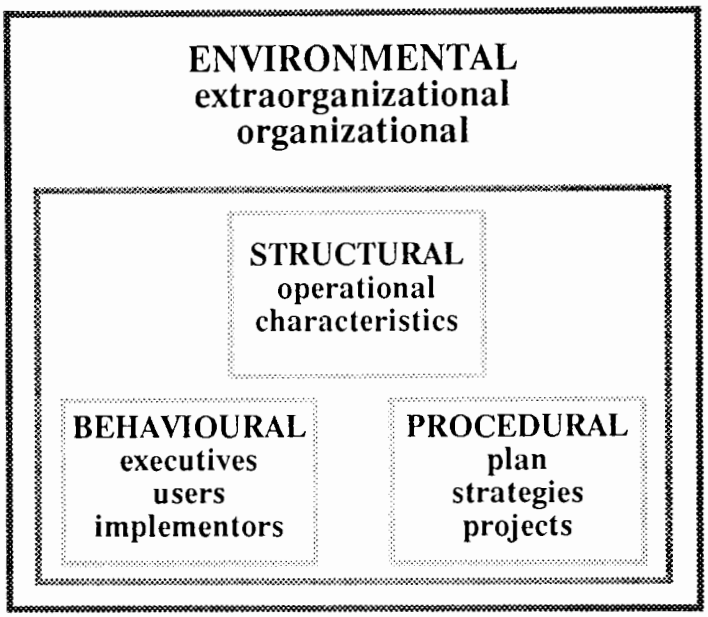


FIGURE 1.3 EIN-DOR AND SEGEV'S PARADIGM FOR MIS

(Source: Ein-Dor & Segev 1981)

It is concluded that the role of I/S in organisations has expanded dramatically over a short space of time. The original purpose of computerisation is still valid and firms continue to use computers in order to meet their basic data processing needs. But these applications now compete for attention with the host of higher level management support requirements, opportunities to exploit computers for competitive advantage, expert systems and so on, all of which have become practical thanks to the technological advances in the field of computers and communications.

Efforts to bring order to this territory reveal two key issues. Firstly the I/S arena is extremely broad, encompassing the whole range of organisational functions, the extraorganisational environment and the micro-environment of interpersonal relationships between individual users and implementors. Secondly I/S in the organisation is undergoing a "paradigm shift". The traditional Anthony paradigm is giving way to, or at least being modified and expanded to include the Porter paradigm. There is no agreement or even proposal for a new paradigm for I/S, so experimentation with new concepts of I/S in the organisation can be expected over the next few years.

It is in the face of these complexities and uncertainties that organisations have to plan and budget for their future technological development. With little definitional clarity and few well-grounded prescriptions, managers must select a route, define their needs and engineer the implementation of multiple systems. Achieving effectiveness in this herculean task is the subject of this study.

1.3 ACHIEVING AN EFFECTIVE I/S FUNCTION

The body of popular and academic literature addressing ways to improve the success rate of I/S bears testimony to the long history of failure in this field. Organisations have a very poor record of installing systems on time and within budget, fulfilling the real needs of the user and allowing adaptation to changing environmental conditions (McFarlan 1981).

This study concerns itself with *effectiveness* rather than *efficiency,* where efficiency is "doing things right" and effectiveness is "doing the right things" (Drucker 1974). Once the purpose for a particular application has been decided, then designers should design the system so that, according to chosen criteria, development and subsequent operational resource utilisation is minimised. This then will be an efficient system. Effectiveness addresses the question of whether the choice of application is best in the first place. Has the most important organisational issue been identified? Is the chosen solution (computer or otherwise) best in terms of cost versus benefit? Efficiency and effectiveness overlap, but effectiveness emphasises benefits, and efficiency emphasises costs.

This study is also concerned with assessment of the *overall* I/S function rather than individual systems. There are many aspects of I/S, such as corporate I/S planning and policy setting, data base design, network configuration, and end-user computing capabilities that impact many systems and directly or indirectly influence the success of individual systems. Organisations today have implemented many if not most of their basic data processing applications and now maintain a portfolio of systems and capabilities that cover a wide spectrum of corporate activity. Maximising the effectiveness of this total portfolio and its future additions is important, not only because of the size of budget involved but also because of the opportunity afforded for supporting the achievement of superordinate corporate goals. As Mendelow (1987) has pointed out, general managers

view the I/S group either as a cost or as a profit centre. Based on their particular view of the overall contribution of the I/S subunit to the organisation, they will allocate funds to I/S.

Some of the warning signs that the I/S function is ineffective include consistently poor service from I/S, frequent cost and budget overruns, lack of connection between I/S investments and corporate priorities and, perhaps as a consequence, hostile users, demoralised I/S staff and top management who feel they have lost control of the I/S function (Lucas 1982).

Many explanations are advanced for the observed successes and failures of I/S, but few have withstood rigorous testing. Amongst these are so-called industry norms for investment in I/S. Success in I/S has not been shown to associate with level of investment in I/S. Formal I/S management procedures are also examined and in some cases associated with greater penetration of I/S into the organisation. There has been more success in demonstrating the relevance of behavioural elements to successful implementation of I/S, in particular the role of top management and the involvement of the user.

These research issues will be examined in some detail in Chapters Two and Three and a critique of the research will show slow and uncertain development of insights into I/S effectiveness. A central explanation lies in the difficulty in defining "effectiveness" and the associated lack of acceptable and generalisable measures of the concept. Without a reliable basis for longitudinal and intra- and inter-firm comparisons, studies will be compartmentalised, similar works non-comparable and researchers unable to build on each others' findings.

This research will conclude that there continues to be a large gap in practice between the potential benefits of I/S and their realisation and that the I/S research community still has far to go in identifying factors associated with success and failure and in providing valid and reliable prescriptions for success of individual systems and the I/S function as a whole.

1.4 THE RESEARCH QUESTIONS

Three fundamental questions are addressed. First:

WHAT IS INFORMATION SYSTEMS EFFECTIVENESS?

There are a variety of definitions of I/S effectiveness, grounded in the economics, accounting, and behavioural disciplines. There is no consensus as to a definition and it will be shown that existing attempts at definition are quite unsatisfactory.

In practical terms it is important to measure I/S effectiveness and the definition should lead directly to a basis for such measurement. It will be shown that some definitions of I/S effectiveness do not lend themselves to pragmatic measurement and remain theoretical constructs. Others have resulted in an unsatisfactory mixture of measures. Thus the second question is:

HOW CAN INFORMATION SYSTEMS EFFECTIVENESS BE MEASURED?

Improvements in organisational functioning are effected by organisational members, especially managers. Managers base their decisions and actions on their perceptions of problem areas, "pressure points" and so on, using implicit or explicit measures to direct their actions. Given a useful definition of I/S effectiveness and its associated measurement, the third question is then:

WHAT CAN MANAGERS DO TO IMPROVE I/S EFFECTIVENESS?

1.5 STRUCTURE OF THE THESIS

In attempting to answer the research questions, the thesis examines the theoretical and empirical literature related to I/S in the organisation and reports on the results of an empirical investigation into I/S effectiveness in eleven large South African organisations.

The next chapter establishes the link between I/S and organisational theory, and identifies a particular set of organisational assumptions as the starting point for this investigation. The unresolved state of *organisational* effectiveness research is dealt with as it applies to the macro-analysis of I/S, and the growing contribution of the behavioural sciences to

micro-analysis of individual and group I/S behaviours is described. Against this background Chapter Three critically reviews the literature on I/S effectiveness research. The topic of definition of I/S effectiveness is introduced and a number of measurement instruments are analysed. A variety of empirical studies are reviewed and trends in theoretical orientation are explored. Special emphasis is placed on an instrument developed by the author and colleagues and applied in a variety of settings (Miller & Doyle 1987, Miller 1988, 1989).

Chapter Four draws on several behavioural theories to offer a broad model of I/S behaviours in the firm. The model incorporates the perceptions and behaviours of I/S staff and user-managers and hypotheses regarding these entities are formulated and discussed.

In Chapter Five the focus shifts to the empirical. The limitations of classical approaches to I/S theorising and research methodologies are analysed and alternative multimethod approaches are proposed. The current research methodology, incorporating quantitative and qualitative data gathering is described. Chapter Six then presents and analyses the quantitative data and assess the results in relation to the proposed model and the stated hypotheses. Chapter Seven synthesises the body of qualitative data gathered in the subject organisations and seeks connections between contextual phenomena, the quantitative results and the prescriptions of the behavioural model.

The work in this thesis is summarised in the final chapter. A new definition of I/S effectiveness is proposed and guidelines for the measurement of this construct are offered. In relation to the proposed model and the stated hypotheses, conclusions are drawn regarding I/S behaviours in organisations. The chapter ends with proposals for management action and recommendations for future research.

1.6 ASSUMPTIONS AND LIMITATIONS

A fundamental assumption of this thesis is that computer-based information systems activity is separable from the general information processing function of individuals in the organisation. It is also assumed that this separation is meaningful and desirable. The

empirical data for the study is obtained from I/S professionals and managers in the subject organisations. It is assumed that these respondents are capable of adequately discriminating between various facets of I/S and making logical connections between I/S and the overall business requirements of their organisations.

While a number of organisations in four different industries have been polled, these were selected to meet particular design requirements and cannot be construed to be representative of all organisations or even organisations within their own sectors. Frequently reliance had to be placed on liaison personnel within particular organisations. Thus the extent to which the author has been able to control the administration of the survey documents has sometimes been less than desirable. The results are limited by the inherent subjectivity in individual responses, the possibility of interviewer and interviewee bias in the personal interviews and selectivity in the choice of company documentation for analysis. Despite stringent efforts to control and account for these aspects, they must be regarded as limitations to the quality and generalisability of the findings.

This thesis is an enquiry into behavioural and organisational phenomena. No attempt is made to analyse detailed I/S technologies or draw conclusions about the impact of different computer or communications facilities, data base structures, development languages etc. on I/S effectiveness.

1.7 THE CONTRIBUTIONS OF THIS RESEARCH

In searching for answers to the research questions, this thesis intends to make the following contributions to the theory and practice of I/S in organisations:

- Overcome an important gap in I/S research by surfacing the fundamental links between I/S and organisational theory in general and I/S and organisational effectiveness in particular.

- Through a critical analysis of the relevant literature, confirm the importance of, and sharpen insights into individual and group behaviours as these affect I/S performance.

- Derive a testable model of I/S behaviours, grounded in established theory.

- Provide empirical support for the derived model.

- Provide a theoretically justifiable and pragmatic definition of I/S effectiveness.

- Provide a valid and reliable instrument for measurement of I/S effectiveness, consistent with the chosen definition.

- Broaden and deepen previous findings by the author that alignment between organisational needs and I/S capabilities is necessary for the achievement of I/S effectiveness.

- Identify key features and processes contributing to I/S effectiveness in South African organisations.

1.8 SUMMARY

In introducing the topic of this thesis, the rapid evolution in the nature and purpose of computer-based information processing in organisations has been stressed. It has been shown that managers face a daunting task in planning for and controlling the vital and expensive I/S resource. Given multiple choices, organisations must attempt to utilise this resource efficiently and effectively. The chapter states the three research questions to be addressed, all of which relate to the effective use of I/S. The structure of the following chapters is described as are some important assumptions and limitations in the research. The main areas in which this thesis hopes to make a contribution to the theory and practice of I/S are listed.

In the next chapter the nature of the I/S discipline is discussed and connections are made between I/S research and organisational science.

ENDNOTE

[1] Throughout this thesis the acronym *I/S* will mean "information systems". Depending on the context I/S might refer to the totality of computer-based information processing in the organisation, a particular computer system, a capability such as a decision support software or an electronic communications facility. *I/S activities* will refer to any acts or tasks related to computer-based I/S including formal data capture, processing and output generation, systems design and development, user accesses to computers etc.*I/S professionals* or *I/S staff* will generally mean trained systems analysis and design staff, project leaders, and managers of I/S groups. The *I/S department* will refer to formally structured groups of I/S professionals charged with providing computer-based information services to the organisation. The *I/S function* will encompass all computer-based I/S activities performed by anyone in the organisation, including both I/S professionals and users.

CHAPTER TWO

ORGANISATIONAL SCIENCE AND INFORMATION SYSTEMS RESEARCH

2.1 INTRODUCTION

2.2 THE I/S DISCIPLINE

2.3 ORGANISATIONAL THEORY

2.3.1 Choice of a Starting Point

2.3.2 Information Processing Models of the Firm

2.3.3 Organisational Effectiveness

2.4 ORGANISATIONAL BEHAVIOUR

2.4.1 Macro- and Micro-Analysis

2.4.2 User Involvement

2.4.3 Group Decision-Making

2.4.4 Inter-Group Phenomena

2.4.5 Organisational Change Management

2.5 CONCLUSIONS

CHAPTER TWO

ORGANISATIONAL SCIENCE AND INFORMATION SYSTEMS RESEARCH

"We, as producers of (IS) research, have chosen to remain ignorant of our lack of synchronisation with the needs of society. We have chosen to proceed blindly forward. We have created one technical innovation after the other as we move further away from a society concerned with applications and implications of technology use." (Bjørn-Andersen 1984 p.1)

2.1 INTRODUCTION

The above quote eloquently expresses the need for a connection between organisational research and information systems research. In the previous chapter the rapidly evolving role of computers in organisations was described and it was argued that the information systems world was experiencing a paradigm shift from an internally focused view of I/S to an external competitive focus. If Bjørn-Andersen is correct then any study of the effectiveness of information systems must address the organisation as a whole and even societal needs and constraints. This chapter examines the nature of the I/S discipline and focuses particularly on the contribution that organisational theory, studies into organisational effectiveness, and organisational behaviour research make to information systems research. The chapter provides an important context within which to evaluate the specific theories, models and empirical studies dealt with subsequently in this thesis.

2.2 EMERGENCE OF AN I/S DISCIPLINE

Culnan (1986) reports a co-citation analysis of 47 core authors publishing in I/S over the period 1972 to 1982. She concludes that I/S is a young field without an accepted paradigm or well defined sub-fields. Subsequently however, together with Swanson she analyses the

contents of key I/S, Management Science, Computer Science and Organisational Science journals over the period 1980 to 1984 and concludes that I/S *is* now a distinct discipline and is starting to develop its own tradition (Culnan & Swanson 1986). In this process I/S draws from fundamental discipline areas including Computer Science, Management Science and Organisational Science, shown diagrammatically in Figure 2.1:

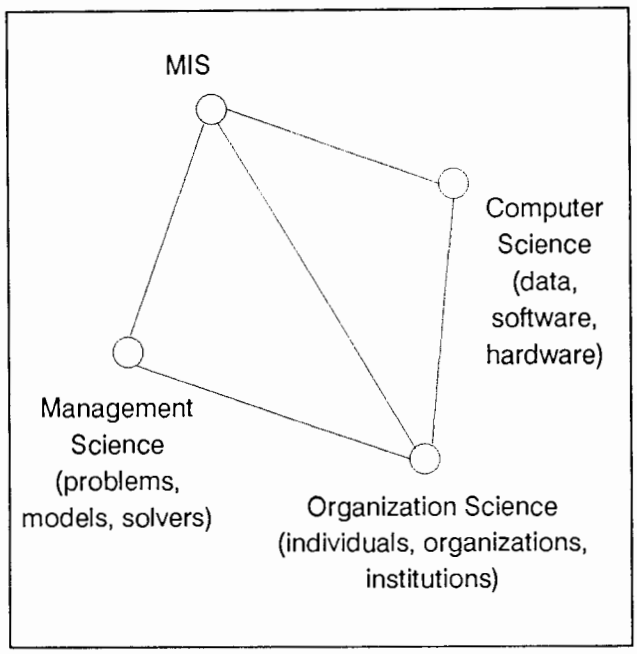


FIGURE 2.1 I/S AND ITS FOUNDATIONAL BASE
(Source: Culnan & Swanson 1986)

Computer science focuses on data, hardware and software; management science attends to problems, models and solvers; and organisation science studies individuals, organisations and institutions. Broadly speaking the contribution of computer science is directed at technological efficiency and therefore is of less relevance to the present study than the other discipline areas. Insights from the management science discipline will be referred to in subsequent chapters and in the following sections contributions of organisational theory, studies into organisational effectiveness and organisational behaviour research will be discussed.

2.3 ORGANISATIONAL THEORY

2.3.1 Choice of a Starting Point

Culnan found almost no references to the organisational literature in her study of prominent I/S research up to 1982 (Culnan 1986). Yet recently Drucker announced "the coming of the new organisation." He considers that the business enterprise has gone through two major evolutions in concept and structure. The first, at the turn of the century, distinguished management from ownership and established management as work and task in its own right. The second, in the 1920s, resulted in the command-and-control organisation of today, and the third is occurring now, the emergence of the organisation of knowledge specialists, what he calls *the information-based organisation* (Drucker 1988).

While several years ago it may have been in order for researchers to ignore the organisational literature and concentrate on the technicalities of I/S, this view establishes the crucial link that must now be forged between information systems research and organisational research (see also quote at beginning of Chapter 1).

Organisational theory concerns itself with the nature of the organisation, its culture, purpose, structure and function. I/S research can and should benefit from the large body of research into organisations, applying its theories and models to the I/S domain. Of immediate relevance therefore is the fact that as recently as 1983 leading organisational theorists were unable to find a generally accepted model of the organisation (Goodman, Atkin & Schoorman 1983). Morgan and Smircich (1980) have suggested that the variety of approaches to the organisation arise through fundamental differences in assumptions about reality and human nature. These assumptions represent the starting point for any research enquiry and in particular should shape the research methodology chosen. Six approaches are shown in Figure 2.2 and briefly described here in order to position the current I/S study and its chosen methodology.

Assumption 1 leads to the view that the organisation is an objective, hard, concrete, real thing "out there". Organisational members behave in stimulus-response fashion and their behaviours are predictable and determinable. From this vantage I/S is a simple matter of

defining manual procedures in computer terms, converting to computer operations and installing new procedures.

	Assumptions About Reality	Assumptions About Human Nature	
1	Reality is a Concrete Structure	Humans are Responding Mechanisms	**OBJECTIVE**
2	Reality is a Concrete Process	Humans are Adaptive Agents	
3	Reality is a Contextual Field of Information	Humans are Information Processors	
4	Reality is Symbolic Discourse	Humans are Social Actors	
5	Reality is a Social Construction	Humans Create Their Realities	
6	Reality is a Projection of Human Imagination	Humans are Transcendental Beings	**SUBJECTIVE**

FIGURE 2.2 ASSUMPTIONS ABOUT REALITY AND HUMAN NATURE
(Based on Morgan & Smircich 1980)

Assumption 2 sees the organisation as an evolving process, concrete in nature but ever changing in detailed form. Organisational members influence and are influenced by their world and everything interacts with everything else in highly complex but theoretically determinable ways. Early attempts to design the total Management Information System reflect this view of the organisation. Dearden's comments here are instructive.

> *"The notion that a company can and ought to have an expert (or a group of experts) create for it a single, completely integrated super system - an 'MIS' - to help it govern every aspect of its activity is absurd... a company that pursues an MIS embarks on a wild goose chase, a search for a will-o'-the-wisp." (Dearden 1972)*

Assumption 3 views the organisation as changing continuously as a result of the exchange of information. The nature of relationships is probabilistic and dependent on the ways in which organisational members receive, interpret and act on information received.

Assumption 4 leads to the view of the organisation as a Culture. The organisation is seen as a pattern of symbolic relationships and meanings sustained through a process of human action and interaction. Organisational members are social actors using language, labels and routines for impression management.

Assumptions 5 and 6 are the most subjective and solopsistic views of the organisation. Here it would be concluded that managers are fundamentally different in the way they give significance to life in the organisation and create the surrounding world. In this view appropriate information systems could not be seen as coherent and unified with literal meaning, but in the context of levels of ambiguity, multiple interpretations and potential paradox.

This study starts with a view that has elements of Assumptions Three and Four. Reality is seen as a probabilistic field of information in which the meaning attached to items of information can be subjective and symbolic. Participants in the I/S process are information processors *and* social actors. As will be seen throughout subsequent chapters, the probabilistic and subjective elements of these views of reality bear directly on the structure of I/S theory, the definition and measurement of I/S effectiveness, and the choice of research methodology. In the next section specific models of the organisation consistent with these assumptions will be discussed.

2.3.2 Information Processing Models of the Firm

Some 15 years prior to Drucker's "information-based organisation", the relevance of information processing and decision making in the organisation had been expressed as follows:

> *"The decision making process... will bulk larger and larger as the central activity in which the organisation is engaged. In the post-industrial society the central problem is how to organise to make decisions - that is, to process information." (Simon 1973)*

Galbraith (1974, 1977) has carried out seminal work on information processing and its relevance to organisational design. In his information processing model of the firm he argues that uncertainty has to be reduced in order best to perform the organisation's basic task. This is achieved by managers processing information (making decisions). To cope with the information processing load (or overload), organisations can reduce the requirement to process information, or increase their capacity for information processing. Options to accomplish the latter include the creation of lateral linkages between groups and investment in vertical information systems.

In a perspective closely related to Galbraith's, Huber and McDaniel (1986) present a decision making paradigm for the organisation. They argue that decision making requirements are increasing in frequency and criticality in a hostile, complex and turbulent environment. Organisations should be designed specifically to facilitate effective decisions. They present a decision making paradigm together with a number of organisational design guidelines that flow from it.

The extent to which human beings are subjective and idiosyncratic in their behaviour and interpretations is not addressed in the above models. Daft and Lengel (1986) tackle this issue. They show that "uncertainty" is in fact only one of two key information-related issues that underpin organisational functioning. The other is "equivocality". The information processing task is *uncertain* when the questions and criteria for choice and action are known, but sufficiently timely and accurate information is not available. The information task is *equivocal* when even the question and criteria for choice are unclear or ambiguous. Figure 2.3 shows several co-ordinating and control mechanisms that can be employed to cope with these information processing requirements.

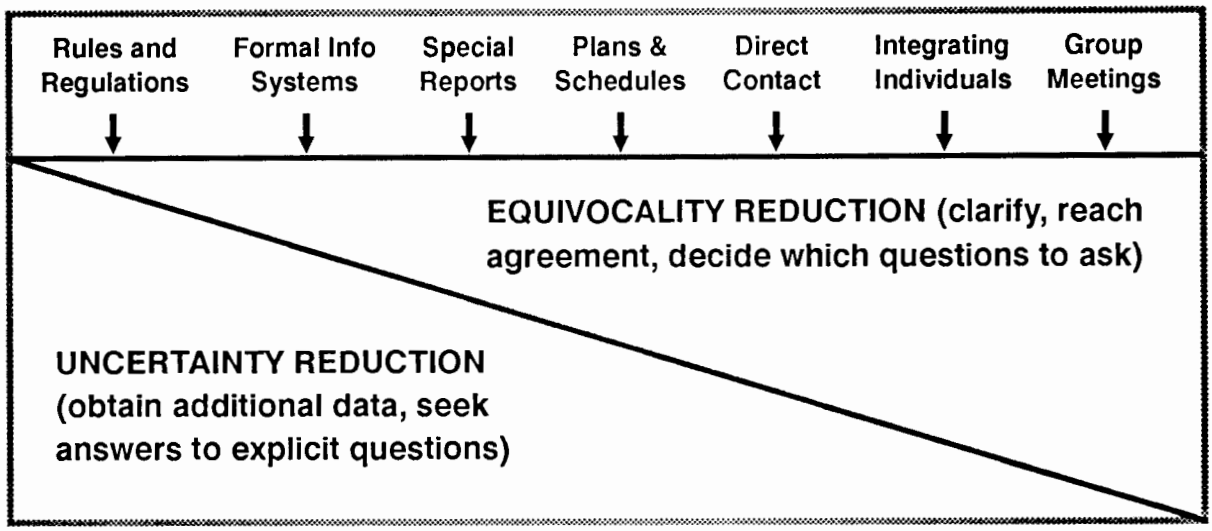


FIGURE 2.3 INFORMATION/STRUCTURAL CHARACTERISTICS FOR REDUCING UNCERTAINTY AND EQUIVOCALITY (Source: Daft & Lengel 1986)

The above discussion underlines the central and growing importance of information processing in a world characterised by burgeoning growth in the volume and complexity of information. Computer-based I/S is only one of a number of options open to organisations in dealing with information and the discussion shows how decisions regarding I/S are interwoven with other organisational design decisions. The probabilistic and subjective nature of information processing is well-captured by the twin concepts of uncertainty and equivocality.

From a theoretical standpoint, this perspective reinforces the earlier argument that I/S research should view reality as a contextual field of information with inherent elements of subjectivity and symbolism. It also shows that I/S cannot be studied separately from its organisational context.

2.3.3 Organisational Effectiveness

The effectiveness of individual information systems and the total information systems function only has meaning to the extent that I/S contributes to the effectiveness of the organisation as a whole. Therefore it is essential to examine models and concepts of

organisational effectiveness to provide the appropriate basis for measuring and judging I/S effectiveness.

Unfortunately there is no unanimity on how to measure the effectiveness of organisations. So complex and frustrating has the quest for a model of organisational effectiveness become, that Goodman et al recently announced "the demise of organisational effectiveness studies" through lack of a single parsimonious model of effectiveness, no strong theory of the organisation and the unlikelihood of convergence on a single theory of organisational effectiveness (Goodman et al 1983). Subsequently Lewin and Minton (1986) expressed their belief "in the futility of seeking a universal, overarching theory of effectiveness". They argue for a contingent approach recognising that different organisations and organisation designs can be characterised by different effectiveness attributes.

Current analysis is based on the premise that organisational effectiveness ultimately involves the question of values. The variety of values, associated criteria of effectiveness and widely differing models of the organisation have been synthesised by several authors (Cameron and Whetten 1983, Quinn and Cameron 1983, Quinn and Rohrbaugh 1983, Lewin and Minton 1986). Figure 2.4 brings together many of these elements and may be seen as a much abbreviated synthesis of views expressed in the organisational effectiveness literature over the last twenty years. It is based on a spatial model propounded by Quinn and Rohrbaugh, onto which Lewin and Minton have mapped a large number of effectiveness criteria proposed in the literature.

Underlying Figure 2.4 is a set of three value axes. Organisations must grapple continuously with trade-offs related to *internal vs external focus, control vs flexibility* and *means vs ends*. Recent studies show that the priorities and criteria applied by organisations vary according to the stage of growth of the organisation, conditions in the environment, and with the perceptions of the individual stakeholder (Smith, Mitchell and Summer 1985, Mendelow 1987).

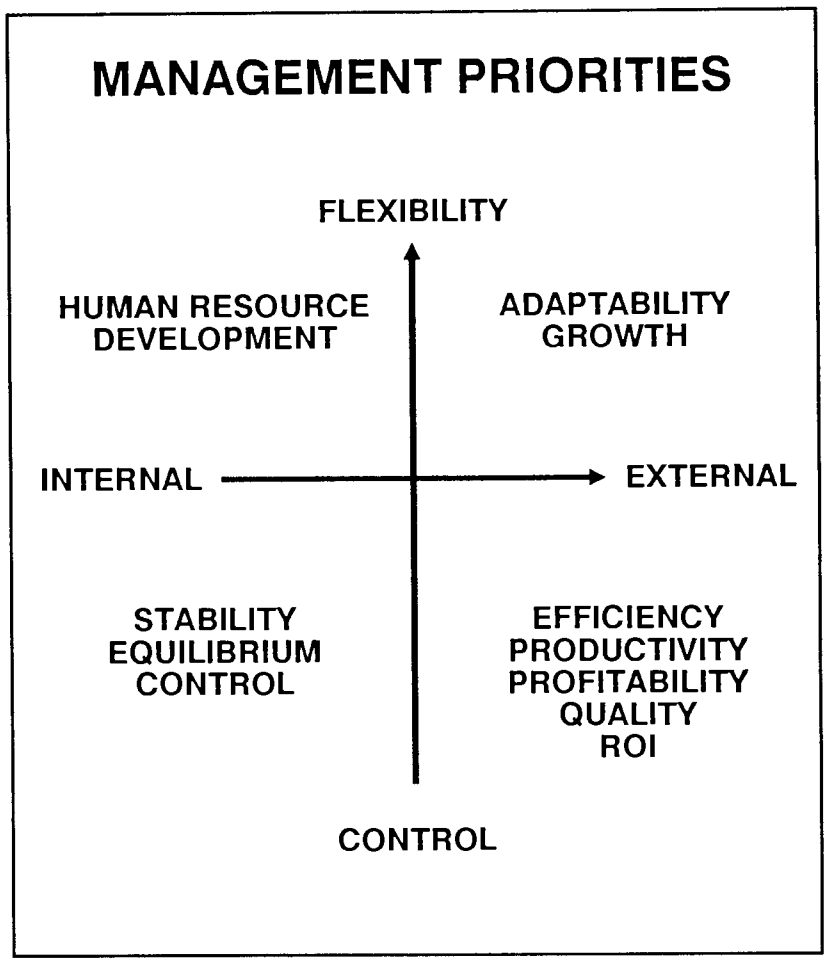


FIGURE 2.4 DIMENSIONS OF ORGANISATIONAL EFFECTIVENESS
(Based on Quinn & Rohrbaugh 1983, Lewin & Minton 1986)

The following conclusions for I/S effectiveness studies can be drawn from the organisational effectiveness literature. Firstly it appears to be futile to search for an objective measure or set of measures for I/S effectiveness that will be common across all organisations. Secondly criteria for I/S effectiveness in a single organisation can be expected to vary with changing value structures, the stage of growth of the organisation, levels in the organisation, etc. Thirdly the values and attitudes of organisation members (especially management), can be expected to play a key role in evaluating I/S effectiveness. In Chapter Three a number of approaches to the definition of I/S effectiveness will be presented and evaluated in the light of these conclusions.

2.4 ORGANISATIONAL BEHAVIOUR

2.4.1 Macro- and Micro-Analysis

The previous sections focused largely on macro perspectives of the organisation. But interplay between I/S staff, users and top management occurs continuously from the initial determination of the need for computer based information to the translation of these needs into implementable products or services, commissioning of the new facilities and ongoing maintenance and day-to-day usage. Thus in this section the theme of the subjective behaviours of organisational members is continued at the micro level by examining psychological and sociological perspectives derived from the field of organisational behaviour.

Organisational behaviour addresses issues related to the individual, the group, between groups and the overall organisation. I/S research draws on behavioural research at all of these levels. This section samples key behavioural studies in I/S in order to show the breadth of applicability of behavioural research to I/S and to introduce topics that will be dealt with in greater detail in the next two chapters.

2.4.2 User Involvement

The participation and involvement of the individual user in I/S is widely regarded as being important for successful I/S[1]. In an extensive review of the literature, Ives and Olson highlight the theory of Participative Decision Making (PDM) due to Locke and Schweiger (1979) as an important starting point. PDM research suggests that user involvement in the systems implementation process should increase user acceptance of new systems and result in greater I/S success. Overall, however evidence for the benefit of user involvement is mixed, possibly due to flawed theorising and/or poor methodology (Ives and Olson 1984).

2.4.3 Group Decision Making

Increasingly organisational decisions are made by groups and within the I/S context groups are particularly important. I/S professionals are organised into groups; users represent subunits such as accounting, personnel and marketing; end users establish

groups for mutual help and swopping of ideas; and I/S staff and users conduct joint projects, develop plans for the future, set priorities for I/S activity etc.

Boland has examined the problem-solving performance of mixed user and I/S teams. In the traditional systems design process designers ask systems-related questions and users respond with suggestions for solutions. Under experimental conditions this protocol is compared with an alternative where both users and designers separately discuss business-related issues and concerns and then come together in mutual discussion of the business requirements. It is found that the alternative groups devise more business- and less computer-oriented solutions, are regarded as having performed better at the task and generate closer communication between I/S and users (Boland 1978).

Henderson (1988) treats I/S planning and design as a problem solving/decision making process and examines the utility of a group problem solving model due to Davis and Smith (1983). He derives a three-component problem solving model and finds that interactive strategies where designers and users are highly involved in every aspect of problem solving correlate with high overall performance.

Group Dynamics examines group cohesion and effectiveness in achieving laid down tasks. Behavioural issues such as the formation of group norms, values and goals, interpersonal attraction, and communication between members are studied (Lau and Jelinek 1984). In one of the few studies of the psychological behaviour of I/S groups, Argyris (1971) concludes that I/S professionals react to stress and tension in ways that tend to inhibit effective problem solving.

These examples reveal the added complexities of group decision-making in the I/S context where I/S professionals and users must work together to reach joint solutions.

2.4.4 Intergroup Phenomena

Information systems groups interact constantly with groups of users in order to define needs and implement systems. An aspect of organisational behaviour research especially relevant to information systems work is therefore that of interactions between groups.

Beath (1987) draws on industrial economics models (Barney and Ouchi 1986) to under-

stand the relationship between I/S and user groups in joint project developments. Two sets of procedures to manage this relationship are evaluated in the I/S context. The traditional set includes formal procedures such as prespecification of acceptance criteria, check-points, and progress and cost control against explicit written agreements. A contrasting set includes social contracting, with more casual but mutually understood agreements, the presence of a sense of personal obligation and commitment, shared responsibilities, frequent contact with users and social assessment of progress and outcomes. She finds empirical support for the notion that the nature of the I/S project should dictate the approach used.

Drawing from the innovation and R & D literature, Zmud (1984) proposes a "push-pull" paradigm for successful systems implementation. In principle, successful implementation should come from the joint efforts of the organisation's I/S managers "pushing" (marketing) their products and services to user managers and the organisation's user managers "pulling" (requesting) products and services into their subunits. Flowing from this, a recent study finds that the extent and nature of I/S-related interactions between I/S and user managers is positively associated with the degree of penetration of I/S products and services into the organisation. Informal communications between these two groups seems to be more important for success than the formal structures and management procedures prescribed in the literature (Zmud, Boynton and Jacobs 1987).

The above studies suggest how I/S and user groups might work together to promote successful I/S. However groups within organisations compete for scarce resources and this results in psychological and sociological phenomena that inhibit successful I/S. For instance it has been asserted that success in terms of larger budgets, staff complements, etc. is highly dependent on political rather than rational-economic decision making (Bariff and Galbraith 1978). Accordingly a study of the exercise of power through political processes in the I/S arena is extremely important.

The determinants of power in organisations include: dependence of others on the powerholder, ability of the powerholder to provide resources, ability of the powerholder to cope with uncertainty, ability to affect a decision making process, and irreplacibility (Pfeffer 1981). The power potential of information and especially access to information is clear. For

instance Markus (1984) asserts that in every information-related event there are winners and losers. Support for or resistance to I/S can be predicted according to the direction and magnitude of implied power shifts.

The determinants of power suggest that the I/S group should be particularly powerful within the organisation, but an empirical study by Lucas (1984) finds that the firms polled do not view their I/S departments as particularly powerful. Markus and Bjørn-Andersen (1986) note that this and other studies report user *perceptions* of power. Exercise of power may occur without users being aware of it and they conclude that current technological trends will simply make it more difficult for users to be aware that power is being exercised, thus diminishing their ability to prevent or mitigate its consequences.

This section has examined the formal structures and informal relationships between I/S and user groups. Both appear to have considerable bearing on the successful implementation of systems. This study will devote much attention to the perceptions of I/S and user groups and the relationships between them.

2.4.5 Organisational Change Management

Information systems and technology initiatives are examples of complex organisational change. The Lewin-Schein model of social change with its three-phase process of unfreezing-moving-refreezing (Schein 1980) holds a central position in the I/S literature. This model and its variants (e.g. Kolb-Frohman 1970) has found much acceptance as a basis for studying the change process in organisations and especially change involving management science and information systems implementations. Zand and Sorensen (1975) show convincingly that the presence of actions consistent with this change model is closely associated with more successful management science implementations. Ginzberg (1979, 1981) comes to similar conclusions in studies of information systems projects.

Again it emerges that social and behavioural phenomena are crucial to success in information systems efforts.

2.5 CONCLUSIONS

It is concluded that, as the information systems field expands to include support for a wide variety of organisational and inter-organisational functions, so a new applied research discipline is emerging. This is the I/S discipline which finds its roots in the computer, organisational and management sciences. The chapter has concentrated on the connections between organisational science and I/S research and has presented micro- and macro-analyses.

Of the various assumptions about reality and human nature that underpin theories of the organisation, the most fruitful ones for I/S research see the organisation as a contextual field of information in which probabilistic and subjective elements play a part. Organisational members are decision makers and information processors coping with uncertainty and equivocality. Through their use of symbols and subjective interpretations of reality they shape their own and their organisation's future. The application of these assumptions about the organisation and its actors will have important implications for theory formulation and research methodology.

It is stated that the concept of I/S effectiveness only has meaning to the extent that I/S contributes to overall organisational effectiveness. However there is no agreed measure or set of measures for organisational effectiveness and indeed it appears that criteria for effectiveness change over time and with stakeholder perspective. Any definition and measurement of I/S effectiveness must be against this background.

Interaction between people is inherent in information processing in general and the creation of computer-based systems in particular. A number of studies grounded in the organisational behaviour discipline were used to demonstrate the emphases on individual, group, intergroup and overall organisational phenomena in I/S research today. Of special relevance to the present study are issues of user involvement, group decision making, the politics involving I/S and user groups and the treatment of I/S implementation as a process of social and organisational change. Important current research contrasts formal structures linking organisational participants with informal relationships and finds that informal processes are at least as important as formal ones.

ENDNOTE

[1] For the purposes of this and subsequent discussion in this thesis a user is regarded as "high enough in the organisation to influence the flow of resources and is also a knowledgeable participant in the business function to be supported." (Beath 1987)

CHAPTER THREE

I/S EFFECTIVENESS RESEARCH

3.1 INTRODUCTION

3.2 DEFINING I/S EFFECTIVENESS

3.2.1 Cost-Benefit Analysis

3.2.2 Economic Analysis

3.2.3 Systems Usage

3.2.4 User Attitudes

3.2.5 Discussion

3.3 MEASURING UIS

3.3.1 UIS Measurement Instruments

3.3.2 The Bailey-Pearson Instrument

3.3.3 The Miller-Doyle Instrument

3.3.4 Measurement Scales

3.4 STUDIES INVOLVING USER INFORMATION SATISFACTION

3.4.1 Empirical Work

3.4.2 Theoretical Grounding

3.5 CONCLUSION

CHAPTER THREE

I/S EFFECTIVENESS RESEARCH

"The most common way to evaluate the MIS function is to listen to 'screams in the hallways'." (Dickson & Wetherbe 1985)

3.1 INTRODUCTION

There is more than a grain of truth in the above quotation. As I/S assumes greater and greater importance in organisations, so does the need to determine I/S effectiveness. Yet there are no absolute measures of information systems effectiveness and, in practice top management often has to resort to informal and imprecise measurement, responding to "he who shouts the loudest".

In the previous chapter it was suggested that the concept of I/S effectiveness only has meaning in relation to organisational effectiveness, but that concept itself is fraught with difficulties. It is not surprising that there is still no agreement as to how to measure I/S effectiveness and that "measuring information systems effectiveness" has for several years remained one of the top ten key issues in successive information systems management surveys. For instance a recent survey notes:

> *"Underlying the problem is the I/S profession's inability to establish and quantify the value of information. Meanwhile, measurement continues to be a critical problem as organisations invest more and more money in information systems." (Brancheau & Wetherbe 1987).*

In that survey, measuring effectiveness was also the issue over which I/S managers and general managers differed the most, with general managers consistently rating this issue more important than their I/S counterparts. Clearly the problem of maximizing information systems effectiveness is exacerbated if the *providers* of the service are less involved with the issue than the *recipients*.

This chapter examines various definitions of information systems effectiveness, in particular contrasting accounting, economics and behavioural perspectives. Attention is paid to the measurement of I/S effectiveness via "user information satisfaction". Special emphasis is placed on the evolution of a new instrument under the direction of this author. Empirical studies of information systems effectiveness, their theoretical grounding and association with other organisational factors are reviewed.

3.2 DEFINING I/S EFFECTIVENESS

3.2.1 Cost-Benefit Analysis

The classic approach to evaluating effectiveness takes an accounting approach and measures the costs and benefits of the target system over time (see for instance Zmud 1983). Once all the identifiable costs and benefits are expressed in financial terms, one of many techniques such as Discounted Cash Flow, Payback Period, Ratio Analysis etc may be adopted to compare different projects with each other, decide whether the potential return for a particular project exceeds some established hurdle rate, conduct a post-implementation evaluation etc. Such approaches were clearly relevant in the "accounting" era of I/S where the main point of computerisation was to automate and reduce the costs of well-understood, structured manual processes. But even then there was a state of unease. The merits and demerits of more and more projects were debated in terms of their so-called "intangible" benefits. Increasingly analysts were called upon to express these intangible benefits in financial terms so that defensible choices could be made[1].

Ginzberg notes that *how* new information will be used must first be understood and then a value can be determined. Accordingly he presents a taxonomy of benefits related to the improvement of organisational processes including:

- information processing and handling
- asset utilisation and resource control
- company planning
- activities fostering organisational flexibility
- organisational learning (Ginzberg 1979)

These categories of improvement are listed in order of difficulty of quantification. While Ginzberg argues strongly that it is both possible and necessary to express all such systems

benefits in a common metric (money), the analysis actually reveals the practical impossibility of applying strict cost-benefit analysis to all process outcomes.

3.2.2 Economic Analysis

The above view of information systems effectiveness stresses the impact of I/S on organisational process. Through improved processes will come ultimate benefits such as increased sales revenues, customer satisfaction etc. By contrast, another well-established approach ignores "process", and draws on micro-economics. The emphasis here is on input-output analysis, where I/S investments and costs represent the inputs and organisational outputs are measured in terms of return on assets, profit as a percentage of sales, growth and other overarching criteria. I/S effectiveness is expressed through measures of technical efficiency.

For instance Chismar and Kriebel (1985) examine the strategic business unit and define its efficiency in terms of the "frontier production function". Comparing across firms, this represents the industry's "best practice" with current technology. Given multiple economic outputs, it is shown how mathematical programming techniques such as Data Envelopment Analysis (Charnes, Cooper & Rhodes 1981) can be used to determine where a firm is in relation to the efficient production frontier and the influence of different mixes of inputs (including I/S) on its position. The precise economic benefit of I/S can then, at least in theory, be determined. Several studies using economic models such as this have been reviewed by Crowston and Treacy (1986), who note that no definitive results have been obtained. Despite strong theoretical merit, input and output measurement and computational difficulties prevent empirical tests.

A recent economics view sees organisations as networks of contracts which govern exchange transactions between members. I/S is viewed as a means to streamline exchange transactions, enabling organisations to operate more efficiently (Williamson 1981, Ciborra 1987). Building on Galbraith's (1977) model of the firm as information processor (see 2.3.2), the transaction costs approach sees information systems as networks of information flows and files necessary to create, set up, control and maintain the organisation's network of exchanges and contracts. The transaction costs approach caters for internal and external information exchanges, shifting organisational and industry boundaries, and formal procedures as well as symbolic exchanges such as rituals, stories

and ceremonies. In terms of the information processing and symbolic discourse perspectives discussed in Chapter Two, transaction cost economics offers a strong basis for measurement of information systems effectiveness, but the key and unresolved methodological issue remains how to measure transaction costs (Ciborra 1987).

3.2.3 Systems Usage

A third approach to evaluating information systems effectiveness is based on individual usage. Assuming that a system has the goal of improving individual performance (through improvement in any of the organisational processes referred to in 3.2.1), then usage of the system becomes a tangible behavioural measure by which to assess changes in individual effectiveness and, in sum, overall organisational effectiveness.

Lucas (1981) describes a series of studies he conducted over the period 1973-1978 in which the dependence of systems usage was examined in relation to a variety of independent variables such as systems quality, user attitudes, decision style and management support. The systems include an administration system, a sales information system, a planning model, a bank information system and a brokerage model. He finds many positive associations between the independent variables and usage. Trice and Treacy (1986) review 17 studies of I/S use and its connection with implementation factors, individual differences and other variables. Again a variety of positive relationships are found.

Several observations can be made here. Firstly usage as a behavioural measure of information systems effectiveness only makes sense if such usage is discretionary. This is indeed the case in the studies reported above, but is obviously not always so. Ginzberg (1978) describes a study of some 30 computer systems all of which were in active use, but several of which were rated as unsatisfactory by many users. In these cases, the users had no choice because the previously existing procedures had been discontinued. Usage and *appropriate* usage may be very different[2]. In particular when the system in question is a planning or decision support system, success may well be measured by a *reduction* in usage as users learn more about underlying relationships and internalise these insights (Srinivasan 1985). The relative unpopularity of the use construct has been traced to the way it has been operationalised in much of the research. The integrated context in which work is accomplished and the extent to which information obtained from a system is

actually used are ignored in these operationalisations. The interpretation of usage behaviour when use is mandated is also problematic (Melone 1988).

Clearly the connection between usage and information systems effectiveness is not straightforward and many variables intervene between individual behaviours and ultimate outcomes for the firm. As shown in Figure 3.1, Trice and Treacy (1986) suggest that utilisation is a necessary but not sufficient condition for systems to affect performance and that utilisation should be regarded as an important intervening variable in the link between information technology and performance. As they say "It is difficult to trace a clean theoretical path between information technology and performance with utilisation, but impossible to trace such a path without it."

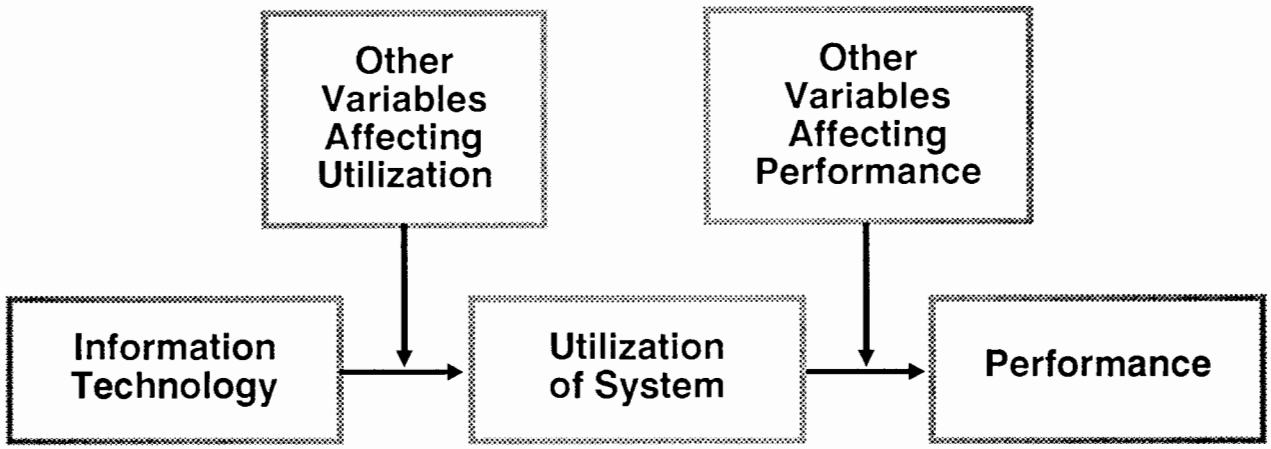


FIGURE 3.1 UTILISATION AS AN INTERVENING VARIABLE

(Source Trice & Treacy 1986)

3.2.4 User Attitudes

A large and growing number of studies of information systems effectiveness treat user attitudes towards I/S as surrogates for value, systems quality, decision making performance, usage and other systems attributes. The attitude construct is generally operationalised as "User Information Satisfaction (UIS)", defined as:

> *"the extent to which users believe the information system available to them meets their information requirements ... a meaningful surrogate for the critical but unmeasurable result of an information system, namely, changes in organisational effectiveness." (Ives, Olson & Baroudi 1983)*

A study of the literature shows a wide diversity of application of the UIS measure. The

"user" in the UIS construct may be the direct user of the system (Baronas & Louis 1988), the manager of such users (Miller & Doyle 1987), top management (Guimaraes & Gupta 1988), or the internal auditor (Hamilton & Chervany 1981b). User attitudes are also compared with those of I/S staff, both in large organisations (Miller & Doyle 1987) and small business (Montazemi 1988).

"Information" can refer to the outputs of a particular data processing system (eg Dickson & Powers 1973), a planning model or decision support system (Snitkin & King 1986), the general service provided by the I/S department (Mendelow 1987, Guimaraes & Gupta 1988), end-user computing (Doll & Torkzadeh 1988) or overall I/S activities (eg Alloway & Quillard 1981, Miller & Doyle 1987).

"Satisfaction" is variously taken to mean feelings about I/S ("How satisfied are you with the overall service provided by your I/S Department?"), objective assessments of performance on specific items ("How well do these reports suit your specific task requirements?"), beliefs about I/S capabilities and other constructs.

3.2.5 Discussion

Four views of information systems effectiveness have been presented, including the extent to which *costs of organisational processes* are reduced relative to I/S costs incurred, the extent to which *overall economic outputs* exceed I/S-related inputs, the extent of measurable *usage of I/S facilities*, and the extent of *users' satisfaction* with their I/S. It is shown that organisational complexities and analytical problems militate against economics approaches. Similarly process approaches such as cost-benefit analysis are fraught with difficulty since key organisational processes do not easily lend themselves to quantitative measurement. Even apparently straightforward measurement of behaviours such as I/S usage falls down because of definition of usage measures and their complicated connection with systems value.

Mason and Swanson include the measurement of costs, economic outputs and usage in the category of "scientific measurement". Here the emphasis is on observing and measuring the properties of an object (eg an information system) so that similar objects may be compared with each other. "A good measure is an *accurate* measure" (Mason & Swanson 1979, p.72). However these authors assert that from a management point of view "the *user*

of measures must be more closely considered. A good measure must be an *influential* one" (p.73).

Mason and Swanson apply Churchman's conditions for something to be conceived of as a system (Churchman 1971) and note in particular that a system serves the interests (values) of a client who is the standard of the measure of performance. They argue that, within the organisational context, measurement for management decision must aid the manager in pursuing the social system's purpose and thus be pragmatic and focus on purpose. The emphasis shifts from "the thing measured to the user and his response to the measure". Rather than attempting to identify and measure as accurately as possible all those elements of an information system that happen to be quantifiable, the quest is for pragmatic measures that are influential in disposing users to behave in particular ways as they pursue the purposes of the organisation.

As will be shown in Chapter Four, "user attitudes" are argued to play an important role in shaping I/S behaviours. In line with the above reasoning, attitudes may thus provide a conceptually sound basis for defining information systems effectiveness.

In summary, this section has shown that, in the quest for a definition of information systems effectiveness, practical and conceptual problems have forced researchers backwards along a logical chain linking information systems to organisational value, ie.:

ATTITUDES ⟶ BEHAVIOURS ⟶ PROCESS OUTCOMES ⟶ ECONOMIC BENEFITS

Currently attitude measurement offers a potential solution both on conceptual grounds because of its emphasis on the larger purpose and on practical grounds since measurement of attitudes is feasible.

However the presumption that positive user attitudes are necessary *and* sufficient for positive economic outcomes or achieving user purposes from information systems is problematic. This would imply that all systems with happy users are successful and all those with unhappy users are failures (Chismar, Kriebel & Melone 1985). It is also not immediately obvious that UIS is the appropriate operationalisation of user attitudes.

Despite these reservations, because of its widespread adoption, the UIS construct, its

measurement, and its application as a surrogate for user attitudes and information systems effectiveness will be dealt with in some detail in subsequent sections of this chapter.

3.3 MEASURING UIS

3.3.1 UIS Measurement Instruments

In view of the frequent application of UIS as a surrogate for I/S effectiveness, various UIS measurement instruments are discussed and critiqued in this section. Table 3.1 lists attributes of twelve instruments that purport to measure UIS.

The table shows that the coverage of UIS instruments varies widely. Some focus on the nature of *the I/S product* only (quality, currency, timeliness of information provided), others include broader issues related to *support provided* to the user (processing of change requests, user training), while some assess all of this plus features of *the overall I/S function* (strategic planning for I/S, application of business-related priorities).

The source documents show very limited theoretical grounding for most UIS instruments. The typical approach to developing a UIS instrument has been to review the literature in the area and identify items that appear to be important facets of UIS. This exploration may be supplemented by in-depth interviews with I/S professionals, users, top managers or other relevant personnel. Likert scales or semantic differential scales are then associated with the items and pilot tests, field tests, and statistical evaluations conducted to evaluate psychometric properties such as reliability and validity. Other researchers are then invited to take up the effort and apply the new instrument in a variety of settings and circumstances to consolidate its applicability.

TABLE 3.1 UIS MEASUREMENT INSTRUMENTS

INSTRUMENT	DERIVATION	COVERAGE	ITEMS	SCALES
Gallagher (1974)	Empirical	IS Product	18	Beliefs
Schultz & Slevin (1975)	Literature & empirical	OR Implementation variables	67	Beliefs & Attitudes
Jenkins & Ricketts (1979)	Literature & interviews	IS Product	5	Beliefs
Larcker & Lessig (1980)	Interviews	IS Product	2	Beliefs
Alloway & Quillard (1981)	Empirical	Product & function	26	Beliefs
Bailey & Pearson (1983)	Literature, interviews, empirical	Product & support	39	Beliefs & Attitudes
Ives, Olson & Baroudi (1983)	Bailey & Pearson	Product & support	22	Beliefs & Attitudes
Sanders (1984)	Literature, interviews, empirical	Product	13	Beliefs & Attitudes
Baroudi & Orlikowski (1986)	Bailey & Pearson	Product & Support	13	Beliefs & Attitudes
Miller & Doyle (1987)	Literature & empirical	Product & function	37	Beliefs
Guimaraes & Gupta (1988)	Interviews & empirical	MIS department	19	Beliefs & Attitudes
Doll & Torkzadeh (1988)	Literature, interviews, empirical	End-user computing	12	Beliefs

While such an approach may be appropriate at the early stages of a discipline, the lack of theoretical underpinning for construct formation and instrument design leads to patchiness in research, uncertain bases for measurement and interpretation and lack of accumulation of knowledge. The large (and growing) number of UIS instruments bear testimony to this fact[3].

A further problem with the available instruments relates to the nature of the perceptions tapped. For instance, Swanson (1982) notes confusion between the psychological constructs of "beliefs" and "attitudes" in the measurement of user perceptions. Referring to Fishbein and Ajzen (1975), he notes that attitudes should be measured on bipolar affective scales (like .. dislike, satisfactory .. unsatisfactory), whereas beliefs are assessments of subjective probabilities (reports are timely: never .. sometimes .. always). The belief construct is cognitive whereas the attitude construct relates to feelings and the two

represent important distinguishable elements. Table 3.1 shows that some instruments measure beliefs and others both beliefs and attitudes, but distinctions are not drawn in the source literature. It is significant that several authors are now starting to call for methodological consistency in the measurement of beliefs, attitudes and UIS (Treacy 1985, Baroudi et al 1986, Galletta & Lederer 1986, Melone 1988).

In short, a wide variety of instruments to measure UIS have been proposed. Their scope varies considerably, their origins are largely empirical and there is methodological confusion as to the perceptions being measured. Against this background two instruments are now discussed in some detail.

3.3.2 The Bailey-Pearson Instrument

Publication of this 39-item instrument in 1983 represented a turning point, promising as it did a common base for measurement of UIS (Bailey & Pearson 1983). The appearance just a few months later of a careful analysis and endorsement of the instrument together with a shortened, psychometrically sounder 22-item version (here referred to as "the IOB version") and an even shorter 13-item "Short Form" generated a good deal of interest (Ives et al 1983). Over 40 requests for this Short Form were received in the period March 1985 - March 1986 (Baroudi & Orlikowski 1986). As shown ahead in Table 3.3, a number of researchers have published empirical results using the Bailey-Pearson instrument or derivatives. The emphasis is on derivatives because no researchers other than Ives et al have published studies using the full version. Montazemi (1988) dropped four items and one scale. Mahmood & Becker (1985), Raymond (1985, 1987) and Tait & Vessey (1988) used the IOB version and others the Short Form. Treacy (1985) used substantial portions of the original instrument in a detailed test of the instrument and the theory behind it. The instrument failed five out of six tests for construct validity. Galletta & Lederer (1986) conducted an experiment to determine test-retest reliability of the Short Form and could not find support. In light of today's end-user computing environment, there is also criticism that the instrument is out of date, having been designed for a 1970s data processing environment (Doll & Torkzadeh 1988).

3.3.3 The Miller-Doyle Instrument

The development of this instrument can be traced to the author's early research into information systems planning (Miller 1982, 1985). There the success of formal company-

wide I/S planning efforts in several South African companies is measured in terms of the subsequent implementation and penetration of planned systems. That work triggered a programme of research to more precisely define and measure I/S success and identify factors other than the I/S planning process that might contribute to perceived success (Doyle & Astbury 1983, Somerville 1984, Baker & Miller 1984, Grallert & Russell 1985, Emanuel 1986, Miller & Doyle 1987, Miller 1988, Miller 1989). This section concentrates on the development of the Miller-Doyle measurement instrument.

The first version of the instrument was developed and tested in mid-1983, and used the Bailey-Pearson and Alloway-Quillard instruments as a starting point (Doyle & Astbury 1983). Relative to other instruments, this work aimed to create an instrument to evaluate the whole I/S function, and which would be shorter and more accessible to higher levels of management than the source instruments. The lack of conceptual base for the Bailey-Pearson instrument was recognised and the fact that, in I/S terms, much time had passed since the items for that instrument had been chosen. A paradigm for I/S against which to establish content validity of a comprehensive and current instrument was thus sought.

Using the Ein-Dor & Segev paradigm for I/S as a basis (see Chapter One), a 38-item instrument was devised and applied to 21 firms in the financial services sector. The construct validity and reliability of the instrument were tested and found to be acceptable (Miller & Doyle 1987). Subsequently surveys of the retailing and manufacturing sectors were also conducted and minor enhancements to the instrument incorporated (Somerville 1984, Grallert & Russell 1985). Further support for the validity of the instrument was obtained in a detailed study of seven companies in which the results of the questionnaire survey were compared with information from independent interviews and group discussions amongst I/S and user managers. The conclusions from these alternative methods were found to be in close agreement (Emanuel 1986).

The author evaluates and integrates the findings of the above surveys, which cover responses from 794 I/S and user managers in 83 firms (Miller 1988). A factor analysis of the 34 items common to all early versions of the instrument is conducted separately for each economic sector and consolidated across sectors.

The results are reproduced in Figure 3.2 and show that the instrument comprises six robust and intuitively meaningful factors.

FIGURE 3.2 FACTOR ANALYSIS OF MILLER-DOYLE INSTRUMENT

Questionnaire Items	TRAD. SYSTEMS M	R	F	C	IS STAFF QUALITY M	R	F	C	STRAT. ISSUES M	R	F	C	USER PARTIC. M	R	F	C	RESPONSE TO CHANGE M	R	F	C	DSS/EUC M	R	F	C
ACCURACY OF OUTPUT INFORMATION	*	*	*	.72																				
CURRENCY OF OUTPUT INFORMATION	*	*	*	.72																				
COMPLETENESS OF OUTPUT INFORMATION	*	*	*	.70																				
USER CONFIDENCE IN SYSTEMS		*	*	.60																				
RELEVANCE OF REPORT CONTENTS	*		*	.62																				
TIMELINESS OF REPORT DELIVERY	*	*	*	.58																				
EFFICIENT RUNNING OF CURRENT SYSTEMS	+		*	.56																				
OVERALL COST-EFFECTIVENESS OF I/S			+	.47																				
LOW HARDWARE & SYSTEMS DOWNTIME	*	*	+	.41																				
DATA SECURITY & PRIVACY	+		+	.40																				
COMPETENCE OF SYSTEMS ANALYSTS					*	*	*	.62																
TECHNICAL COMPETENCE OF I/S STAFF					*	+	*	.60																
POSITIVE ATTITUDE OF I/S TO USERS						*	*	.57																
I/S SUPPORT FOR USER PROPOSALS							*	.55																
USER-ORIENTED SYSTEMS ANALYSTS						*	*	.53																
IS/USER-MANAGER COMMUNICATIONS						*	*	.50																
TOP MANAGEMENT INVOLVEMENT IN I/S POLICY									*	*	*	.74												
PREPARATION OF A STRATEGIC I/S PLAN									*	*	*	.71												
BUSINESS-RELATED I/S PRIORITIES									*	*	*	.59												
STEERING COMMITTEE TO OVERSEE I/S									+	*	*	.52												
USING DATA BASE TECHNOLOGY									*	*	+	.51												
MORE I/S EFFORT ON NEW SYSTEMS									+	+	+	.40												
USERS' FEELING OF PARTICIPATION													*	*	*	.63								
USERS' UNDERSTANDING OF SYSTEMS													*	*	*	.49								
USER CONTROL OVER I/S SERVICES													*	*	+	.45								
SHORT LEADTIME FOR NEW DEVELOPMENTS																	*	*	*	.56				
FLEXIBILITY OF DATA AND REPORTS																		+	+	.56				
RESPONSIVENESS TO CHANGING USER NEEDS																	*	*	+	.49				
PROMPT PROCESSING OF CHANGE REQUESTS																	*	*	+	.48				
IMPROVING NEW SYSTEMS DEVELOPMENT																	+	*	+					
DATA ANALYSIS TO SUPPORT DECISION-MAKING																					*	*	*	.56
MODELS TO ANALYSE BUSINESS ALTERNATIVES																					*	*	*	.48

F = FINANCIAL SERVICES R = RETAILING M = MANUFACTURING C = CONSOLIDATED SET
* = HIGHEST LOADING AND > = .50 , + = HIGHEST LOADING BUT < .50

Additional items loading equally on several factors:
EASY USER ACCESS TO TERMINALS/PCs
EFFECTIVE USER TRAINING IN I/S

(Source: Miller 1988)

As shown in Figure 3.3 there is a good mapping of these factors onto the three subcomponents of the Ein-Dor & Segev paradigm for MIS, the paradigm chosen to ground the instrument (see section 1.2 for a fuller description of the Ein-Dor & Segev paradigm).

MILLER-DOYLE Factors	EIN-DOR & SEGEV Subcomponents
Traditional Systems	Structural
Decision Support/EUC	Structural
IS Staff Quality	Behavioural
User Participation	Behavioural
Strategic Issues	Procedural
Responsiveness to Changing Needs	Procedural

FIGURE 3.3 MAPPING OF I/S CONSTRUCTS
(Sources: Miller 1988, p.103, Ein-Dor & Segev 1981, p.9).

The latest version of the instrument includes two new items, one related to office automation facilities and the other to I/S for competitive advantage. Table 3.2 lists all of the items in the full Bailey-Pearson instrument and additional ones appearing in the Alloway-Quillard and latest version of the Miller-Doyle instruments. Subsets of the Bailey-Pearson items included in the IOB version and Short Form are also shown. The list is ordered to reveal how the content of I/S measurement instruments is shifting in nature. It can be seen that technical items such as computer languages, documentation of systems and error recovery in the original Bailey-Pearson instrument are discarded. These issues may have been important in the 1970s mainframe environment but have now been resolved or have declined in importance. By contrast new items cover strategic issues like steering committees and priorities reflecting organisational objectives, highlighting current management concerns, and items such as models to analyse business alternatives, reflecting the central role of end-user computing today.

TABLE 3.2 LISTING OF ITEMS IN SELECTED UIS INSTRUMENTS

	B-P	IOB	SF	A-Q	M-D*
Schedule of products and services	*				
Language for interaction with system	*				
Format of output	*				
Documentation of systems and procedures	*				
Error recovery for corrections and reruns	*				
Response/turnaround time (online/batch)	*				
Integration of systems across functional areas	*				
Organisational position of the EDP function	*				
Organisational competition with the EDP unit	*				
Expectations regarding I/S products/services	*				
Job effects - changes due to computer systems	*				
Vendor support	*	*			
Priorities determination (fairness)	*	*			
Volume of output	*	*			
Reliability of output information	*	*	*		
Precision of output information	*	*	*		
Relationship with the EDP staff	*	*	*		
Users' feeling of participation	*	*	*		*
Users' understanding of systems	*	*	*		*
Processing of change requests	*	*	*		*
Completeness of output contents	*	*	*		*
Accuracy of output information	*	*	*	*	*
Relevancy of products/services provided	*	*	*	*	*
Time required for new development	*	*	*	*	*
Attitude of EDP staff	*	*	*	*	*
Communication with EDP staff	*	*	*	*	*
Degree of training in user proficiency	*	*	*	*	*
Currency of output information	*	*		*	*
Convenience of access to computer system	*	*		*	*
Flexibility of systems	*	*		*	*
Timeliness of output information	*	*		*	*
Users' feeling of control/influence	*	*			*
Users' confidence in systems	*	*			*
Means of interface with EDP centre	*				*
Perceived utility/cost-effectiveness	*				*
Technical competence of EDP staff	*			*	*
Security of data	*			*	*
Top management involvement	*			*	*
Charge-back method of payment for services	*			*	
Appropriate I/S budget or growth rate				*	
The new system request backlog				*	
Developing more monitor systems				*	
Developing more exception systems				*	
Developing more inquiry systems				*	
Developing more analysis systems				*	
Efficiency of hardware utilisation				*	
Hardware and systems downtime				*	*
Technical sophistication of new systems				*	*
Quality of systems analysts				*	*
User-oriented systems analysts				*	*
I/S support for users in preparing I/S proposals				*	*
Increased I/S effort on creating new systems				*	*
Responsiveness to changing user needs				*	*
I/S strategic planning and resource allocation				*	*
Use of I/S steering committee					*
Priorities reflecting organisational objectives					*
I/S providing competitive advantage					*
Integration of office communications and I/S					*
Direct user access to data and models					*
Quick and flexible access to computer data					*
Models to analyze business alternatives					*
Data analysis to support decision-making					*

*Column Headings: B-P = Bailey-Pearson, IOB = Ives et al, SF = Short Form, A-Q = Alloway-Quillard, M-D = Miller-Doyle

Publication of the original version of the Miller-Doyle instrument prompted a dozen requests for the updated version from researchers throughout the world. Howard (1987) identifies this instrument as an important step towards a comprehensive UIS measure and Deprez (1988), in his review of the measurement of information systems effectiveness, discusses the instrument at length, listing all its items and scales. He too focuses on the need for a comprehensive measure of information systems effectiveness.

3.3.4 Measurement Scales

User perceptions form the basis for UIS measurement and are gathered through written responses to one or more scales. It is the structure and wording of these scales that to a large extent determines the concept being tapped. Typically Semantic Differential scales (Osgood et al 1957) or Likert-type scales are used and the information gathered on different facets may be cognitive, affective, intentional or behavioural (Fishbein & Ajzen 1975). Figure 3.4 uses the topic of computer terminal response times to contrast these facets. Figure 3.5 shows the scales used in the Miller-Doyle instrument and examples of scales from the original Bailey-Pearson and subsequent Short Form version. The substantial differences mirror the wide variety of scales in use.

As shown previously in Table 3.1, existing UIS instruments tap both cognitive (beliefs, knowledge possessed) and affective (attitudinal) perceptions without necessarily discriminating between them in the research design or methodology.

Of particular relevance to the current study is the "importance" scale. Importance scales are used *as a means to select attributes* for inclusion in a UIS questionnaire (Guimaraes & Gupta 1988) and *to compare evaluator viewpoints* (Mendelow 1987). Bailey and Pearson (1983), use an important ... unimportant scale *as a weighting factor* for assessing UIS. However Ives et al (1983) note that the weighted and unweighted scores for the attributes in this work are highly correlated and therefore recommend discarding of the importance scale. Other researchers also find that this weighting adds no further information to that provided by unweighted scores and discard it for this purpose (Doyle & Astbury 1983, Montazemi 1988).

Alloway & Quillard (1981) and Miller & Doyle (1987) treat importance as a separate

dimension and compare importance with performance ratings. These studies will be reviewed together with other field studies in the next section.

FIGURE 3.4 MEASUREMENT SCALES AND BEHAVIOURAL CONSTRUCTS

cognitive - Regarding service to our customers, quick terminal response is:

unimportant . . . . .somewhat important . . . .very important . . . . . essential
1 2 3 4

affective - Response times at our customer terminals are generally:

excellent 1 2 3 4 5 very poor

intentional - Are you planning to improve terminal response times in the next year?

no . . . . . .possibly . . . . . .very likely . . . . . .definitely
1 2 3 4

behavioural - In the last month average response times were:

< 1 sec . . . . . 1-3 sec . . . . . > 3 sec

FIGURE 3.5 UIS INSTRUMENTS : EXAMPLES OF SCALES

BAILEY-PEARSON

Item: Degree of EDP training provided to users: The amount of specialised instruction and practice that is afforded to the user to increase the user's proficiency in utilizing the computer capacity that is available.

complete	: : : : : : :	incomplete
sufficient	: : : : : : :	insufficient
high	: : : : : : :	low
superior	: : : : : : :	inferior
satisfactory	: : : : : : :	unsatisfactory
To me this factor is important	: : : : : : :	unimportant

The seven intervals are denoted by adverbial qualifiers; extremely, quite, slightly, neither/equally, slightly, quite, extremely.

BAILEY-PEARSON SHORT FORM

Item: Users' feelings of participation

positive	: : : : : : :	negative
sufficient	: : : : : : :	insufficient

The seven intervals denoted as above, except that the middle interval also caters for "does not apply".

MILLER-DOYLE

Item: A low percentage of hardware and systems downtime

Importance Scale ("assess the importance to your organisation's activities")

Irrelevant		Possibly Useful		Important		Very Critical
1	2	3	4	5	6	7

Performance Scale ("assess your organisation's performance on this item")

Very Poor		Poor		Good		Excellent
1	2	3	4	5	6	7

(Sources: Bailey & Pearson 1983, Baroudi & Orlikowski 1986, Miller & Doyle 1987)

3.4 STUDIES INVOLVING USER INFORMATION SATISFACTION

3.4.1 Empirical Work

The UIS construct and associated measurement instruments have implicitly and explicitly become the vehicle for evaluating information systems effectiveness. This section categorises a number of such studies and examines their theoretical base.

One of the earliest studies in this category is that of Dickson and Powers (1973). They attempt to correlate four success criteria for MIS projects with 16 organisational factors (management participation, measurable objectives, documentation standards etc). The success criteria are: time to complete project, cost of development, impact of project on computer operations and user satisfaction. Several factors are found to relate to their user satisfaction scales. They also find that the four success criteria are independent of each other. Table 3.3 lists features of this study and a further 19 empirical studies in which UIS is employed to tap user perceptions. The table is in chronological order to reveal possible developments over time[4].

The studies are characterised by great diversity. There is a mixture of factor studies searching for contingent relations with UIS (eg Raymond's and Montazemi's studies of factors influencing UIS in Canadian small business firms) and process studies in particular examining the implementation process (eg Baronas & Louis' study of users' perception of control during implementation).

The UIS studies also vary considerably in the unit of analysis, including a particular system in a single firm (Robey), a single class of system across firms (Srinivasan), satisfaction with the I/S department (Mendelow), end-user computing (Doll & Torkzadeh), and overall I/S activity (Miller).

Generally UIS studies examine the attitudes and perceptions of user managers, but here too there is a range of respondents from chief executives (Miller & Baker) to payroll clerks (Baronas & Louis).

TABLE 3.3 STUDIES INVOLVING UIS MEASUREMENT

AUTHORS	INDEPENDENT VARIABLES	MEASURES	FOCUS OF STUDY	RESPONDENTS	COMMENTS
DICKSON POWERS 1973	PROJECT AND ORGANISATIONAL CHARACTERISTICS	ATTITUDES: SCALES NOT SPECIFIED	MIS PROJECTS	MANAGERS	SEVERAL I/S RELATED ORGANISATIONAL FACTORS ARE RELATED TO UIS; UIS IS INDEPENDENT OF PROJECT TIME AND COST VARIABLES. LARGE DIFFERENCE BETWEEN I/S AND USER RANKINGS.
SCHEWE 1976	SYSTEM AND ORGAN-ISATIONAL CHARACTERISTICS	10 ATTITUDE SCALES SYSTEMS	BATCH AND ON-LINE	79 USER MANAGERS	SOME ASSOCIATIONS BETWEEEN USE, ATTITUDES AND INDEPENDENT VARIABLES.
ROBEY/ ZELLER 1978	SYSTEM ADOPTION	SCHULTZ/ SLEVIN	A QUALITY INFORMATION SYSTEM	11 MANAGERS AND USERS	ADOPTION OF SYSTEM INFLUENCED BY ATTITUDES REGARDING INDIVIDUAL PERFORMANCE AND IMPORTANCE/ URGENCY OF SYSTEM. ORGANISATIONAL FACTORS ALSO INFLUENCE ADOPTION.
ROBEY 1979	USE, PERCEIVED WORTH	SCHULTZ/ SLEVIN	CUSTOMER DATA BASE	66 SALES PERSONNEL	USER ATTITUDES MORE STRONGLY CORRELATED WITH USE THAN WITH PERCEIVED WORTH.
GINZBERG 1981	USERS' PRE-IMPLEMENTATION EXPECTATIONS	5 ATTITUDE SCALES	A PORTFOLIO MANAGEMENT SYSTEM	35 PORTFOLIO MANAGERS	REALISTIC EXPECTATIONS CORRELATE WITH UIS AND USAGE.
BAKER/ MILLER 1984	I/S IMPORTANCE RATING; NOLAN STAGES	15 ATTITUDE SCALES	I/S FUNCTION	180 CEO'S	UIS CORRELATES WITH OVERALL IMPORT-ANCE RATING AND PRESENCE OF DATA BASE, INQUIRY AND DSS FACILITIES
SRINIVASAN 1985	USE	JENKINS/ RICKETTS INSTRUMENT	MODELLING SYSTEMS	29 CORPORATE PLANNERS	UIS AND USE OF MODELLING SYSTEMS NOT ALWAYS POSITIVELY CORRELATED. FIT BETWEEN NEEDS AND FEATURES PROMOTES UIS
RAYMOND 1985, 1987	7 ORGANISATIONAL FACTORS	20 ITEMS FROM BAILEY-PEARSON	I/S SUPPORT	464 CONTROLLERS IN SMALL BUSINESS FIRMS	STRONGER ASSOCIATIONS WITH UIS THAN WITH USE. UIS CORRELATED WITH IN-HOUSE DEVELOPMENT EFFORT AND OTHER FACTORS
MAHMOOD/ BECKER 1985	ORGANISATIONAL MATURITY IN I/S	22 ITEMS FROM BAILEY-PEARSON	I/S ORGANISATION	59 USER-MANAGERS	UIS ASSOCIATES WITH DIFFERENT LEVELS OF I/S MATURITY.
FRANZ/ ROBEY 1986	USER INVOLVEMENT; ORGANISATIONAL CONTEXT	12 PERCEIVED USEFULNESS SCALES	PARTICULAR SYSTEMS	118 USER-MANAGERS; PROFIT/ NON-PROFIT	UIS CORRELATES WITH INVOLVEMENT IN DESIGN AND IMPLEMENTATION. UIS ALSO INFLUENCED BY VARIOUS FEATURES OF MIS DEPARTMENT
SNITKIN/ KING 1986	USE, USER SYSTEM CHARACTERISTICS	SINGLE EFFECTIVENESS SCALE	PERSONAL DSSs	31 USERS	HIGH CORRELATION BETWEEN USE AND UIS. OTHER ASSOCIATIONS ALSO FOUND.
EMANUEL 1986	13 MANAGERIAL FACTORS	MILLER-DOYLE INSTRUMENT	THE I/S FUNCTION	98 MANAGERS AND I/S PROFESSIONALS	UIS CORRELATES WELL WITH PRESENCE OF IMPORTANT MANAGERIAL FACTORS.
BARQUDI/ OLSON/IVES 1986	USE, USER INVOLVEMENT	BAILEY-PEARSON INSTRUMENT	I/S ACTIVITY	200 PRODUCTION MANAGERS	USER INVOLVEMENT LEADS TO UIS AND USAGE. UIS PROMOTES SYSTEMS USE.
MENDELOW 1987	MANAGERS VS.I/S PROFESSIONALS	42 EFFECTIV-ENESS CRITERIA	IS DEPARTMENT	106 USER-MANAGERS AND I/S PROFESSIONALS	USERS AND I/S PROFESSIONALS DIFFER ON RELATIVE IMPORTANCE OF EFFECTIVENESS CRITERIA.
HILL/SMITH MANN 1987	SENSE OF COMPUTER EFFICACY	BELIEF AND INTENTION SCALES	COMPUTER PURCHASE DECISION	437 UNDERGRADUATE STUDENTS	BELIEFS ABOUT PERSONAL COMPUTER EFFICACY INFLUENCE EVENTUAL PURCHASE DECISION
MILLER 1988	INDUSTRY SECTORS	MILLER-DOYLE INSTRUMENT	I/S ACTIVITY	794 USER AND I/S MANAGERS	PERFORMANCE RATING ASSOCIATES WITH IMPORTANCE-PERFORMANCE CORRELATIONS.
BARONAS/ LOUIS 1988	CONTROL DURING IMPLEMENTATION	BAILEY-PEARSON SHORT FORM	PAYROLL SYSTEM	92 PAYROLL/ PERSONNEL EMPLOYEES	PERCEIVED CONTROL CORRELATES WITH UIS.
TAIT/ VESSEY 1988	USER INVOLVEMENT	BAILEY-PEARSON 22 ITEMS	SPECIFIC SYSTEMS	42 PAIRS OF USERS AND DESIGNERS	UIS NEGATIVELY INFLUENCED BY SYSTEM COMPLEXITY AND RESOURCE CONSTRAINTS.
MONTAZEMI 1988	7 ORGANISATIONAL FACTORS	BAILEY-PEARSON 35 ITEMS	I/S ACTIVITY	164 USERS AND I/S PERSONNEL IN 42 SMALL BUSINESSES	SEVERAL ORGANISATIONAL FACTORS CORRELATE WITH UIS. STRONG CORRELATIONS BETWEEN I/S AND USERS.
COLLINS/MANN 1988	HUMAN NEEDS, GROUP INFLUENCE, MANAGEMENT STYLE	BELIEF AND ATTITUDE SCALES	REAL ESTATE DATA BASE	362 REALTORS	HUMAN NEEDS, GROUP NORMS AND MANAGEMENT STYLE INFLUENCE INTENTION TO USE DATA BASE

Only a few UIS studies tap the perceptions of I/S professionals, input from this group being reserved for technical assessments (eg Mahmood & Becker rely on I/S managers to define the stage of growth of I/S in the firms they study, but gather information satisfaction data from users). While, by definition, the "bottom line" is *user* satisfaction, Dickson and Powers find that:

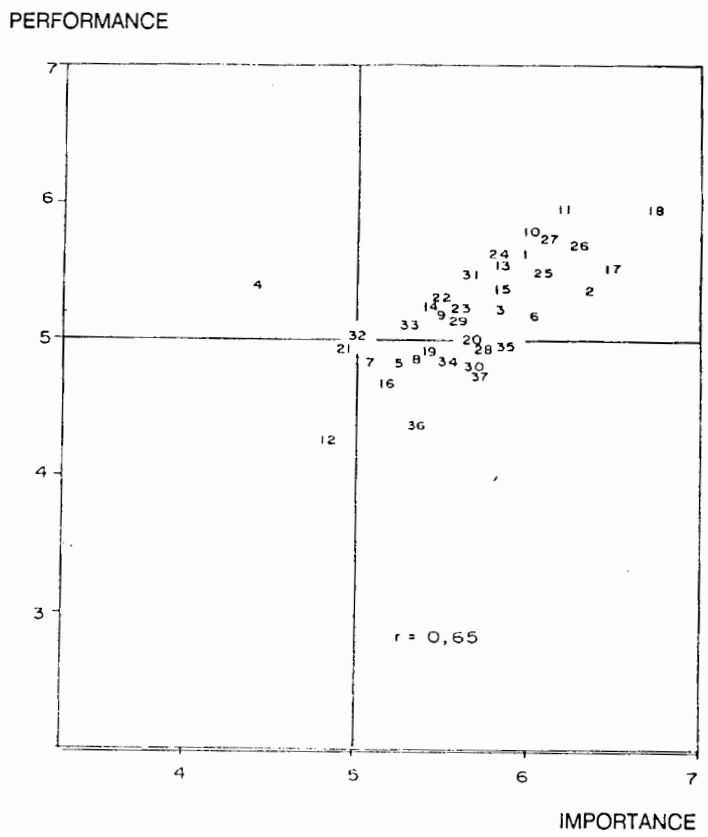
> *"a very, very great difference exists between what factors MIS professionals believe to be important to MIS project success and what factors a depth study shows to actually be related to successful projects." (Dickson & Powers 1973 p.411)*

In other studies shown in the table Mendelow finds large differences between I/S and user manager perceptions of items important for I/S success, but Alloway & Quillard and Montazemi find I/S and users in complete agreement on importance and UIS ratings. These contradictory findings suggest that important insights can be gained by comparing I/S and user perceptions.

Some studies compare importance and performance ratings and these have a direct bearing on the present work. Alloway and Quillard (1981) plot importance ratings against performance ratings for the 1000+ respondents to their 26-item instrument, but find no correlation. By contrast Doyle and Astbury (1983) use their 38-item instrument to poll 276 managers in 21 firms in the financial services sector and do find correlations between importance and performance. The degree of association varies with level of perceived performance. This finding is subsequently confirmed in further two studies, one involving 21 firms in the retail sector (Somerville 1984) and the other using 45 firms in the manufacturing sector (Grallert & Russell 1985). The results of these studies are synthesised by Miller (1988). Figure 3.6 shows importance-performance plots for groups of firms showing relatively high and relatively low performance ratings respectively.

FIGURE 3.6 IMPORTANCE versus PERFORMANCE PLOTS

(Source: Miller 1988)



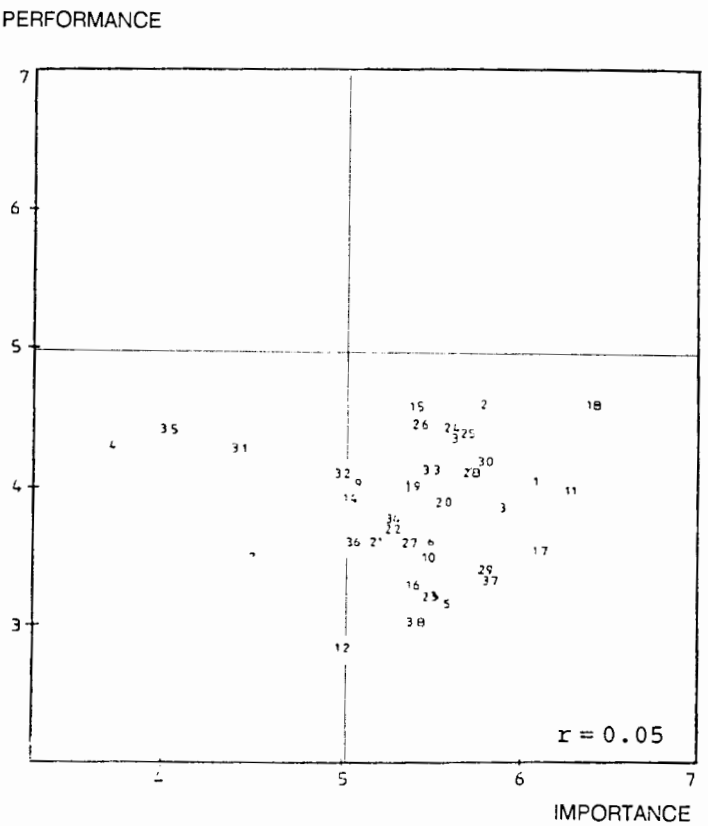


Table 3.4 shows correlation coefficients for so-called "success groups" of firms, where Group 1 firms have the highest perceived performance levels and Group 4 the lowest. All correlation coefficients are significant at the 3% level or better, except for Group 4 in the Financial Services sector[5].

SUCCESS GROUP	MANUFACTURING	RETAILING	FIN. SERVICES
	Correlation Coefficients (r)		
1	.65	.67	.52
2	.65	.49	.30
3	.55	.44	.31
4	.50	.30	.05

TABLE 3.4 CORRELATION BETWEEN IMPORTANCE AND PERFORMANCE

(Source: Miller 1988)

3.4.1 Theoretical Grounding

It is useful to examine the role of theory in the studies reviewed here in light of other reviews of earlier I/S studies. Swanson (1982) reviews 14 I/S studies that measure user attitudes, covering the period 1973-1981. He reports a variety of results that are sometimes conflicting and suggests that inconsistencies may arise through adoption of different research perspectives or, as mentioned earlier, failure to distinguish between different psychological constructs probed by the research instruments. Since few of the studies were grounded in theory, choice of measurement instrument had to have been based on other less satisfactory criteria such as methodology or expediency.

In their review of research into user involvement and MIS success, Ives and Olson (1984) examine studies up to about June 1982. They find most work in this area atheoretic, methodologically flawed and relying on inadequate measures. In particular they find that

> *"the typical information satisfaction measure is not usually generalizable outside of the particular system for which it is developed [and] there is no basis for comparing information satisfaction across systems, organisations or research studies." (Ives & Olson 1984 p.600)*

Table 3.3 reveals a tendency towards stronger theoretical grounding in more recent times. Robey draws on *expectancy theory* in his study and Ginzberg's study on pre-implemen-

tation expectations develops hypotheses grounded in expectancy theory and *social change theory. Nolan's stage theory* is used by Mahmood and Becker and Franz & Robey[6]. Social change theory is also a basis for the work of Franz & Robey, Baroudi et al, and Tait & Vessey. *Participative decision making* theory is used by Baroudi et al and Tait & Vessey. Baronas & Louis test theories of *perceived control* drawn from the social psychology discipline and Hill et al and Collins & Mann test hypotheses emanating from the *theory of "reasoned action"* (Ajzen & Fishbein 1980).

These observations suggest that I/S researchers are now placing greater emphasis on theory and especially behavioural theory (see also Chapter Two).

3.5 CONCLUSION

This chapter has reviewed conceptual and empirical studies of information systems effectiveness. Various approaches to the definition of information systems effectiveness as a "scientific" construct amenable to accurate measurement were discussed, including organisational process, economic and usage models. These views were contrasted with the interpretation of information systems effectiveness as a "management" construct, requiring measures that are pragmatic, concerned with purpose and focused on the client or user.

Important characteristics of twelve UIS measurement instruments were discussed. It was suggested that the lack of a generally accepted base of theory has led to a proliferation of UIS measurement instruments. Despite attempts to establish one of these (the Bailey & Pearson instrument) as a common basis for measurement of UIS, almost no studies using this tool have been published. Rather, researchers have created a variety of shortened and modified versions, progressively departing from the original in terms of items and scales. The author's development and validation of a new measurement instrument (the Miller-Doyle instrument) was described in some detail.

The chapter also reviewed 20 empirical studies into information systems effectiveness using the user information satisfaction (UIS) construct. It was concluded that information systems research in general and UIS studies in particular have lacked strong theoretical underpinning and this has slowed down progress in understanding the elements contribut-

ing to information systems effectiveness. Recently there has, however been a growing emphasis on social psychology as a grounding for I/S studies and a number of researchers have drawn on the theory of reasoned action due to Ajzen & Fishbein (1980) for theory formation and measurement of perceptions.

A series of empirical studies using the Miller & Doyle instrument was discussed. This instrument explicitly uses an importance rating as one of its scales. Outcomes from broadly-based surveys using the instrument have consistently revealed that high perceived I/S performance is associated with positive correlations between importance and performance, suggesting the importance of "fit" or alignment between organisational needs and I/S facilities.

The next chapter proposes a general model of I/S-related behaviour and states the hypotheses to be tested in this study.

ENDNOTES

[1] This author had many opportunities to exercise creativity in translating potential improvements in decision-making, office communications, customer service etc into annual cashflows and then on to Internal Rates of Return. Often the real challenge was to work backwards from a desired ROI to plausible savings figures - "playing the numbers game".

[2] An example may be quoted of a major on-line personnel information system where users call up detailed or summary information on employees. The tendency is to select the detailed (and costlier) displays much more often than necessary, because it saves the effort of deciding amongst the levels of summary. Simple measures of use would suggest that this system was being used most successfully.

[3] Two examples of generalizable instruments that are grounded in conceptual models are those of Jenkins and Ricketts who base their instrument on Simon's model of the problem solving process (see Srinivasan 1985) and Miller and Doyle who used the Ein-Dor & Segev (1981) paradigm for MIS to supplement items from the Bailey & Pearson and Alloway & Quillard instruments (see Doyle & Astbury 1983).

[4] Only a few studies from the 1970s are listed. Extensive reviews applicable to this period are available (Zmud 1979, Swanson 1982, Ives & Olson 1984)

[5] Referring to section 3.3.4 and the discussion of importance scales, it appears that the utility of an importance weighting depends on the correlation between this rating and the rating of the perception being weighted. If the correlation is significant, depending on its sign the importance weighting will serve to strengthen or weaken the perception being measured. If there is no correlation, the importance weighting will simply increase the variance in the individual perceptions.

[6] This theory has been strongly criticised (see Benbasat et al (1984) and King & Kraemer (1984))

CHAPTER FOUR

A MODEL OF INFORMATION SYSTEMS BEHAVIOURS

4.1 INTRODUCTION

4.2 THE THEORY OF REASONED ACTION

4.3 I/S SATISFACTORINESS

4.3.1 The Satisfactoriness Construct

4.3.2 Measuring I/S Satisfactoriness

4.4 A MODEL OF I/S BEHAVIOURS

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CHAPTER FOUR

A MODEL OF INFORMATION SYSTEMS BEHAVIOURS

"Most managers get into trouble because they forget to think in circles ... Managerial problems persist because managers continue to believe that there are such things as unilateral causation, independent and dependent variables, origins, and terminations." (Weick 1979, p.86)

4.1 INTRODUCTION

Chapter Three reviewed the history of attempts to define and measure I/S effectiveness and suggested that, on pragmatic and conceptual grounds, the perceptions of users form a sound basis to solve this problem. The chapter also found that early research into I/S effectiveness was atheoretic and methodologically flawed, but that a number of recent I/S studies were grounded in well accepted psychological theories. The desirability of theoretical grounding is obvious and indeed recently there has been a specific call for a more theoretical view of user satisfaction and examination of the link between attitudes, behaviours and I/S effectiveness (Melone 1988).

This chapter offers a model of I/S behaviours that builds on and synthesises previous theoretical work, provides an explanation for the empirical findings regarding importance-performance correlations described in the previous chapter and enables further and more detailed testing of I/S-related hypotheses. The model builds on the theory of reasoned action and draws from the job satisfaction literature to establish a particular set of cognitive beliefs that shape attitudes to I/S. It is then shown that discrepancy theory can be used to measure the proposed belief structures. Previous research that provides support for different aspects of the current model is noted. The specific hypotheses examined in this study are developed and the instrument used as the measurement tool is discussed.

4.2 THE THEORY OF REASONED ACTION

In 1975 Fishbein and Ajzen presented a model relating beliefs, attitudes, intentions and behaviour (Fishbein & Ajzen 1975). Their initial conceptual framework is shown in Figure 4.1 and will be briefly described below.

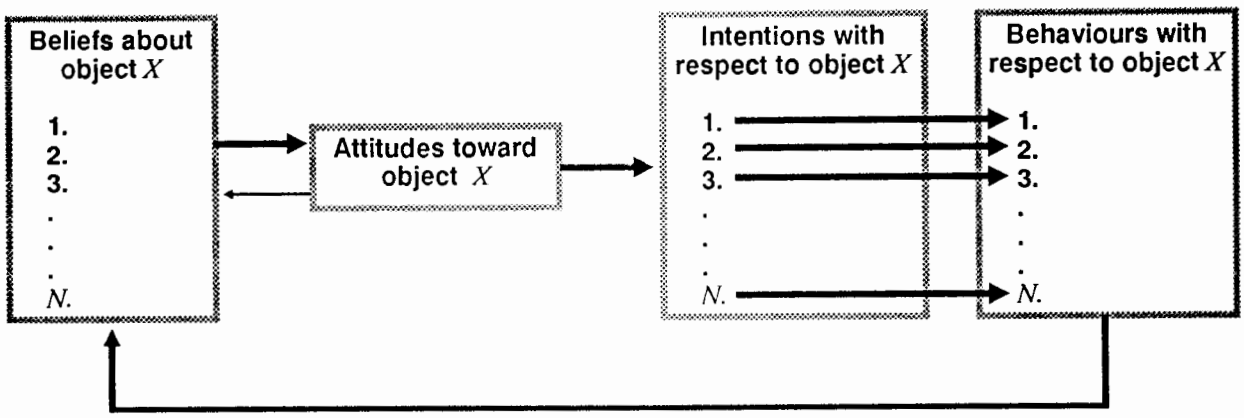


Figure 4.1 BELIEFS, ATTITUDES, INTENTIONS AND BEHAVIOURS

(Source : Fishbein & Ajzen 1975 p.15)

On the basis of direct observation or information received, a person forms a number of *beliefs* about an object and specifically about certain attributes associated with that object. The extent of a belief is measured in terms of the perceived likelihood that the object has the attribute in question, thus placing the person along a dimension of subjective probability involving the object and its related attribute. For example a father's assessment of the likelihood that television may serve an educational purpose for his child is such a belief. Formation of beliefs is regarded as a rational, "thinking" process.

In contrast to the cognitive foundation for a belief, "affect" is the essential component of the concept *attitude*. Attitudes are defined as feelings towards or against an object and, according to the model, are formed on the basis of a person's cognitive beliefs about that object. Attitudes are measured by locating the person on a bipolar affective or evaluative dimension vis-a-vis the object. Thus if the father has generally favourable beliefs about the benefits of television, this set of beliefs will lead to positive feelings that might be measured on a scale from "bad" to "good".

Attitudes predispose an individual to behave in a certain way. This is the *behavioural intention*, defined as the subjective probability that the individual will perform the behaviour in question. Thus intention is also seen as a cognitive process to be measured on a probability dimension. In the example, the likelihood that the father will wish to purchase a television set will be influenced by his attitude towards television.

Finally *behaviour* refers to the overt acts of the subject and is the tangible outcome of the intention to act. Intentions and actions are distinguished since, for instance, the intention to purchase a TV may have a high probability, but still not occur because of a lack of funds, or a low trade credit rating.

While this model links beliefs and attitudes about a particular object to *general* behaviours with respect to that object, it is not intended to predict a *specific* action. For this the individual's beliefs and attitudes about that specific action must be determined as well as his beliefs that particular people or groups think he should or should not perform the action. These ideas are captured in Figure 4.2 below which is the framework for the Theory of Reasoned Action (Ajzen & Fishbein 1980).

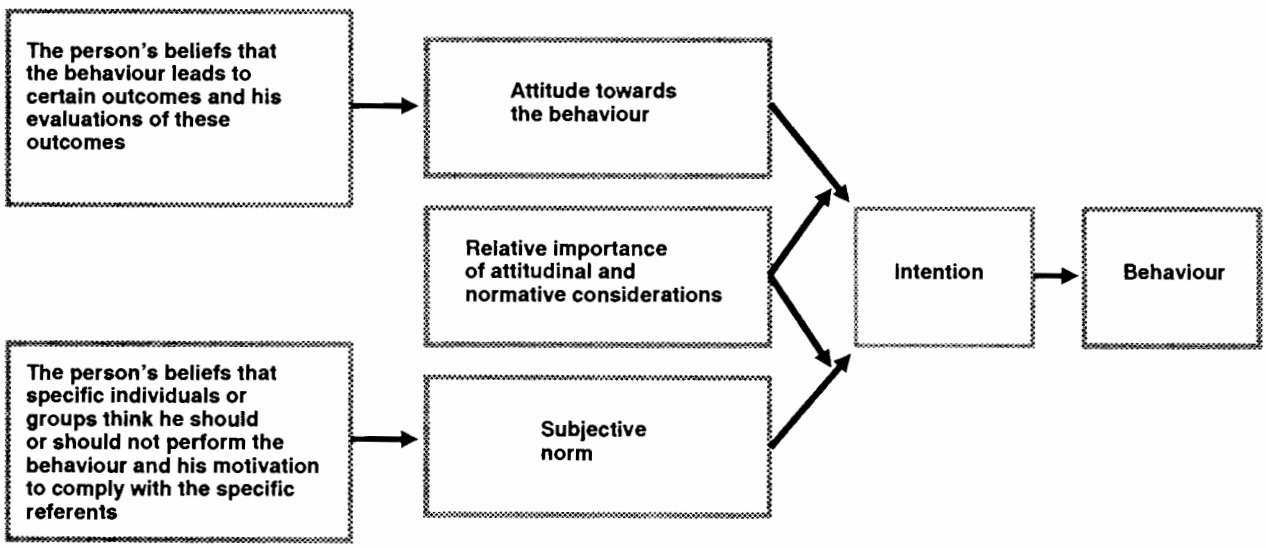


Figure 4.2 A THEORY OF REASONED ACTION

(Source : Ajzen & Fishbein 1980 p.8)

Continuing the television example, the theory of reasoned action argues that the likelihood of purchase of a television set is best determined by determining the father's beliefs about *the purchase behaviour* itself, rather than about television in general. The intention to purchase may also be influenced by the father's beliefs about his wife's views on spending money for a television set rather than a dishwasher. This is the subjective norm.

In the I/S context, typical behaviours might be purchasing a microcomputer, defining a new system, requesting an output report, applying a planning model, accessing a data base etc. In terms of the theory of reasoned action the intentions to perform these behaviours are shaped by the user's attitudes towards the expected consequences. The crucial distinction is then between attitudes and beliefs. I/S attitudes are regarded as having been formed by rational assessments of expected outcomes, assessments that can thus be dealt with in the cognitive domain (eg by education or training). It is also expected that subjective norms perhaps established through a managerial hierarchy, within the user group or within the I/S group will influence the intention to act. The relative strengths and "directions" of the attitudinal and normative determinants of such behavioural intentions will depend on a variety of specific factors[1].

Compared with simple decisions like purchasing a TV set in a family context or a microcomputer in an office context, the process of setting policy for I/S and designing, implementing and operating specific systems is dynamic and multi-levelled. Complex feedback loops can be expected to occur, particularly as outcomes of actual behaviours are experienced and modify previously held beliefs. Feelings can also be expected to colour "rational" assessments of possible outcomes. Also, since much of I/S has to do with group behaviour (IS professionals, user groups, combined task forces, steering committees) and hierarchical processes (high level prioritisation decisions, allocation of I/S resources), the influence of important referent's attitudes through the formation of subjective norms can be expected to have a key influence on intentions to behave (see the discussions of group and intergroup phenomena in 2.4.3 and 2.4.4).

In I/S, several variables might intervene between the intention to act and the act itself. If the behaviour is usage, discretion to use is important (indeed the theory of reasoned action is only applied to behaviours under an individual's volitional control (Ajzen & Fishbein 1980, p.9)). Changes in availability of practical alternatives may influence the outcome of

intentions as well. Swanson (1987) introduces the concept of "channel disposition" in I/S and explores alternative channels that users may use to obtain desired information. For instance a manager may be able to update his knowledge of production performance by calling for a written report, initiating an interactive terminal-based query or requesting the information from a subordinate. Intervening variables such as these will vary in importance depending on details of task and timing. The many factors that may influence I/S-related behaviours are regarded by Ajzen and Fishbein as "external variables", affecting behaviour only to the extent that they influence the determinants of behaviour shown in Figure 4.2. In other words, they assert that the logical paths between beliefs, attitudes, intentions and behaviours remain fundamental in predicting behaviour.

4.3 I/S SATISFACTORINESS

4.3.1 The Satisfactoriness Construct

Fishbein and Ajzen note that "beliefs are the fundamental building blocks in our conceptual structure" (1975 p.14). A particular class of beliefs deriving from job satisfaction research is proposed here as being of special importance in the I/S context, namely those relating task requirements to I/S capabilities.

Goodhue (1986) looks to the extensive research into job satisfaction and job performance for analogies to link I/S satisfaction (UIS) to performance. In particular he uses structures from the Theory of Work Adjustment (Dawis, Lofquist & Weiss 1968) to devise the model of I/S "Satisfaction" and "Satisfactoriness" shown in Figure 4.3. Three entities are shown: the individual, the job and the information system and the theory of work adjustment relates specifically to the individual and the job. As shown in the lower part of the diagramme, this theory considers that the correspondence between the individual's needs and the "reinforcer system" inherent in the job influences the attitude towards the job, or job satisfaction. The upper part of the diagramme relates to the supervisory level where the satisfactoriness of the individual for the job is assessed by comparing individual abilities to the requirements of the job. This assessment is regarded as a *belief* held by a supervisor about the objective fit between a subordinate and the job. Some interaction between the supervisor's beliefs and the subordinate's attitudes is also shown.

Goodhue's extension to the work adjustment model is to incorporate the information system. He suggests that a given system will have certain intrinsic benefits of use (attractive output, timely information, flexibility). The degree to which these benefits correspond with task needs will define I/S "satisfaction", which is regarded as an attitude towards the system that may moderate usage. The individual also makes an "objective" assessment of job requirements and I/S functionality and forms a *belief* about the "fit" or satisfactoriness of the system. Judgements about satisfactoriness then influence a variety of behaviours such as usage, training, job redesign or systems changes. There are mutual influences between satisfaction and satisfactoriness.

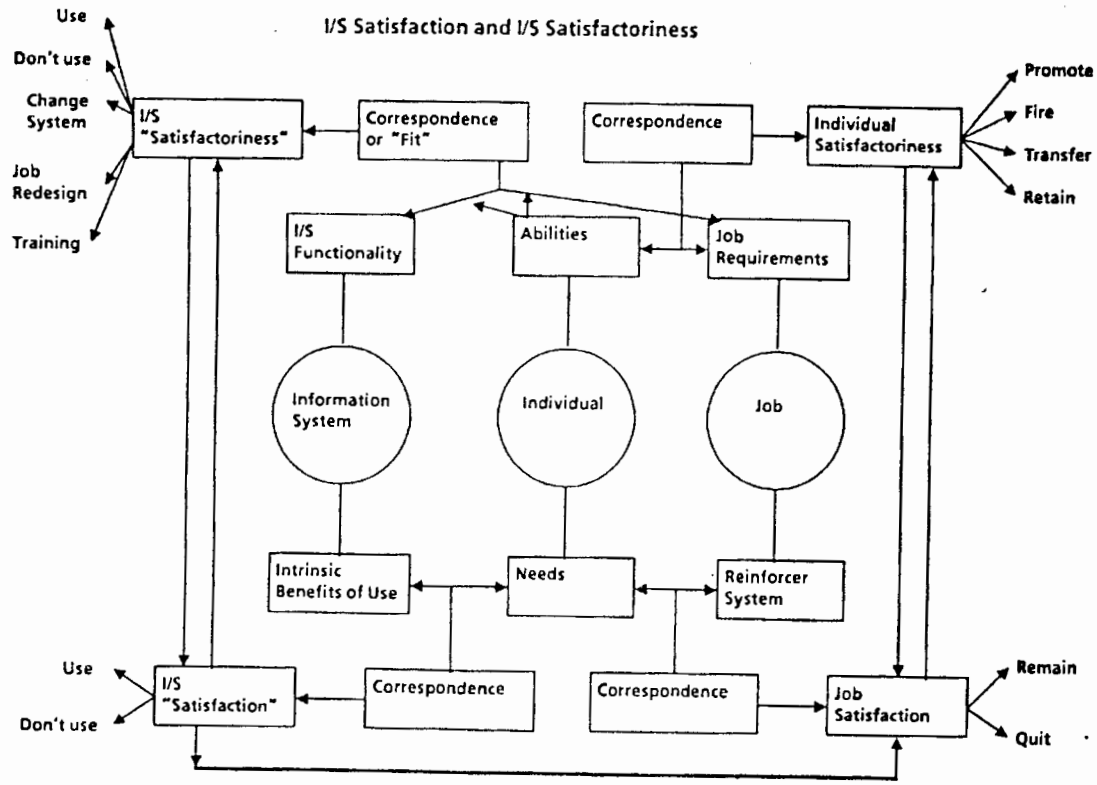


Figure 4.3 GOODHUE'S MODEL OF I/S SATISFACTORINESS

(Source : Goodhue 1986 p.15)

This model provides a valuable belief structure for I/S assessment, but some comments are in order. Firstly, except in trivial cases, even assessments of intrinsic benefits of use and individual needs are based on perceptions and subject to uncertainties and

emotionality. Enthusiastic technologists and resistant users may be expected to view the same context quite differently. Perceived correspondence between needs and benefits will vary with the individual and may change over time or be modified in the light of experience. Secondly, the assessment of satisfactoriness may be conducted by the user himself, or by a supervisor or manager. Thus a supervisor may be interested in the overall benefits of an automated stock control system while the stock clerk is simply concerned with ease of use at a particular workstation. The supervisor's beliefs about fit will lead to attitudes about the system and influence the stock clerk just as the stock clerk's feelings will influence the supervisor.

A key contribution of this model is the "satisfactoriness" construct, the perceived fit between job requirements and I/S functionality. Goodhue offers satisfactoriness as "a prominent feature in the landscape of the system-to-value causal chain" (p.16) and proposes it as a basic standardised construct to understand the links between system and policy antecedents and value consequences.

4.3.2 Measuring I/S Satisfactoriness

The satisfactoriness construct is a belief rather than an attitude (such as UIS). Rather than how they feel about things, individuals should be asked to report their objective assessment of the extent to which attributes of their systems match job requirements. Goodhue does not deal with the measurement issue although this is clearly important for any form of comparative study or hypothesis testing. Here it is suggested that Discrepancy Theory may provide a sound basis for measuring I/S satisfactoriness.

In seeking explanations for job satisfaction, Lawler (1973) discusses four theories of satisfaction and focuses on two in particular - discrepancy theory and equity theory. Equity theory is not directly relevant to the present context and will not be pursued[2].

Discrepancy theory compares the actual outcomes an individual receives with the outcomes desired[3]. The greater the discrepancy the greater the dissatisfaction. Further it is suggested that overall satisfaction is influenced by the sum of discrepancies for the different facets of the job, weighted by some authors according to relative importance.

Job satisfaction can thus be expressed as :

$$S = \sum w_i |A_i - D_i| \qquad (1)$$

where S is overall satisfaction with the job, A_i the actual outcome for facet i, D_i the desired outcome and w_i the relative importance of facet i.

The model in Figure 4.3 relies on the idea of correspondence or "fit" to predict behaviour. It can now be seen that discrepancy theory provides a basis to compute both satisfaction and satisfactoriness. I/S satisfaction in Figure 4.3 can be expressed as the difference between the individual's needs (what he wants from the system) and intrinsic benefits of use (what he gets when he uses it). Since there will generally be several facets or attributes of a system, each with a different level of importance to the user, overall I/S satisfaction can be calculated using equation (1). In similar fashion, the "satisfactoriness" of a particular system might be calculated as the sum of the weighted discrepancies between various elements of the overall job requirement and the pertinent functions of the target information system.

4.4 A MODEL OF I/S BEHAVIOURS

4.4.1 Structure of the Model

The ideas of the three previous sections and the earlier discussion of organisational outcomes are combined in the model of I/S behaviours shown in Figure 4.4. The model is an elaboration of the theory of reasoned action, but preserves the integrity of that theory. Following the discussion in section 3.2.3, the model indicates that I/S behaviours result in process and economic outcomes for the organisation. A fundamental behaviour is of course "usage", but in general there are many other I/S-related behaviours such as those described in section 4.2 that might be expected to influence outcomes (equipment purchase decisions, participation on project teams etc.). Particular behaviours may have positive or negative impact on organisational outcomes. As discussed in 3.2.3, behaviours such as usage are seen as a necessary but not sufficient condition for a particular level of performance or outcome and the potential influence of other extraneous variables is included in the model.

Behaviours result from intentions to act, but there may be intervening variables that on occasion prevent certain actions from taking place (eg poor timing, changes in task requirements, imposition of new priorities by higher management levels etc). The intention

to behave is shaped by favourable or unfavourable personal attitudes regarding the behaviour and social pressures for or against that behaviour. In line with the theory of reasoned action, personal attitudes are seen to be the result of cognitive beliefs (expectations) regarding the behaviours in question and subjective norms formed as a result of beliefs or expectations about the views of important others (managers, supervisors, colleagues, work groups, the I/S department etc).

Following the discussion on "fit", it is argued that a major influence on the individual's beliefs about the outcomes of I/S behaviour is his or her evaluation of the relationship between task needs and I/S capabilities. If a large discrepancy is perceived, there will be low expectations of eventual success/value, negative attitudes and thus a disinclination to perform the behaviour. Conversely a perception of close fit between needs and capabilities will initiate a positive sequence and encourage the behaviour.

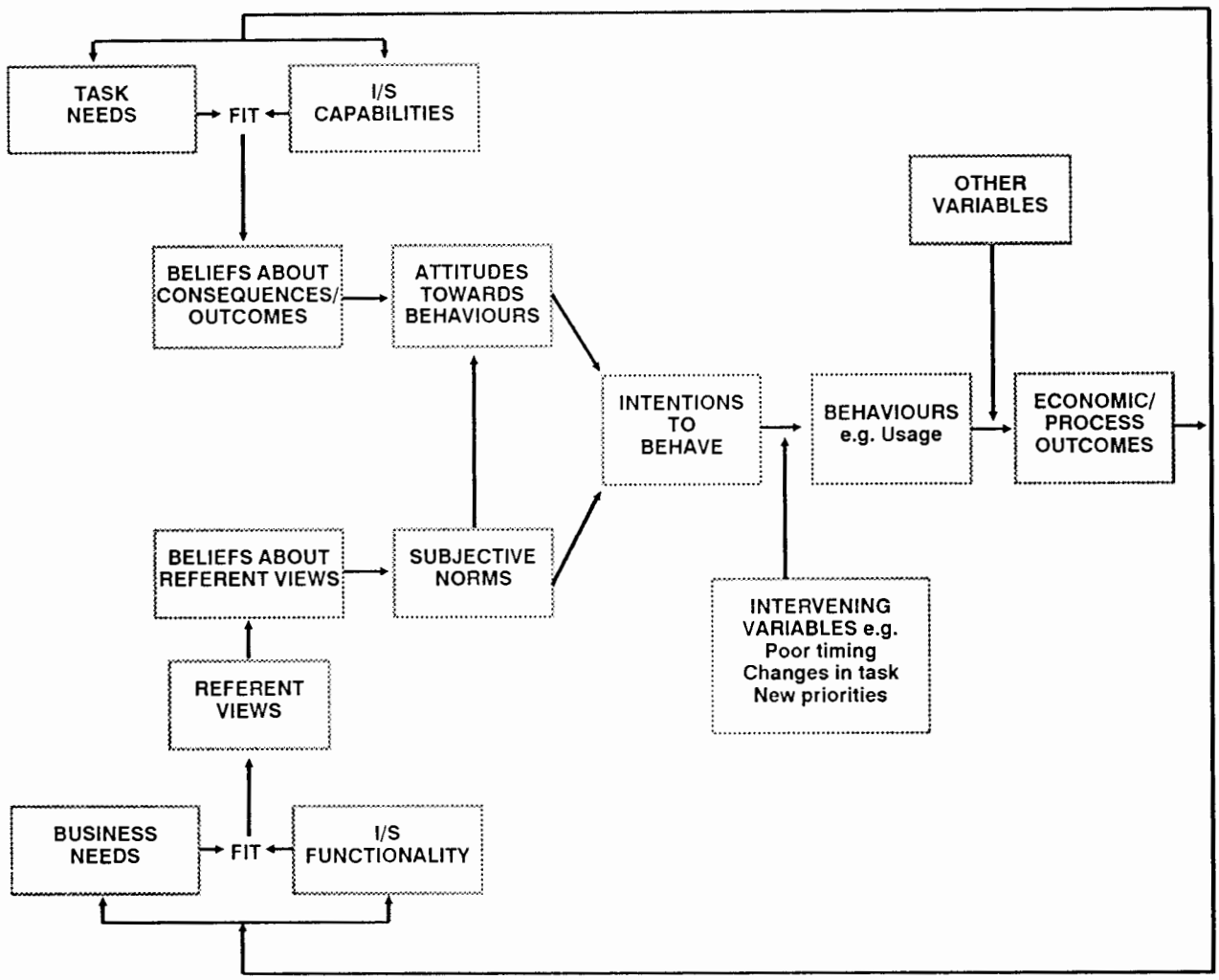


Figure 4.4 A MODEL OF INFORMATION SYSTEMS BEHAVIOURS

Expressed or perceived referent views lead to subjective norms. The model shows the case where the referent might be a supervisor or manager forming views (beliefs, expectations) about the perceived gap between an overall business requirement and general I/S functionality. Similar considerations will apply where referents are peers in the user or I/S areas.

The model indicates various potential feedback loops that might be expected in practice. This recognises the fact that information systems behaviours, including policy decisions, implementation projects and individual usage of particular systems form part of an adaptive process (Cyert & March 1963). Continuous comparisons of organisational needs and systems capabilities take place at user and managerial levels in the organisation. Beliefs about expected outcomes shape attitudes which in turn set up intentions to proceed with actions such as expenditure on equipment, usage of a system etc. Individual attitudes and intentions may be modified by perceptions of peer group or supervisor views, or both. Once behaviours are undertaken, implicit or explicit comparisons of actual versus expected outcomes take place, discrepancies lead to modification of preconceived ideas and the adaptive cycle continues.

4.4.2 Empirical Support for the Model

The proposed model has its origins in expectancy theory. The relevance of expectancy theory approaches is confirmed by Robey (1979), who finds that the use of an I/S by members of an industrial sales force correlates with prior expectations regarding the impact of the system on job performance. Ginzberg (1981) shows that the degree of realism of users' expectations regarding an on-line portfolio management system correlates positively with subsequent attitudinal and behavioural measures of systems success. In a laboratory setting, de Sanctis (1983) finds support for an expectancy theory explanation of the use of a decision support system.

Ajzen and Fishbein have documented several studies demonstrating the usefulness of the theory of reasoned action in the psychology and marketing domains (Ajzen & Fishbein 1980), but only recently has its value in the I/S arena been investigated. In a study of production managers' use of I/S, Baroudi et al (1986) use path analysis to show that user involvement (arguably shaping beliefs and expectations) influences UIS and usage and that UIS has a direct influence on usage. The latter path provides support for the direct

linkage between attitudes and behaviours predicted by the theory. Hill, Smith and Mann (1987) study the relation between undergraduate students' beliefs that they will be able to cope with computers (ie. their sense of personal efficacy regarding computers) and their intentions to purchase computers. They use structural equation modelling and confirm the predicted path between beliefs, attitudes, intentions and behaviours. In a study of the use of a computerised database by a real estate salesforce, Collins and Mann (1988) also find support for the theory of reasoned action. In particular they find that attitudes towards usage of the database are influenced both by individual factors and group norms.

The influence of management and peer groups on users' I/S behaviours has been investigated from other standpoints as well and four studies are described here. Schultz, Ginzberg and Lucas (1984) propose a model which sees implementation of an information system as a two-stage process. *Managers'* acceptance of an I/S initiative is expected to influence *users' sense of personal stake in usage of the system.* An empirical test of the model finds significant associations between manager acceptance and user perceptions of support, user personal stake and system use (Ginzberg, Lucas & Schultz 1986). In another study, the penetration of information technology in large companies is shown to correlate with the strength of informal communications networks between I/S managers and user managers (Zmud, Boynton & Jacobs 1987). This work shows the importance of input from the I/S group ("technical gatekeepers") in shaping the expectations and attitudes of users.

Leonard-Barton and Deschamps (1988) examine managerial influence on the implementation of an expert system for the salesforce in a computer company. They find that the influence of management input varies according to employee characteristics. "Employees whose characteristics incline them to adopt an innovation will do so without management support or urging if it is simply made available. Employees low on these characteristics will await a managerial directive before adopting" (p.1252). Robertson (1988) examines the social determinants of I/S use amongst professionals in a management consulting firm. He finds that the use of an information system is directly influenced through the individual's attention to the social influences around him, and indirectly through the social system's influence on how the individual interprets the I/S available.

The above findings are consistent with the theory of reasoned action. They also highlight the complex interplay between users of information systems, their managers, peers and the providers of the service. All of these influences are seen to shape user beliefs and attitudes and thus eventual usage.

Empirical support for the notion of fit between task needs and I/S capabilities is found in Srinivasan's study of the use of modeling systems (Srinivasan 1985). He measures the fit between technical features of the available modeling systems and the perceived needs of corporate planners, finding meaningful associations between the extent of fit, usage and satisfaction with output quality.

Fit between general business requirements and overall I/S capability has been examined in the series of studies previously cited (Miller 1988). A consistent relationship between fit and an aggregate I/S performance measure is found. From the theory of reasoned action this aggregate performance measure can be interpreted as the user's general attitude towards I/S, so the association with fit supports the argument that cognitive beliefs (and especially beliefs about fit between needs and capabilities) shape general attitudes towards the object whose attributes are being evaluated.

This section has offered empirical evidence supporting the theory of reasoned action as a basis for understanding information systems-related behaviours. Research also suggests that attitudes towards I/S are shaped by assessments of fit between task needs and I/S capabilities. Further, individual I/S behaviours may be influenced by the individual's own assessment of fit as well as the views of important referents, whether these be superiors, peers, users or I/S professionals.

4.5 RESEARCH HYPOTHESES

The area to be investigated in this study is the overall I/S function and user-managers' evaluations of I/S effectiveness. Specific attention is also paid to the potential influence of the I/S group on user attitudes. In line with the theory of reasoned action, individual attitudes towards I/S are regarded as the summation of cognitive beliefs about I/S, specifically relating to perceived I/S performance. It is postulated that attitudes are positively influenced by beliefs about fit held both by the individual and the I/S group. Given the undoubted

presence of feedback loops as outcomes change preconceived ideas, and complex interactions between individuals and groups, only general hypotheses are put forward here:

H1 A user-manager's attitude towards the overall I/S function is influenced by his or her belief about the fit between the perceived organisational needs for I/S and the I/S capabilities available.

H2 A user-manager's attitude towards I/S is influenced by beliefs about fit held by the providers of the I/S service.

Other related mechanisms may also apply. Firstly positive user attitudes may result from the simple agreement between users and I/S as to priority needs for I/S. In 3.3.4 and 3.4.1 it was noted that some researchers claim widely differing views on I/S by users and I/S staff and stress the importance of achieving alignment here. Secondly a common evaluation of I/S capabilities - how well the I/S function is performing - may be sufficient to achieve overall user satisfaction. Disagreement here may indicate that I/S and users apply different criteria for evaluation, a situation that could well lead to frustration and dissatisfaction on the part of the user community (and amongst I/S staff). These ideas can be expressed in the form of the following hypotheses:

H3 A user-manager's attitude towards the overall I/S function is influenced by the extent to which his perceptions of organisational needs for I/S are matched by similar perceptions in the I/S group.

H4 A user-manager's attitude towards I/S is influenced by the extent to which users and I/S agree on how well I/S is performing.

Two other mechanisms are firstly that overall user satisfaction results when I/S staff rate highly those I/S capabilities that users regard as important. This could come about if I/S were aware of priority organisational needs and satisfied with the way in which they had been able to meet those needs (irrespective of users' interest in, or ability to assess I/S performance). Secondly user satisfaction may be achieved when there is a match between I/S identification of organisational priorities for I/S and users' evaluation of performance in

those areas. This could come about if I/S have translated the correct needs for I/S into I/S products and services, which are then assessed as satisfactory by the users themselves. These possibilities are expressed as follows:

H5 A user-manager's attitude towards I/S is influenced by the extent to which I/S performance in areas regarded as important by the user is rated highly by I/S staff.

H6 A user-manager's attitude towards I/S is influenced by the extent to which I/S are able to perceive the users' priority requirements and provide capabilities that are highly rated by the users.

It should be noted that the terms user-manager, user and manager tend to be used interchangeably in this thesis. They are meant to accord with the definition adopted in Chapter Two, ie. an individual who is "high enough in the organisation to influence the flow of resources and is also a knowledgeable participant in the business function to be supported" (Beath 1987). This definition thus includes top management and goes down as far as first-line operational management. Senior professional staff (eg corporate planners) would also qualify by this definition.

As stated, this study compares and contrasts user and I/S perceptions. To limit the scope of the study no attempt is made to differentiate the responses of users by level of management or functional area in the organisation. However specific efforts are made to obtain a representative sample of respondents according to these criteria.

The hypotheses focus only on beliefs and attitudes. It is assumed that positive attitudes will lead to the intended I/S behaviours and, if the expectations are well-founded in the first place, to the desired process and economic outcomes. Conversely negative attitudes, however ill-founded, will lead to a disinclination to act, resistance to change and other behaviours that will militate against successful outcomes. These assumptions will not be tested empirically.

For any particular aspect of I/S, fit occurs if there is a match between need and availability. This can happen in two ways as shown in Figure 4.5.

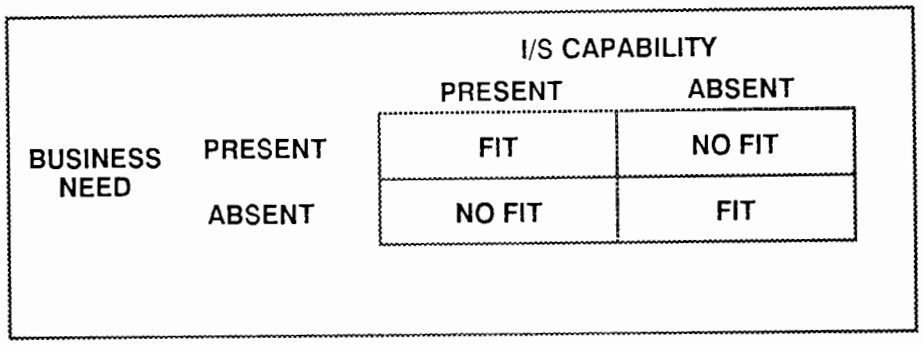


FIGURE 4.5 FIT BETWEEN BUSINESS NEEDS AND I/S CAPABILITIES

Fit occurs if there is a perceived business need for a particular I/S capability and that capability is believed to be present. Conversely if no need is perceived and the capability is absent, there is also fit. An unfulfilled need implies lack of fit, as does the presence of an unwanted capability. In the latter case such an unwanted I/S capability is at best irrelevant and at worst distracting, unnecessarily costly and militates against appropriate allocation of funds.

4.8 MEASUREMENT INSTRUMENT

The extent of fit between needs and capabilities will be measured by the Miller-Doyle instrument. The items in this instrument represent a comprehensive range of I/S-related elements that have been shown to tap important information systems constructs (See 3.3.3). They are thus appropriate for the present study, which addresses the total I/S function.

The Importance scale in this instrument operationalises the "business need" construct (see Figure 3.2). If a manager assesses a particular aspect of I/S as "extremely important", this presumably reflects his or her perception of the needs of the business. The Performance scale operationalises the I/S capability construct. By rating an item on a scale from "very poor performance" to "excellent performance", the respondent is providing his perception of the existing I/S capability.

The fit between needs and capabilities can be computed in various ways. As shown in

section 4.3.2, discrepancy theory would suggest calculating absolute differences between importance and performance. Previous studies conducted by the author have found the correlation between the two scales to be illuminating. Both approaches will be used.

Overall attitudes towards I/S will be calculated as simple averages of the performance scales, and the validity checked by comparing the averages with a global measure of overall satisfaction with the I/S function.

4.9 SUMMARY

This chapter has presented an adaptive behavioural model of I/S activity. The model builds on a number of recent attempts to explain I/S behaviour and has been prompted in part by interesting empirical results obtained from previous studies by the author and colleagues. The core of the model is the theory of reasoned action, which states that individuals hold cognitive beliefs or expectations about the consequences of their behaviours. These beliefs collectively lead to an attitude towards the behaviours, this attitude also being influenced by social norms involving important referents. The individual's attitude then moderates his intentions to perform the behaviour and the execution of the behaviour itself.

Studies of job satisfaction are used to ground the concept of I/S satisfactoriness, a particular belief construct offered as key to attitude formation and I/S activity. It is argued that this construct, being the discrepancy (or fit) between perceived business needs and I/S capabilities, predicts attitudes towards I/S behaviours and is thus crucial to appropriate I/S activity and ultimately information systems effectiveness.

Hypotheses involving I/S satisfactoriness, individual attitudes and social norms are stated and will be tested using an established instrument. The measurement of fit is grounded in discrepancy theory and the measurement of I/S attitudes in the theory of reasoned action. Alternative hypotheses are also stated and will be tested.

In the next chapter the research methodology adopted to study the connections between beliefs about fit and I/S attitudes is described.

ENDNOTES

[1] The notion of a belief described here is a very similar to that arising from Expectancy Theories of motivation. Lawler (1973) notes "all of the [expectancy] theorists maintain that the strength of a tendency to act in a certain way depends on the strength of an expectancy that the act will be followed by a given consequence (or outcome) and on the value or attractiveness of that consequence (or outcome) to the actor"(p.45)

[2] Equity theory considers an individual's perceived input-outcome balance relative to others' as a determinant of job satisfaction. This is not directly relevant to the present context since the issue is an individual's satisfaction with an information system.

[3] Lawler acknowledges the distinction between "what he wants" and "what he feels he should receive", but suggests that the two discrepancies are probably closely related and influence each other. In either case it is argued that the difference from actual outcomes influences satisfaction.

CHAPTER FIVE

RESEARCH METHODOLOGY

5.1 INTRODUCTION

5.2 TRADITIONAL I/S THEORY AND METHODOLOGY

5.3 CAUSAL STRUCTURE AND I/S THEORY

5.4 RESEARCH METHODOLOGY

5.5 SAMPLE SELECTION

5.5.1 Organisations

5.5.2 Respondents

5.6 QUESTIONNAIRE DATA

5.6.1 Instrument Design and Administration

5.6.2 Data Capture and Processing

5.7 CONTEXTUAL DATA

5.8 SUMMARY

CHAPTER FIVE

RESEARCH METHODOLOGY

"Qualitative data are apt to be superior to quantitative data in density of information, vividness, and clarity of meaning - characteristics more important in holistic work than precision and reproducibility." (Weiss 1968, p.344)

5.1 INTRODUCTION

The previous chapter developed a theoretical model linking individual beliefs and attitudes regarding information systems to usage of systems and ultimate benefits to the organisation. The model also accounts for the role that social norms might have on individual attitudes. Based on this model and earlier empirical findings, hypotheses were proposed.

This chapter presents the research design adopted to gather data and explore the hypothesised relationships. The chapter commences with a critique of predominant theorising in I/S and research methodologies based purely on quantitative analysis. Limitations of this tradition are noted and placed in the context of alternative world views and structures of theory. Qualitative and quantitative research methodologies and multi-method approaches are discussed in relation to theory structure in general and the present study in particular. The specific methodology adopted here is then described, including selection of participating organisations and respondents within organisations, questionnaire design and administration and data collection procedures.

5.2 TRADITIONAL I/S THEORY AND METHODOLOGY

Most of the empirical studies shown in Table 3.3 start with one or more hypotheses relating independent variables to outcome variables and test these hypotheses via statistical analysis of the data gathered. This approach is typical of the bulk of I/S research:

> *"American information systems research generally is characterised by a methodology of formulating hypotheses that are tested through controlled experiment or statistical analysis" (Kaplan & Duchon 1988, p.572).*

Lucas has classed such studies as "factor studies" (Lucas 1981) and, more generally they can be classed as applications of *contingency theory.*

There are several grounds for criticising this approach, both in principle and in practice. Firstly a contingency theory of I/S is criticised for use of naive meta-theory. Managers are assumed to make rational non-political decisions based on accurate and plentiful information. Deterministic cause and effect models are posited and in the process much of the richness and complexity of the social sciences is assumed away (Weill & Olson 1987). Secondly very mixed empirical evidence has been found relating contingent variables to outcome variables and typically little variance in the dependent variable is explained by the independent variables (Ives & Olson 1984, Markus & Robey 1988, Weill & Olson 1987). Thirdly, regarding the practice of contingency analysis, the experimental and survey designs adopted to test contingent relations have generally lacked adequate statistical power. Baroudi and Orlikowski (1989) examine the power of the statistical tests applied in a large number of I/S studies. They conclude that:

> *"It is only when one assumes that the effect is so large as to make statistical testing unnecessary, that [the] studies on average reach adequate power levels."*

The authors believe the problem is directly attributable to a research tradition which demands statistical inference testing before a study is considered "publishable". This is a major criticism because it implies that researchers will be inclined to adopt research methods for expediency rather than because they are appropriate to the nature of the theory or context.

5.3 CAUSAL STRUCTURE IN I/S THEORY

Markus & Robey (1988) examine cause and effect in I/S research and contrast three perspectives regarding causal agency. The *technological imperative* views technology as the causal agent, an exogenous force impacting the behaviours of individuals and organisations. The *organisational imperative* assumes that managers and designers choose freely amongst technological options according to rational preferences and goals and have (almost) unlimited control over the consequences. The *emergent perspective* holds that

> *"the uses and consequences of information technology emerge unpredictably from complex social interactions ... information technology [is] an ensemble of equipment, applications and techniques that carry social meanings ... [there is] dynamic interplay between actors, context and technology" (p.588).*

Two alternatives regarding the logical formulation of the theoretical argument are also described - variance and process theories. *Variance theories* are static in time and assert that the "cause" is necessary and sufficient for the outcome. *Process theories* recognise the passage of time and define causation as consisting of necessary conditions in sequence. Chance and random events play a role and outcomes may not occur even when necessary conditions are present.

Against this background, contingency theory in I/S can be seen to be a variance theory adopting the technological or organisational imperative. This together with reliance on quantitative analysis represents a narrow and limiting view of I/S phenomena.

Referring to Chapter Two, traditional I/S theory and method may be appropriate to the positivistic view that the organisation is a machine and human beings are responding mechanisms. It is inappropriate to the view adopted here, that information systems activity and general organisational activity cannot be treated as discrete domains; that there is constant interplay between information processing and other behaviours making it difficult to find causal relationships between constituent processes; that relationships are probabilistic and changes in one area lead to indeterminate changes and adjustments throughout the whole context; and that human actors in the organisation behave in subjective ways, utilising language, labels, routines and other modes of culturally specific

action to interpret their milieu and orientate their actions. The emergent perspective and process theories appear better suited to theory formation given this perspective.

5.4 RESEARCH METHODOLOGIES

Increasing attention is being paid to methods of research that are better aligned with these current perspectives on I/S phenomena and structures of theory. So-called "qualitative" strategies such as contextual and historical analysis, case study research, action research, ethnomethodology, phenomenology and others now appear in articles on I/S research:

> *"Qualitative methods are characterised by (1) the detailed observation of, and involvement of the researcher in the natural setting in which the study occurs, and (2) the attempt to avoid prior commitment to theoretical constructs or to hypotheses formulated before gathering any data ... Qualitative strategies emphasise an interpretive approach that uses data to both pose and resolve research questions." (Kaplan & Duchon 1988, p.573).*

Qualitative methods are now being seen as complements to quantitative methods. Use of multiple methods and multiple data sources and comparison of results through "triangulation" strengthens findings when there is congruence and provides a basis for exploration when divergence is experienced (Denzin 1970, Jick 1979). Harrigan (1983) is specific about methodologies for business strategy research, comparing coarse-grained (large-scale statistical data bases), medium-grained (multiple case studies) and fine-grained (in-depth single company) methodologies. In order to strike a balance between generalisability and statistical rigour on the one hand and the nuances and insights of individual strategies on the other, she proposes a hybrid methodology consisting of multiple sites, multiple data sources and "intricate" sample designs.

Against this background the next section describes the methodology adopted in this study. It will be seen that it has the characteristics of a hybrid methodology and combines qualitative and quantitative techniques.

5.5 SAMPLE SELECTION

5.5.1 Organisations

The previous work upon which the current study builds used large numbers of firms to seek patterns within and between economic sectors (Miller 1988). Associations were indeed found and encouraged deeper enquiry into the observed phenomena, reducing the number of organisations and increasing and segmenting the individual respondents. Since a fundamental relationship had been found between I/S performance ratings and "fit", it was decided to survey a few organisations in depth, preferably obtaining a sample showing a wide range of perceived performance levels. It was also decided to maintain generalisability by sampling different economic sectors. Accordingly the original list of 83 firms used in prior studies was scrutinised to create a "short list" in terms of extremes in perceived I/S performance. A conscious effort was also made to widen the net by including public sector organisations not previously surveyed. Some firms requested participation as a result of hearing the author speak on the topic of I/S effectiveness at public seminars.

The list so obtained was then reduced for various reasons. Firstly samples of 80-100 respondents were desired, thus excluding organisations of smaller size. Secondly firms were excluded because of major changes in organisational status (the financial services sector in particular was going through a series of mergers at the time). Thirdly each candidate organisation had to have a clearly delineated I/S group responding to the needs of its set of users, thus excluding firms supported by distant corporate developers, or external bureaus. Other controls such as measures of organisational effectiveness were not applied. Eventually 11 organisations were selected for the purposes of this study. None of the organisations specifically invited to participate declined, so respondent bias was not a factor.

Table 5.1 shows the participating organisations. MNF 1 used the results of the survey to evaluate their I/S function and initiate changed procedures. They then readministered the questionnaire 12 months later. Both sets of data are included in this study.

TABLE 5.1 PARTICIPATING ORGANISATIONS

CODE	SECTOR	NATURE OF ORGANISATION	ORIGINAL RATING OF PERF.
FIN 1	Financial	Bank and building society	4.7
FIN 2	Financial	Life assurance society	5.1
FIN 3	Financial	Life assurance society	4.0
FIN 4	Financial	Building society	4.3
FIN 5	Financial	Short term insurance company	3.4
MNF 1	Manufacturing	Producer of aluminium feedstock	new
MNF 2	Manufacturing	Motor vehicle manufacturer and marketer	5.5
MNF 3	Manufacturing	Manufacturer of motor vehicle engines	5.0
RET 1	Retailing	Retailer:clothing/footwear/household items	4.6
PUB 1	Public sector	Provincial hospital authority	new
PUB 2	Public sector	1700-bed teaching hospital	new

5.5.2 Respondents

In each case a senior manager - usually the chief information officer - acted as liaison person for respondent selection and questionnaire administration. The total population of users with managerial status and I/S personnel with the status of senior systems analyst or higher was selected. In only one case (FIN 2) was sampling of the target population necessary. Here the liaison officer arranged the full list of names in alphabetical order and selected every third name.

5.6 QUESTIONNAIRE DATA

5.6.1 Instrument Design and Administration

As already discussed in 3.3 and 4.8, the Miller-Doyle instrument was used in this study. The items and scales are shown in Table 3.2 and Figure 3.2. Appendix A reproduces the instrument. Aspects of the questionnaire design included:

- the sequence and wording of items was identical in the Importance and Performance sections of the instrument. This was done to exclude unwanted influences on respondent thought processes.

- the Importance set was presented first, followed by the Performance set. This was done to emphasise a business focus first, rather than a systems focus, on the assumption that users would respond more willingly as a result.

- in view of the large number of items, scales for all items were in the same direction despite the risk of mechanical responses.

- the single scale tapping global attitude towards I/S was presented first to create some independence between this response and the detailed responses to performance ratings. Ideally separate questionnaires might have been issued days or weeks apart, but this approach was not attempted.

- each questionnaire was preceded by the same preamble and followed by requests for demographic information. The latter section was tailored to suit the organisation.

Questionnaires were sent to respondents through each organisation's own mail service under cover of a letter. The letter was generally signed by a very senior (non-IS) official in the organisation and stressed confidentiality and the fact that the primary purpose was to assist in a university research effort. Respondents were asked to omit responses to items with which they were not familiar and in some questionnaires extra columns were provided to facilitate this response.

The author coordinated all but two of the surveys. The first survey at MNF 1 was run independently by their senior administrative manager. The FIN 4 survey was coordinated by two senior employees of the organisation under the supervision of the author, as part of their MBA degree.

5.6.2 Data Capture and Processing

All questionnaires were returned to the author or associated researchers via the liaison officers. Generally response rates were considered acceptable and liaison officers did not send out reminders. Data was captured on the PR1ME computer at the author's institution and all subsequent analysis was done using standard mainframe routines for calculating descriptive statistics and LOTUS 123 (Version 2) for correlation analysis.

5.7 CONTEXTUAL DATA

Various sources of primary and secondary data were used to establish the context for survey responses in each organisation. An in-depth interview was conducted with the liaison officer after a preliminary analysis of the survey data was available. The interview followed the structured format shown in Appendix B. It can be seen that information on the organisation as a whole and I/S capabilities and processes was obtained before a discussion of the survey results took place. The intention of the latter discussion was to confirm, contradict or embellish on the statistical data. In the case of the organisations that had previously been surveyed it was also possible to compare the outcomes of successive surveys. These comparisons included statistical data and in some cases detailed interviews with I/S and user managers. In one case (FIN 5) top management interviews were also conducted. Group discussions were held with top management, I/S management or both in FIN 4, MNF 3, PUB 1 and PUB 2.

Preliminary analysis of the data suggested that perceptions within the I/S group might be of importance to I/S effectiveness. Accordingly a specific instrument to assess the character of the I/S group was developed and administered via the liaison officers (see Appendix C).

Finally, data from several related studies supervised by the author and internal documentation such as Annual Reports and internal planning documents were also available. Table 5.2 summarises the main sources of study data used.

In due course the author submitted short reports to the liaison officers. The reports were generally studied by more than one official including selected superiors and subordinates of the liaison officers. A dialogue then ensued during which a good deal more, and more accurate information was obtained to assist in the analysis.

TABLE 5.2 MAIN DATA SOURCES

CODE	ORGN. SURVEYS	IS GROUP SURVEY	IS MGMT INTERV.	OTHER PRIMARY DATA SOURCES
FIN 1	84/88	yes	yes	
FIN 2	84/86/88	yes	yes	Emanuel 1986; MBA group report.
FIN 3	84/86/87	yes	yes	Emanuel 1986; Jones 1987; 2 MBA group reports.
FIN 4	84/88	yes	yes	Jacobs/Linley 1988.
FIN 5	84/87	no	yes	7 top mgmt interviews; MBA group report.
MNF 1	87/88	yes	yes	Cowie 1989; on-going dialogue.
MNF 2	85/86/88	yes	yes	Emanuel 1986.
MNF 3	85/86/88	yes	yes	top mgmt interview; 2 MBA reports
RET 1	84/88	yes	yes	
PUB 1	88	yes	yes	ongoing dialogue with top mgmt; IS group workshop.
PUB 2	88	yes	yes	Davis1981; Flax 1986; 2 MBA group reports.

5.8 SUMMARY

This chapter has argued that the predominant approach to I/S research has been the formulation and statistical testing of hypotheses grounded in contingency theory. It is suggested that this reflects a limited view of the nature of I/S in the modern organisation, overlooks the importance of context and can lead to a mismatch between methodology and structure of theory.

Alternative perspectives on cause and effect, the influence of time and the nature of problems are discussed and it is concluded that the present enquiry reflects an emergent view of I/S and require a research approach consistent with a process theory. The growing interest in qualitative research techniques, multimethod approaches and triangulation between methods is discussed in this context and in particular the methodology adopted in the current study is described. It is seen to combine the administration and quantitative analysis of a numerical survey instrument with in-depth qualitative interviews and content analysis of other contextual data.

In keeping with the essence of qualitative research, the present enquiry has evolved naturally from earlier empirical work. Both the model formulation and research design are informed by the results of previous large-scale surveys. This study in turn incorporates features such as the preliminary behavioural study of I/S groups that may well prove to be the basis for subsequent more rigorous research in that direction.

The next two chapters present and analyse the results of the questionnaire survey and the other qualitative data gathered.

CHAPTER SIX

RESULTS AND ANALYSIS I : SURVEY DATA

6.1 INTRODUCTION

6.2 SURVEY RESPONSES

6.2.1 Questionnaire Returns

6.2.2 Responses to Individual Items

6.3 SUMMARY RESULTS

6.3.1 Importance and Performance Ratings

6.3.2 Properties of the Survey Instrument

6.4 I/S IMPORTANCE AND PERFORMANCE RATINGS

6.4.1 Correlation Analysis

6.4.2 Measures of Fit and User Performance Ratings

6.4.3 Gap Analysis

6.5 DISCUSSION

6.6 SUMMARY AND CONCLUSIONS

CHAPTER SIX

RESULTS AND ANALYSIS I : SURVEY DATA

6.1 INTRODUCTION

The questionnaire survey yielded just over a thousand responses from user-managers and senior I/S staff in eleven organisations. This chapter describes the categories of respondent and the response rate in each organisation. Since responses to individual items in the 37-item instrument were sometimes omitted, the pattern of omissions is analysed to see whether it reveals particular gaps in the knowledge of the respondents.

Overall importance and performance ratings are then derived for the user and I/S groups within each organisation. Psychometric properties of the survey instrument are determined in order to establish a firm basis for subsequent analysis. Statistical correlation coefficients are calculated linking I/S and user perceptions of the importance and performance of individual items contained in the survey instrument. These correlations are regarded as "measures of fit" and associations between the measures of fit and overall user ratings of I/S performance are sought. In similar fashion "gaps" between importance and performance ratings are also examined. Finally the results of these analyses are discussed in the context of the hypotheses presented in Chapter Four.

6.2 SURVEY RESPONSES

6.2.1 Questionnaire Returns

Table 6.1 shows the breakdown of responses to the questionnaire survey. 1025 managers from user areas and senior I/S staff provided usable responses for subsequent analysis. I/S responses represent 18% of the total. Except in the case of FIN 2, where a one-third stratified random sample was used, questionnaires were sent to all staff above a given level in each organisation. As shown in the table, responses were received from a number

of managerial levels and functional areas, suggesting that the user view should be representative of the user-manager population. The differences between organisations shown in the table reflect the variety of organisational structures and definitions of level encountered.

TABLE 6.1 RESPONSES TO SURVEY QUESTIONNAIRE

ORGANI-SATION	QUESTIONNAIRES					MANAGEMENT	
	TOTAL ISSUED	USABLE RETURNS			RESPONSE RATE	LEVELS	AREAS
		I/S	MGMT	TOTAL			
FIN 1	127	16	73	89	70	4	8
MNF 1 (88)	63	9	40	49	78	4	6
FIN 2	297	20	111	131	44	4	10
MNF 2	100	21	63	84	84	3	8
RET 1	70	10	47	57	81	4	9
MNF 3	110	36	53	89	81	3	6
MNF 1 (87)	64	13	40	53	83	4	6
FIN 3	208	29	82	111	53	5	7
FIN 4	576	14	171	185	32	15	8
FIN 5	77	0	77	77	100	4	5
PUB 1	28	11	14	25	89	3	4
PUB 2	130	9	66	75	58	5+	6+
TOTALS	1850	188	837	1025	55		

A small number (2-3%) of nil or unusable returns were received from each site and discarded (eg where only a few out of the 37 possible importance ratings and no performance ratings were provided, or all performance ratings were marked "6", etc). FIN 4 yielded an unusually low 32% usable returns. The researchers administering the instrument here went much deeper into non-managerial levels to obtain a broader range of user perceptions. 52% of these questionnaires were returned, but many nil responses and responses with long strings of identical ratings were found and deemed to reflect lack of familiarity with the topics. By contrast, the 100% response rate achieved in FIN 5 was because the author personally supervised completion of the questionnaires at a series of meetings around the country. In this company the I/S manager strongly supported the overall study, but resisted completion of the questionnaire ("it's the user's attitude that's

important") and no I/S responses were solicited.

6.2.2 Responses to Individual Items

Respondents were requested to omit ratings for items they were not sure about, or were outside their field of activity. In some questionnaires, the option to answer "8" or "9" was provided for this purpose. Data is available for ten of the twelve data sets analysed and Appendix D lists the percentage of items omitted for each of the 37 importance and performance scales in these cases. On average 5.1% of the importance and 16.1% of the performance items were not rated. In subsequent analyses these omissions are regarded as missing observations. Table 6.2 extracts the particular items showing below 5% or above 30% omission of performance ratings together with the associated percentages for the importance ratings.

To determine whether respondents tend to omit both ratings for a given item, the 37 pairs of importance and performance omissions listed in Appendix D were correlated. This procedure yielded an r^2 of .69 which is significant above the 99.9% level. Further, inspection of the data for separate organisations shows a tendency for the pattern of omissions to be common across organisations. These findings are interpreted in Section 6.5.

TABLE 6.2 IMPORTANCE AND PERFORMANCE RATINGS OMITTED

	Item No. & Description	Percentage Omitted Importance	Performance
1	Availability & Timeliness of Output	1.7	3.1
17	User Confidence in Systems	1.2	3.8
18	Accuracy & Completeness of Output	1.4	4.4
25	Quick & Flexible Access to Data	2.2	4.6
28	Users' Understanding of Systems	2.3	4.9
34	Top Management Involvement in I/S	6.7	30.2
29	IS Priorities & Organisational Objectives	10.7	30.4
7	Use of Management Committee to Oversee I/S	7.0	30.7
35	Overall Cost-Effectiveness of I/S	6.4	35.0
36	Models to Analyse Business Alternatives	14.1	36.7
19	Strategic Planning for I/S	11.1	40.5

6.3 SUMMARY RESULTS

6.3.1 Importance and Performance Ratings

Raw questionnaire data was captured onto a PR1ME computer at the author's institution and summary measures were derived using standard routines for calculating descriptive statistics. Statistics for each individual item, items grouped according to underlying constructs (see section 6.3.3) and overall grand means were obtained. Appendices F1 to F12 contain these results and other computations for the twelve sets of data analysed.

Table 6.3 summarises the data. The results in this table and several later tables are placed in order of decreasing mean user rating of I/S performance, since associations with this variable will be sought. For similar reasons results are shown separately for I/S staff and user management. As mentioned above, I/S staff did not complete the questionnaire in FIN 5, so this data set is incomplete. Also, unintentionally, some versions of the questionnaire did not contain a global performance scale (see Appendix A), or the scale was poorly indicated and overlooked by many respondents. This statistic is thus missing from the MNF 1 surveys and those of FIN 5, PUB 1 and 2.

TABLE 6.3 SUMMARY OF IMPORTANCE AND PERFORMANCE RATINGS

			ORGANISATIONS											
			FIN 1	FIN 2	MNF 2	MNF 1 1988	RET 1	MNF 3	MNF 1 1987	FIN 3	FIN 4	FIN 5	PUB 2	PUB 1
NUMBER OF RESPONSES		I/S	16	20	21	9	10	36	13	29	14	0	9	11
		USER	73	111	63	40	47	53	40	82	171	77	64	14
		COMBINED	89	131	84	49	57	89	53	111	185	77	75	25
IMPORTANCE RATINGS	I/S	MEAN	5.57	5.74	5.78	6.01	5.59	5.55	6.09	5.18	5.70	n/a	5.48	5.67
		S.D.	.41	.45	.46	.53	.58	.42	.48	.55	.62	n/a	.43	.49
	USER	MEAN	5.32	5.59	5.76	5.45	5.59	5.53	5.26	5.38	5.63	5.63	5.43	5.30
		S.D.	.74	.35	.34	.46	.39	.40	.45	.47	.55	.43	.63	.48
	COMBINED	MEAN	5.36	5.61	5.77	5.58	5.59	5.54	5.46	5.33	5.64	5.63	5.44	5.46
		S.D.	.65	.35	.35	.46	.40	.39	.43	.48	.53	.43	.61	.51
PERFORMANCE RATINGS	I/S	GLOBAL	6.00	5.47	5.62	n/a	5.90	4.86	n/a	4.27	4.71	n/a	n/a	n/a
		MEAN	5.20	5.02	5.24	5.58	4.71	4.71	5.41	4.16	4.18	n/a	4.48	3.83
		S.D.	.61	.45	.47	.50	.63	.49	.49	.36	.68	n/a	.67	.87
	USER	GLOBAL	5.47	5.41	5.20	n/a	5.09	5.00	n/a	4.51	3.95	n/a	n/a	n/a
		MEAN	5.13	5.00	4.87	4.82	4.63	4.39	4.27	4.16	3.84	3.82	3.77	3.68
		S.D.	.50	.38	.36	.65	.50	.53	.33	.38	.43	.72	1.03	.60
	COMBINED	GLOBAL	5.57	5.42	5.31	n/a	5.23	4.92	n/a	4.45	4.01	n/a	n/a	n/a
		MEAN	5.14	5.00	4.96	4.96	4.64	4.52	4.55	4.16	3.89	3.82	3.86	3.75
		S.D.	.49	.38	.37	.67	.50	.47	.34	.35	.44	.72	1.01	.73

Table 6.3 shows means and standard deviations for the various measures. The skewness and kurtosis of the individual and grouped measures was also examined and in the case of some individual importance ratings there was evidence of skewness to the left and excessive peakedness. This can be attributed to a "ceiling" effect and disappeared as soon as individual items were grouped for subsequent analysis.

Certain features of the data in Table 6.3 are noted here and referred to again later in the chapter.

(i) Overall importance ratings for both groups are generally high, with the I/S groups tending to accord slightly more importance to I/S than user-managers. Overall importance ratings show no particular relationship with overall performance ratings. At a detailed level, however, very noticeable relationships will become evident.

(ii) The organisations are placed in declining sequence of user rating of I/S performance. A similar pattern in the I/S group performance ratings emerges, but is not as uniform, due to the large differences between I/S and user ratings in both surveys of MNF 1 and the PUB 2 survey. In all cases I/S staff ratings are (not surprisingly) higher than users.

(iii) Where global ratings of I/S performance are available, they are always higher than the mean values, but the sequence is generally preserved. This topic will be analysed in some depth in section 6.4.2.

(iv) In most cases the standard deviations around both importance and performance mean values are greater for I/S than user respondents. This is surprising, given the diversity in management levels and functional areas of the user groups noted in Table 6.1. The result may reflect that users are less able than I/S staff to discriminate in their responses to the questionnaire items.

6.3.2 Properties of the Survey Instrument

As reported in section 3.3.3, previous studies have supported the construct validity and reliability in the face of measurement error of the present instrument. Evidence for test-retest reliability has also been found. Regarding content validity and internal consistency, large scale studies (Doyle & Astbury 1984, Somerville 1984) have found a significant and high correlation between the mean I/S performance rating and the single global rating of I/S success. This relationship is examined again in Table 6.4, because further use will be made of both the mean and global measures in this study. The seven organisations for

which global measures were obtained are ranked in terms of the two performance measures for both I/S and users.

TABLE 6.4 GLOBAL AND MEAN PERFORMANCE RATINGS

FIRM	I/S STAFF				USERS			
	GLOBAL		MEAN		GLOBAL		MEAN	
	value	rank	value	rank	value	rank	value	rank
FIN 1	6.00	1	5.20	2	5.47	1	5.13	1
FIN 2	5.47	4	5.02	3	5.41	2	5.00	2
MNF 2	5.62	3	5.24	1	5.20	3	4.87	3
RET 1	5.90	2	4.71	4	5.09	4	4.63	4
MNF 3	4.86	5	4.71	4	5.00	5	4.39	5
FIN 3	4.27	7	4.16	7	4.51	6	4.16	6
FIN 4	4.71	6	4.18	6	3.95	7	3.84	7

The tendency for the global measure to be higher than the mean is consistent with the previous surveys referred to above and is assumed to be an artefact of the survey instrument. The association between the two measures is evident, especially in the case of the user evaluations, thus supporting the content and predictive validity of the instrument.

The construct validity of the instrument has been studied on several occasions and there is good support for the existence of six factors that have content validity (see 3.3.3). It is thus not deemed necessary to repeat the factor analysis here, but rather to aggregate responses to the questionnaire items according to the schema recommended in Miller (1988) and shown in figure 3.2. The two items that load equally strongly on two factors are assigned to both for the purposes of calculating factor means. The two new items are assigned to the factors they were intended to associate with. The full assignment of items to factors is shown in Appendix E.

Table 6.5 shows the mean overall performance rating for all respondents within each organisation, and the mean performance rating for each factor within the instrument. The r^2 values linking each factor's ratings to the overall have been calculated and are also shown. All r^2 values are statistically significant at greater than the 99% level. These results support the internal consistency of the instrument.

TABLE 6.5 PERFORMANCE RATINGS FOR FACTORS

Org	Overall	PF1	PF2	PF3	PF4	PF5	PF6
FIN 1	5.14	5.62	5.19	5.12	4.92	3.88	5.04
FIN 2	5.00	5.31	5.11	4.92	4.99	4.56	4.91
MNF 1	4.96	5.25	5.26	4.65	4.93	4.84	5.08
MNF 2	4.96	5.27	5.20	4.76	4.94	4.70	4.73
RET 1	4.64	4.92	4.81	4.87	4.41	4.15	4.21
MNF 1	4.55	4.75	4.58	4.56	4.25	4.36	4.55
MNF 3	4.52	4.91	4.84	4.32	4.56	4.18	4.43
FIN 3	4.16	4.32	4.41	4.21	3.94	3.80	4.07
FIN 4	3.89	4.06	3.81	4.00	3.97	3.54	3.92
PUB 2	3.86	4.15	4.57	3.73	3.71	3.49	3.44
FIN 5	3.82	3.95	3.95	3.92	3.71	3.36	3.70
PUB 1	3.75	4.24	4.32	3.44	3.79	3.56	3.38
r^2	1.00	.96	.82	.89	.94	.96	.92

PF1 - Traditional Systems Activity
PF2 - I/S Staff Characteristics
PF3 - I/S Strategic Issues
PF4 - User Participation
PF5 - Responsiveness to Changing User Needs
PF6 - End User Computing Facilities

6.4 I/S IMPORTANCE AND PERFORMANCE RATINGS

6.4.1 Correlation Analysis

The hypotheses in this study address user attitudes towards I/S and the concept of fit between organisational needs and I/S capabilities. In Chapter Four it was argued that user attitude could be operationalised as the mean rating of performance of the 37 individual items in the survey instrument. Fit could be expressed in terms of importance and performance correlations, or discrepancies between these measures. The influence of important others on individual attitudes was also addressed and it was noted that this study would focus on the interaction between user-managers and I/S staff.

Against this background, Table 6.6 is an example of the data set developed for each organisation, all of which are shown in Appendices F1 to F12. The contents of the columns in the table are as follows:

ITEM - The item numbers as reflected in the survey instrument. The last seven entries are the aggregates for the six factors and the overall mean.

FACTOR - The assignment of items to factors.

I/S RESPONSES - the total number of respondents is shown in parenthesis. The IMP and PERF columns show the mean values for each item for all valid I/S responses (i.e. excluding missing values). The GAP column is the arithmetic difference IMP-PERF.

USER RESPONSES - Equivalent calculations for user group.

I/S - USERS GAPS - The IMP and PERF columns are the differences between the IMP and PERF means shown for I/S and users.

ALL RESPONDENTS - The weighted averages for I/S and user IMP and PERF means.

GAPabs - The absolute values of the two GAP columns. These columns are totalled for subsequent analysis.

The LOTUS 1-2-3 (Version 2) programme was used to generate this table and its Data Regression function has been used to calculate all correlation coefficients in the study. In this section, correlations will be reported and in 6.4.3 analyses of importance-performance gaps will be presented.

TABLE 6.6 EXAMPLE DATA SET FOR CORRELATION AND GAP ANALYSIS

		I/S RESPONSES (29)			USER RESPONSES (82)			I/S-USER GAPS		ALL RESPONDENTS		GAPabs	
ITEM	FACTOR	IMP	PERF	GAP	IMP	PERF	GAP	IMP	PERF	IMP	PERF	I/S	USER
GLOBAL			4.27			4.51					4.45		
1	1	5.41	4.17	1.24	5.93	4.10	1.83	(0.52)	0.07	5.79	4.12	1.24	1.83
2	2	5.83	4.69	1.14	5.82	4.72	1.10	0.01	(0.03)	5.82	4.71	1.14	1.10
3	2	5.72	4.00	1.72	5.54	3.89	1.65	0.18	0.11	5.59	3.92	1.72	1.65
4	3	4.24	4.07	0.17	4.60	4.20	0.40	(0.36)	(0.13)	4.51	4.17	0.17	0.40
5	5	5.07	4.00	1.07	5.51	3.43	2.08	(0.44)	0.57	5.40	3.58	1.07	2.08
6	1	5.69	4.14	1.55	5.96	3.94	2.02	(0.27)	0.20	5.89	3.99	1.55	2.02
7	3	4.41	3.72	0.69	4.62	4.00	0.62	(0.21)	(0.28)	4.57	3.93	0.69	0.62
8	6	4.28	3.83	0.45	5.24	4.08	1.16	(0.96)	(0.25)	4.99	4.01	0.45	1.16
9	2	4.72	4.45	0.27	5.07	4.23	0.84	(0.35)	0.22	4.98	4.29	0.27	0.84
10	4	5.55	4.83	0.72	5.79	4.48	1.31	(0.24)	0.35	5.73	4.57	0.72	1.31
11	1	5.93	4.35	1.58	5.98	4.07	1.91	(0.05)	0.28	5.97	4.14	1.58	1.91
12	5	4.72	3.66	1.06	4.94	3.39	1.55	(0.22)	0.27	4.88	3.46	1.06	1.55
13	1	6.07	4.72	1.35	5.58	4.39	1.19	0.49	0.33	5.71	4.48	1.35	1.19
14	5	5.38	4.21	1.17	5.24	4.24	1.00	0.14	(0.03)	5.28	4.23	1.17	1.00
15	2	5.69	4.59	1.10	5.55	4.84	0.71	0.14	(0.25)	5.59	4.77	1.10	0.71
16	3	5.07	4.10	0.97	5.23	3.72	1.51	(0.16)	0.38	5.19	3.82	0.97	1.51
17	1	5.97	3.86	2.11	6.10	4.11	1.99	(0.13)	(0.25)	6.07	4.04	2.11	1.99
18	1	6.48	4.55	1.93	6.50	4.66	1.84	(0.02)	(0.11)	6.49	4.63	1.93	1.84
19	3	5.10	3.97	1.13	5.01	4.34	0.67	0.09	(0.37)	5.03	4.24	1.13	0.67
20	2	5.52	4.45	1.07	5.76	4.07	1.69	(0.24)	0.38	5.70	4.17	1.07	1.69
21	4	4.66	3.90	0.76	5.01	3.83	1.18	(0.35)	0.07	4.92	3.85	0.76	1.18
22	4	5.38	3.87	1.51	5.06	3.80	1.26	0.32	0.07	5.14	3.82	1.51	1.26
23	5	4.72	3.59	1.13	5.26	3.99	1.27	(0.54)	(0.40)	5.12	3.89	1.13	1.27
24	2	5.24	4.41	0.83	5.51	4.67	0.84	(0.27)	(0.26)	5.44	4.60	0.83	0.84
25	4	5.34	3.86	1.48	5.80	3.89	1.91	(0.46)	(0.03)	5.68	3.88	1.48	1.91
26	1	5.28	4.38	0.90	5.58	4.71	0.87	(0.30)	(0.33)	5.50	4.62	0.90	0.87
27	1	5.48	4.59	0.89	5.83	4.68	1.15	(0.35)	(0.09)	5.74	4.66	0.89	1.15
28	4	4.93	3.76	1.17	5.26	3.70	1.56	(0.33)	0.06	5.17	3.72	1.17	1.56
29	3	5.21	3.93	1.28	5.20	4.20	1.00	0.01	(0.27)	5.20	4.13	1.28	1.00
30	5	5.17	3.93	1.24	5.58	3.80	1.78	(0.41)	0.13	5.47	3.83	1.24	1.78
31	1	5.41	4.34	1.07	5.27	4.54	0.73	0.14	(0.20)	5.31	4.49	1.07	0.73
32	3	3.90	4.34	(0.44)	4.30	4.32	(0.02)	(0.40)	0.02	4.20	4.33	0.44	0.02
33	3	4.76	5.10	(0.34)	5.07	4.89	0.18	(0.31)	0.21	4.99	4.94	0.34	0.18
34	3	4.76	3.67	1.09	4.90	4.21	0.69	(0.14)	(0.54)	4.86	4.07	1.09	0.69
35	1	5.10	3.97	1.13	5.65	4.04	1.61	(0.55)	(0.07)	5.51	4.02	1.13	1.61
36	6	4.52	3.79	0.73	4.67	3.71	0.96	(0.15)	0.08	4.63	3.73	0.73	0.96
37	6	4.79	4.21	0.58	4.95	3.89	1.06	(0.16)	0.32	4.91	3.97	0.58	1.06
FACTORS:													
TRAD. SYSTEMS		5.68	4.31	1.37	5.84	4.32	1.52	(0.16)	(0.01)	5.80	4.32	39.06	45.14
IS STAFF CHAR.		5.45	4.43	1.02	5.54	4.40	1.14	(0.09)	0.03	5.52	4.41		
STRATEGIC ISS.		4.74	4.12	0.62	4.91	4.24	0.67	(0.17)	(0.12)	4.87	4.21		
USER PARTICIP.		5.16	4.05	1.11	5.36	3.90	1.46	(0.20)	0.15	5.31	3.94		
RESPONSIVENESS		5.01	3.88	1.13	5.31	3.77	1.54	(0.30)	0.11	5.23	3.80		
DSS/EUC		4.78	4.16	0.62	5.16	4.04	1.12	(0.38)	0.12	5.06	4.07		
OVERALL		5.18	4.16	1.02	5.38	4.16	1.22	(0.20)	0.00	5.33	4.16		

Table 6.7 presents r^2 values linking the various combinations of importance and performance ratings for I/S and user groups as shown in Table 6.6. Henceforth these pairs of correlates will be termed "measures of fit". As in Table 6.3 the organisations are listed in decreasing order of user performance rating.

TABLE 6.7 I/S IMPORTANCE AND PERFORMANCE RATINGS : CORRELATION ANALYSIS

					ORGANISATIONS										
					FIN 1	FIN 2	MNF 2	MNF 1 1988	RET 1	MNF 3	MNF 1 1987	FIN 3	FIN 4	FIN 5	PUB 2	PUB1
					Mean User Performance Ratings											
					5.13	5.00	4.87	4.82	4.63	4.39	4.27	4.16	3.84	3.82	3.77	3.68
	MEASURES OF FIT															
	I/S		USERS						r^2 values*							
	Imp	Perf	Imp	Perf												
1	X	X			.62	.58	.49	.61	.47	.39	.30	.17	.15	n/a	.20	.15
2	X		X		.30	.64	.60	.71	.44	.61	.59	.76	.62	n/a	.45	.28
3	X		X		.39	.31	.39	.46	.41	.29	.33	.09	.01	n/a	.27	.23
4		X	X		.25	.63	.48	.58	.27	.43	.20	.11	.18	n/a	.17	.31
5		X		X	.50	.49	.62	.53	.54	.48	.39	.57	.56	n/a	.52	.27
6			X	X	.45	.48	.46	.59	.36	.40	.25	.06	.05	.11	.36	.06

*Significance for d.f.=35: r^2>.21 p<.01, r^2>.12 p<.05, r^2>.08 p<.10

The six measures of fit shown in the table represent the six possible pairs of importance and performance ratings for I/S and users. Statistically most of these r^2 values are significant. What is more relevant, however, is the magnitude of the values, indicating the amount of variance explained by fitting a least squares straight line to the pairs of variates. Simple inspection of the table reveals relationships between some measures of fit and the user mean performance rating and these will be tested in the next section.

A visual impression of high and low correlations between importance and performance ratings is provided in Figures 6.1 and 6.2.

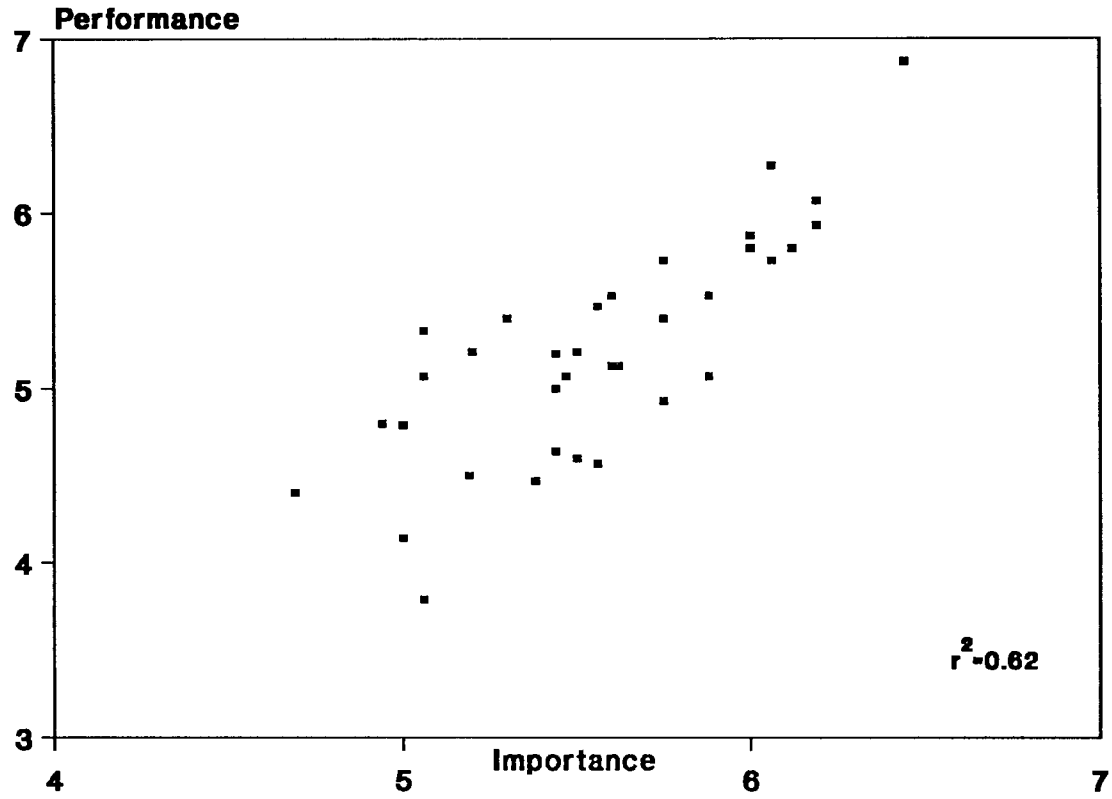


FIGURE 6.1 IMPORTANCE vs PERFORMANCE : FIN 1 I/S

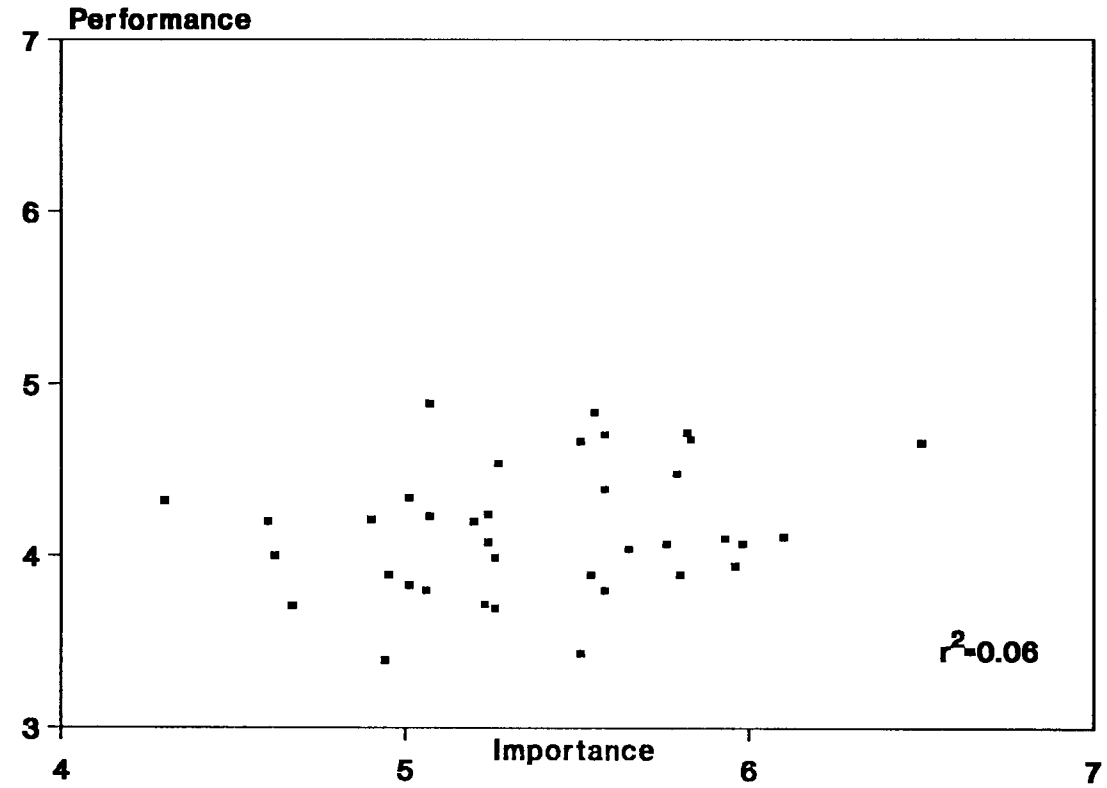


FIGURE 6.2 IMPORTANCE vs PERFORMANCE : FIN 3 USERS

Figure 6.1 shows the scatter between ratings for the I/S staff in FIN 1 and Figure 6.2 for user managers in FIN 3, each point reflecting a pair of entries in a table such as Table 6.6. Since each entry in the table is the mean of several observations within its group, this means that any association between importance and performance reflects a degree of consensus within that group.

6.4.2 Measures of Fit and User Performance Ratings

At least some of the measures of fit shown in Table 6.7 appear to be associated with user ratings of I/S performance. This section explores these relationships. The statistical properties of the r^2 values make it unwise to attempt a parametric correlation analysis here, so the rank order of the organisations in terms of mean user performance ratings and the six measures of fit are compared using Spearman's rank-order correlation formula. The derived rank-order correlation coefficients (r_S) are then compared with the critical values provided (Welkowitz, Ewen and Cohen 1982). The results are shown in Table 6.8 and indicate that measures of fit 1, 3 and 6 are statistically significant. (Since only one measure of fit is available for FIN 5, FIN 5 is excluded from the remainder of the analysis in this section.)

The relationship between the users' global ratings of I/S performance and the measures of fit can be analysed in similar fashion for the seven organisations reporting this statistic. The results are shown in Table 6.9. This table shows that measures of fit 1, 3 and 6 are also significantly associated with the users' global ratings of I/S performance. The result applies equally to the *mean* performance rating for these seven firms, since their rank order in terms of the mean rating is the same.

TABLE 6.8 RANK-ORDER CORRELATIONS
USERS RATINGS OF I/S PERFORMANCE and MEASURES OF FIT

RANKING OF 11 ORGANISATIONS						
MEAN I/S PERF	MEASURES OF FIT 1	2	3	4	5	6
1	1	10	3.5	7	7	4
2	3	3	6	1	8	2
3	4	6	3.5	3	1	3
4	2	2	1	2	5	1
5	5	9	2	6	4	6.5
6	6	5	7	4	9	5
7	7	7	5	8	10	8
8	8	1	10	11	2	9.5
9	10.5	4	11	9	3	11
10	9	8	8	10	6	6.5
11	10.5	11	9	5	11	9.5
r_S	.95	.14	.72	.58	.16	.80

Sign. for 11 pairs: $r_S > .78$ $p < .01$, $> .62$ $p < .05$, $> .48$ $p < .10$

TABLE 6.9 RANK-ORDER CORRELATIONS
GLOBAL RATINGS OF I/S PERFORMANCE and MEASURES OF FIT

RANKING OF 7 ORGANISATIONS						
GLOBAL I/S PERF	MEASURES OF FIT 1	2	3	4	5	6
1	1	7	2.5	5	5	3
2	2	2	4	1	6	1
3	3	5	2.5	2	1	2
4	4	6	1	4	6	5
5	5	4	5	3	7	4
6	6	1	6	6	2	6
7	7	3	7	7	3	7
r_S	1.0	-.53	.71	.61	-.29	.86

Sign. for 7 pairs: $r_S > .93$ $p < .01$, $> .79$ $p < .05$, $> .71$ $p < .10$

To assess the practical significance of these relationships several plots are provided. Figures 6.3 - 6.5 depict the relationships between measures of fit 1, 3 and 6 and the mean ratings of I/S performance in the 11 organisations. Figures 6.6 - 6.8 relate these measures to the global performance ratings in the reduced set of seven firms. The particularly smooth relationship between the I/S group correlation (measure of fit 1) and the users' ratings of I/S performance emerges clearly. Regarding measure of fit 6, PUB 2's user r^2 and performance ratings appear to be at odds and would warrant more detailed study.

FIGURE 6.3 MEASURE OF FIT 1 versus
USER RATING OF I/S PERFORMANCE

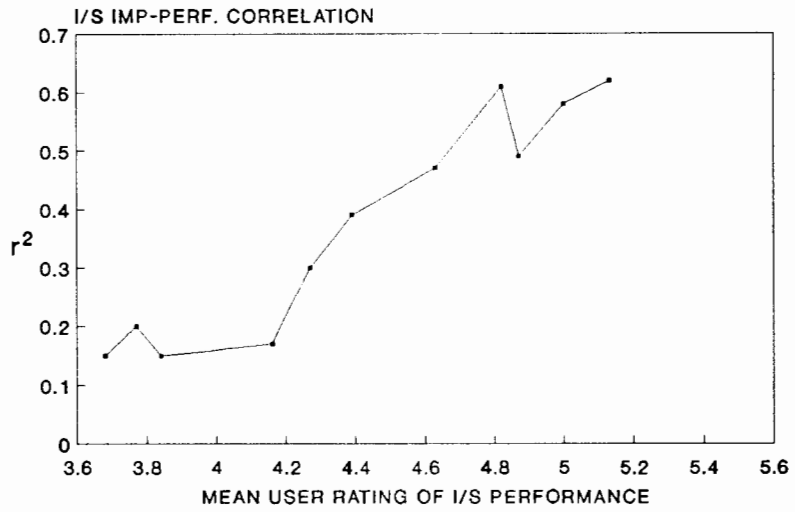


FIGURE 6.4 MEASURE OF FIT 3 versus
USER RATING OF I/S PERFORMANCE

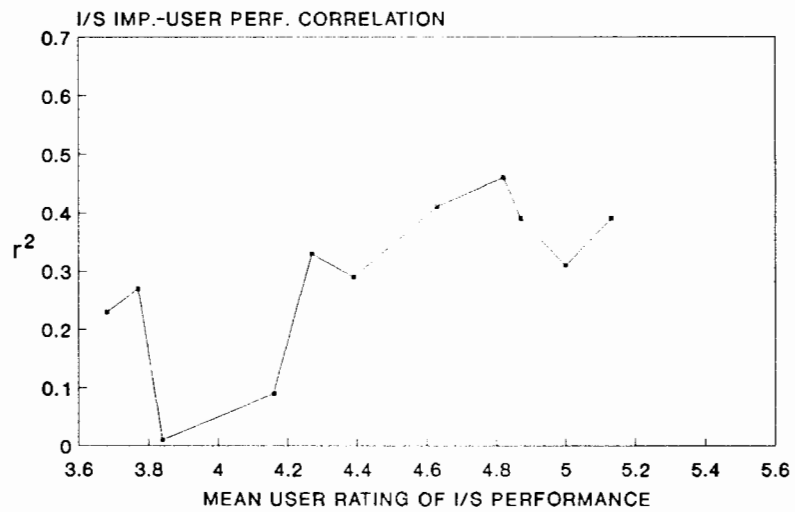


FIGURE 6.5 MEASURE OF FIT 6 versus
USER RATING OF I/S PERFORMANCE

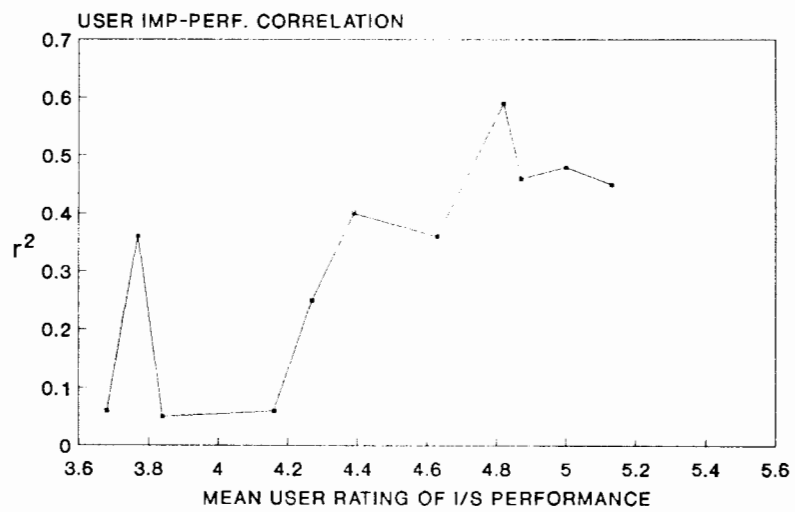


FIGURE 6.6 MEASURE OF FIT 1 versus
GLOBAL USER RATING OF I/S PERFORMANCE

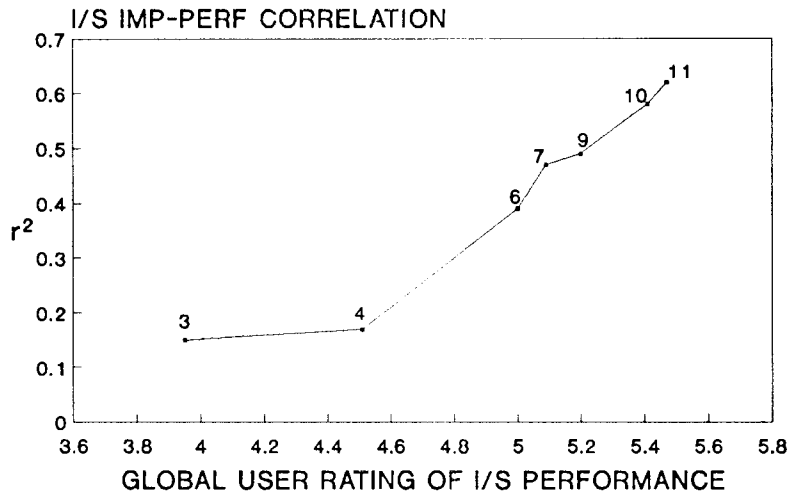


FIGURE 6.7 MEASURE OF FIT 3 versus
GLOBAL USER RATING OF I/S PERFORMANCE

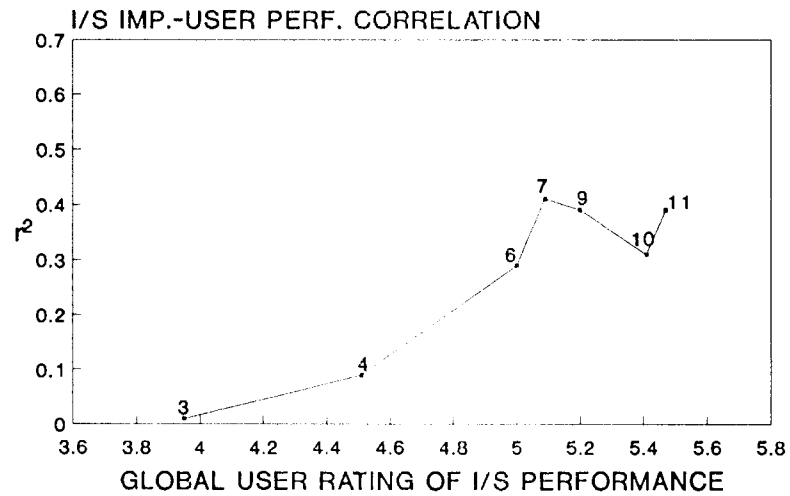
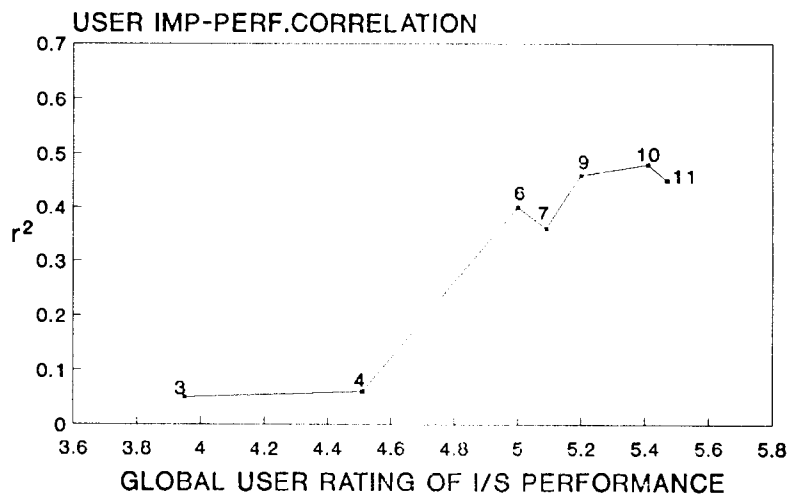


FIGURE 6.8 MEASURE OF FIT 6 versus
GLOBAL USER RATING OF I/S PERFORMANCE



6.4.3 Gap Analysis

The analyses so far have been based on *correlations* between importance and performance ratings. As discussed in Chapter Four, an alternative approach, grounded in Discrepancy Theory, is to calculate the *differences* between these ratings. Large differences would then be construed to reflect dissatisfaction with the I/S capability. A positive gap would imply room for improved performance and a negative gap wasted resources.

These calculations have been carried out as described for Table 6.6. There it can be seen that for each of the items in the survey instrument, and for I/S staff and users separately, the absolute gap between the average importance and performance ratings is derived and the 37 values so obtained are summed to yield an overall discrepancy, here termed the "sum of I-P gaps". Table 6.10 shows the sums of absolute gaps between importance and performance ratings for I/S and user staff.

TABLE 6.10 IMPORTANCE - PERFORMANCE GAPS

		ORGANISATIONS											
		FIN 1	FIN 2	MNF 2	MNF 1 1988	RET 1	MNF 3	MNF 1 1987	FIN 3	FIN 4	FIN 5	PUB 2	PUB 1
Mean User Performance Ratings													
		5.13	5.00	4.87	4.82	4.63	4.39	4.27	4.16	3.84	3.82	3.77	3.68
SUM OF I-P GAPS	I/S	15.4	25.8	19.5	18.2	32.7	30.8	24.9	39.1	59.9	n/a	34.7	59.7
	USERS	18.2	22.6	33.3	17.4	34.6	41.5	36.7	45.1	60.1	67.6	56.7	53.4

The sums of gaps for both the I/S group and users tend to increase as performance ratings decline. This is not surprising, given that the general level of importance accorded I/S by all these organisations is high and roughly similar (see Table 6.3). A decline in overall performance rating must thus lead to an increase in sum of gaps. This phenomenon will be further discussed along with other aspects of the results in the next section.

6.5 DISCUSSION

The survey instrument used in this study has been under development by the author and colleagues for some years and reference is made in this chapter to a number of positive evaluations of its psychometric properties. The analyses conducted here lend further support to the reliability and validity of the instrument. In particular the close relationship

between the global and mean performance ratings is noted. The global question on performance was asked at the beginning of the questionnaire and can be viewed as tapping the general *feelings* of the respondent towards the I/S function. Thereafter the importance scales were presented and finally the detailed performance scales. The global and mean performance ratings thus represent somewhat independent evaluations of I/S performance and support each other, even though it would be better to have a greater separation in time.

The analysis of omitted responses to questionnaire items provides a number of insights. The fact that three times more performance scales than importance scales were omitted suggests that the respondents were more confident and knowledgeable about business needs than actual I/S activity. The observed correlation between omitted importance and performance items does, however, indicate that a significant number of respondents did not feel qualified to comment at all on particular aspects of I/S in the organisation. The nature of the items attracting the lowest and highest response rates is revealing. Those with the highest response rates are those of most immediate relevance (accuracy and timeliness of output, user understanding and confidence in systems). Yet those with the highest rate of omissions are arguably the most critical for management (planning and prioritising I/S, top management involvement, cost-effectiveness of I/S). Given that respondents are almost entirely managers at different levels, this indicates an apparent lack of awareness of these managerial activities amongst a sizeable proportion of managers, or indeed the actual absence of activities such as strategic planning. The pervasive nature of the problem is revealed by the commonality of omissions amongst participating organisations.

Reference is made to the standard deviations of the summary results in Table 6.3. Despite the fact that management responses came from a wide variety of functional areas and management levels, the standard deviations of responses from these groups are typically smaller than those for the I/S groups. This provides a measure of the relative discriminatory ability of the I/S and user groups and, taken together with the discussion of response rates, further indicates the need for management education in I/S matters.

The varying levels of correlation between importance and performance ratings found here confirm and deepen the findings of previous larger scale surveys. The higher levels of

correlation associated with higher levels of performance rating appears to be a general finding across a wide range of organisations and industries. This study also shows that the phenomenon applies separately to I/S and user groups and that there is a positive correlation between these measures of fit for I/S and users. This suggests that there may be antecedent factors influencing perceptions of fit between importance and performance that are common to both groups.

The six hypotheses put forward in Chapter Four postulate that user-managers' attitudes towards the overall I/S function will be influenced by prior beliefs about organisational needs for I/S and actual I/S capabilities. It is also postulated that the IS group will influence user-managers' attitudes. Here beliefs about organisational needs are operationalised by item *Importance* ratings, actual I/S capabilities by the item *Performance* ratings, and user managers' attitudes by the *mean ratings of I/S performance.* The extent to which the empirical results support the hypotheses can thus be examined by reference to Tables 6.8 and 6.9.

(i) Tables 6.8 and 6.9 show that the strongest rank-order correlations with mean and global user ratings of I/S performance are for measures of fit 1 and 6. These are the I/S group importance- performance correlation and the user group importance-performance correlation respectively. These measures of fit are expressions of the concepts contained in the model presented in Figure 4.4. They suggest that users' attitudes towards I/S are influenced by their own sense of fit between business needs and I/S capabilities and also by the perceptions of their I/S staff. This supports hypotheses H1 and H2.

(ii) The tables show that there is no significant correlation between the mean or global performance ratings and either measures of fit 2 or 5. Measure of fit 2 links I/S and user perceptions of importance, and measure of fit 5, I/S and user perceptions of performance. From Table 6.7 it can be seen that the r^2 values for these two measures are all statistically significant and reasonably high. In other words, *irrespective of the level of user satisfaction with I/S*, user-managers and I/S staff tend to agree on what is important for the business, and how I/S is performing. The extent of agreement on these two separate entities is not a predictor of user satisfaction with I/S and in fact there is reasonable consensus here within each organisation surveyed. The results therefore do not support hypotheses 3 and 4.

(iii) The final two measures of fit, 3 and 4, relate to hypotheses 5 and 6. The rank-order correlations are marginally significant and, as regards measure of fit 3, some visible

association with user performance ratings is evident in Figures 6.4 and 6.7. This lends some support to hypothesis 6 which suggests that positive user attitudes are engendered when I/S are able to perceive users' priority requirements and provide capabilities highly rated by the users. The rather weak associations here may however be an indirect consequence of the separate I/S-user importance and I/S-user performance correlations.

Regarding the evaluation of gaps between importance and performance ratings, Table 6.10 shows that the sum of individual gaps rises sharply with declining perceptions of overall I/S performance. This is not as useful a finding as might appear. Firstly, there is a common perception of the importance of I/S irrespective of organisation. Thus, inevitably, as perceptions of performance decline, so will the gaps increase. Secondly there are various ways in which a particular value for the sum of gaps could arise. For instance an organisation could consider all aspects of I/S as performing very well, but none of them as particularly important. This would produce a large sum of gaps just as the reverse situation would. Thirdly, gap analysis does not account for the extent of fit amongst individual items making up the overall I/S function. Correlation analysis does and therefore offers measures of alignment between needs and capabilities. In the present context, the analysis of gaps is thus not as fruitful as correlation analysis. The author has found, however, that in practical terms, identification of large gaps between importance and performance ratings for particular items has proved to be very instructive for managers and has enabled them to make specific diagnoses of problem areas.

6.6 SUMMARY AND CONCLUSIONS

The results of the questionnaire survey of user managers and I/S staff in 11 organisations have been presented and analysed. The summary results suggest that the Miller-Doyle instrument is a valid and reliable instrument for assessing the desired importance and performance ratings of a wide range of facets of informations systems activity in organisations. This supports the findings of the author and colleagues in previous studies. It was found that the noticeable percentages of missing observations could be explained in terms of the likely levels of knowledge of different aspects of I/S amongst the respondents. While these gaps need to be treated as missing values for statistical purposes, they afford important insight into areas for attention in the organisations concerned.

A large number of correlations between the I/S and user ratings of importance and performance were calculated and tested for statistical significance. The r^2 values were then treated as measures of fit and examined together with the primary variable of interest in this study - the rating of I/S performance by the user. Rank-order analysis showed that the strongest associations with this variable were for I/S and user importance-performance correlations respectively. Of the six hypotheses put forward, this finding supports the two that flow from the model of I/S behaviour presented in Chapter Four. That model suggests that user attitudes towards I/S are shaped by users' beliefs about the fit between business needs and I/S capabilities and are also influenced by similar beliefs about fit on the part of the providers of their I/S services.

Of practical significance is the fact that I/S and user groups across all organisations in this survey are in reasonable agreement about priority needs from the I/S function and also about how the function is performing. This is a further contribution to the debate around this topic (see 3.4.1), but does not appear to be the key issue in explaining I/S success.

In the next chapter the results of personal interviews and a study of other information on the participating organisations will be presented and discussed in order to place the survey findings within the larger organisational context.

CHAPTER SEVEN

RESULTS AND ANALYSIS II : THE ORGANISATIONAL CONTEXT

7.1 INTRODUCTION

7.2 DATA SOURCES

7.3 ORGANISATIONAL FACTORS

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CHAPTER SEVEN

RESULTS AND ANALYSIS II : THE ORGANISATIONAL CONTEXT

7.1 INTRODUCTION

The analysis in the previous chapter started from the point that rating the *importance* of a particular aspect of I/S taps cognitive beliefs about the needs of the business or the management task, while rating I/S *performance* taps beliefs about the actual capability of I/S to support that management task or business need. It was also suggested that the views of the providers of the I/S capability (usually the I/S department), influence and to some degree shape the views of the recipients and thereby their attitudes towards I/S. The empirical results support proposed hypotheses linking these constructs.

It has also been argued that organisations are holistic entities in which there are intricate networks of influences. They are probabilistic environments that do not offer simple cause and effect chains or opportunities to determine necessary and sufficient conditions for particular phenomena to occur. This chapter explores the contexts within which the survey questionnaires were administered and attempts to find support for and contextual meaning behind the r^2 values that peppered the previous chapter.
The questions to be addressed are:

- is the organisational context consistent with I/S performance ratings and/or the degree of fit between importance and performance observed by the I/S and user communities?

- does the context explain the similarity or differences between user and I/S perceptions?

- are the technological and organisational changes over time reported in particular

organisations consistent with recorded changes in I/S performance ratings?

7.2 DATA SOURCES

The contextual information was generally gathered by the author through structured interviews of 2-3 hours duration with the chief information officer in each organisation. On some occasions, group discussions were also held and in others top management interviews. Previous to this study, under the author's guidance, MBA students had conducted projects in several of the organisations and gathered a wide range of data regarding I/S and the organisations. On one occasion (FIN 4) two managers in the organisation completed the full I/S effectiveness survey as part of their MBA degree and carried out a series of individual and group interviews with I/S staff and senior management. The author supervised this study and worked closely with the students in planning and conducting the exercise. Appendices G1-G11 summarise the outcomes of this data gathering.

Since the author conducted most of the interviews with knowledge of the survey results, there is likely to be subjectivity and selectivity in these records. However, as noted in Table 5.2, many of the source documents are available for independent analysis and in some cases it was possible to obtain independent interviewer assessments without risk of bias (Emanuel 1986). Finally, all case reports have been thoroughly checked by and discussed with the interviewees and many changes made. The following sections summarise and interpret the detail contained in the Appendices.

7.3 ORGANISATIONAL FACTORS

7.3.1 General Characteristics of the Organisations

As reported in the appendices, 9 of the 11 organisations polled are profit making entities (listed companies, mutual societies). In order to preserve confidentiality, it is not possible to report details of these businesses such as financial performance, specific systems initiatives etc. It can be stated however, that currently they are all successful and growing concerns. FIN 1 and FIN 4 are both major players in the building society arena, as are

FIN 2 and FIN 3 in life assurance. MNF 2 and MNF 3 are very powerful in the motor and heavy engineering sectors, and MNF 1 is the sole and major producer and exporter of aluminium in the country. RET 1 is one of the very largest retailers of fashion clothing and accessories in South Africa, and FIN 5 is amongst the top few short term insurers.

PUB 1 and PUB 2 are in the public health care sector. They do not operate on the basis of profitability, nor is growth an objective as such. PUB 1 administers a budget of over R1,5 billion, has 56000 personnel on its payroll and oversees 140 teaching and regional hospitals as well as many other types of health care facility. PUB 2 has a budget of R280 million and employs 10700 staff in the network of hospitals under its control.

The hospital and health care sector in general is struggling against major financial odds to provide adequate service to the community. The organisational environment is extremely complex with a mixture of authority vested in central government and in the quasi-autonomous provincial bodies. The two organisations studied here are very bureaucratic and experience long lead-times for budget preparation, rigid rules and regulations and substantial impediments to change. Large teaching hospitals such as PUB 2 have particular organisational complexities. The administration of clinical, laboratory, financial and other services is achieved through a very broad matrix-type organisational structure. Reporting lines within the hospital are complicated and so are those to the outside, with responsibilities to both the provincial and university authorities. For instance many staff members are joint university-provincial appointments.

In summary, the profit, cashflow and growth characteristics of the private sector firms in this sample are such that there should be no absolute financial constraint on provision of I/S resources. By contrast the external and internal constraints on PUB 1 and PUB 2 can be expected to have a strong influence on resourcing of their I/S functions.

7.3.2 Corporate Philosophies and Mission Statements.

All of the private sector firms and PUB 2 have developed and published mission statements and/or corporate philosophies in the last few years. While the companies are large, they are essentially homogeneous entities in terms of their products and markets (as opposed to multifaceted conglomerates) and each stated mission is intended to apply to the whole

organisation under study. The following are key elements contained in the corporate statements:

FIN 1 (bank and building society) - *comprehensive range of services; client empathy; relationship banking.*

FIN 2 (life assurance) - *best product and service at lowest cost; emphasis on direct client contact.*

FIN 3 (life assurance) - *financial security through life insurance; efficiency; effective and improved service to customers.*

FIN 4 (building society) - *savings facilities and home ownership for all; social responsibility.*

FIN 5 (short term insurance and life assurance) - *enterprise and professionalism.*

MNF 1 (aluminium producer) - *satisfaction of customer needs; reliability of supply; quality products; delivery on time within specifications.*

MNF 2 (motor manufacturer and distributor) - *quality; service; customer care.*

MNF 3 (vehicle engine manufacturer) - *improvement in productivity.*

RET 1 (fashion goods, accessories and household items) - *satisfaction of customer needs and value expectations.*

PUB 2 (teaching hospital) - *comprehensive health care of the highest quality.*

PUB 1 is currently formulating a mission statement, having awaited a similar exercise at the national level. In general terms it aligns itself with the international health community's vision of *"Health for Everybody by the Year 2000"*.

Customer needs and relationships are emphasised in several of these corporate statements. For instance top management in FIN 2 has expressed its philosophy in concrete

fashion by making presentations on company philosophy and actions to some 10000 clients at more than 200 meetings around the country. In other cases the philosophy has been applied internally as well. FIN 1 applies its philosophy of communications with the client within its own boundaries. The managing director participates in various staff conferences and all divisional meetings to express this concept and regular corporate climate surveys are conducted.

MNF 2 now applies its customer care philosophy internally and places special emphasis on relationships between departments. This has been formalised through a series of regular surveys in which each department evaluates all others with which it has contact. MNF 1 has embarked upon a series of strategic planning conferences that emphasise the role of strategic planning and are also designed to encourage participative management and cohesiveness. RET 1 emphasises participative management and employee partnerships.

These five firms appear to have placed most *real* emphasis on external and internal communications and relationships. They also have the five highest ratings for I/S performance and the highest values for fit. It appears that their overall organisational philosophies facilitate communication of business needs to I/S staff and I/S capabilities to users.

7.4 INFORMATION SYSTEMS CAPABILITIES

7.4.1 Hardware and Software Resources

All the organisations studied here have at least two mainframe computers to satisfy their needs. The computers cover the spectrum of major suppliers in South Africa including ISM, ICL, Unisys, Hewlett-Packard, PR1ME and Hitachi. Total computing power varies considerably, as might be expected with the wide variety of industries being represented. Information on I/S budgets could not be obtained from all participants, but as has been suggested earlier, budget restrictions are not expected to be relevant here except in the public sector organisations. There is also general agreement in the literature that appropriate budget levels are very specific to the particular firm in its competitive environment and cannot simply be correlated with success or failure (see for instance McFarlan &

McKenny 1983).

Batch systems written in Cobol are still common in virtually all of the organisations. All have one or more Fourth Generation languages in place as well and all but PUB 1 and PUB 2 central data base management systems.

7.4.2 Applications Portfolio

Following Zmud et al (1987), the degree of penetration of I/S into the organisations was assessed in terms of four categories of application (see also Chapter One for I/S classification schema):

OPERATIONAL SYSTEMS (daily operational control, cost reduction)

MANAGEMENT SUPPORT (routine monitoring, controlling, planning)

STRATEGIC PLANNING (major ad hoc studies, long range projections)

COMPETITIVE THRUST (intending to gain competitive advantage)

Respondents were asked to rate the degree of penetration of each category into their organisations according to the following scale:

no use at all (1), just starting (2), to some extent (3), to a great extent (4), industry leader (5). Table 7.1 lists the results with the organisations in descending order of user rating of I/S performance.

Some expected tendencies are evident. Firstly, except for FIN 2 and MNF 1, operational and management control systems enjoy greater penetration than strategic planning and competitive applications. The traditional growth path for computerisation in companies first proposed by Nolan (1979) suggests that penetration progresses in stages through the levels of operational control, management control and strategic planning. Where there are differences in the table, they support this model. Nolan's work pre-dates the formal notion

of systems for competitive advantage. However more recently it has been found that systems for competitive advantage only emerge once a strong infrastructure of operational and other systems is in place (Johnson & Carrico 1988). The table supports this finding.

TABLE 7.1 PENETRATION OF INFORMATION SYSTEMS

FIRM	OPERATIONAL SYSTEMS	MANAGEMENT CONTROL	STRATEGIC PLANNING	COMPETITIVE THRUST
FIN 1	5	3	3	3
FIN 2	5	4	3	5
MNF 2	5	4	3	3
MNF 1	4	4	4	4
RET 1	4	4	3	4
MNF 3	5	4	2	1
FIN 3	4	4	3	3
FIN 4	4	4	2	2
FIN 5	4	2	2	2
PUB 1	3	3	1	1
PUB 2	4	2	1	1

Penetration of all categories of system studied here tends to decline with declining user performance ratings. It is difficult to decide whether user dissatisfaction has inhibited I/S penetration, or lack of higher level systems support for users has produced dissatisfaction or both. In general the model presented in this thesis would suggest that perceptions of fit and their influence on user attitudes are key. Fit would foster positive attitudes and encourage I/S behaviours, including support for further I/S penetration. Lack of fit would produce negative attitudes and inhibit such penetration. Case by case analysis of user and I/S perceptions of business needs and I/S capabilities in relation to systems support at the four levels referred to in Table 7.1 would thus be necessary, but this goes beyond the scope of the present study.

7.4.3 End-User Computing and Communications Facilities

These aspects include PCs, local area networks, linking of PCs to mainframes, facilities to download data from mainframes, mainframe and PC modelling and statistical tools, and

electronic mail and messaging facilities.

The organisations vary widely in terms of the extent and nature of facilities in place. With the exception of FIN 5, PUB 2 and PUB 1, PCs have proliferated throughout the organisations studied, many of them replacing terminals for data entry as well as being used as PCs. In several cases there are both local and wide area networks linking the PCs to each other and to their host mainframes. In addition to PC-based analytical software, several organisations have installed powerful mainframe products for end-user computing. These include SAS (FIN 1, MNF 2), AS (FIN 1, FIN 3), System W (MNF 2, RET 1) and APL (FIN 3). Electronic mail and message facilities are not as common, but are present in some cases. PROFS is widely used at FIN 1, and MNF 2 has based a tailor-made communications and enquiry system on the CON-NECT software system. Top management make significant use of this facility. FIN 2 has an extensively used messaging facility and FIN 3 has installed an electronic mail facility.

The three organisations with the highest user ratings of I/S performance and good measures of fit for both I/S and users have well established end-user computing capabilities and in particular electronic mail facilities. However MNF 1 enjoys high ratings without an electronic mail facility and FIN 3 performs poorly despite strong end-user and communications features.

7.5 FORMAL I/S STRUCTURES AND PROCESSES

7.5.1 Size, Structure and Reporting Line of I/S Group

The 11 I/S groups varied in size from 10 to 272 professional staff, with the building societies and life assurers having the largest groups. There is no indication that I/S performance rating associates with size of department.

FIN 1 and FIN 2 I/S groups are separate subsidiary companies with fully constituted boards of directors. The remaining I/S groups are all internal divisions or departments and all of them except MNF 1 report to the second tier of management. MNF 1's DP manager reports to the third level of management.

All I/S departmental structures barring one are typical hierarchies with layers of staff reporting to the I/S manager. The exception is MNF 2, which has dispensed with its hierarchical structure in favour of a looser grouping of staff in different professional categories.

Several examples of split I/S groups are contained in the current sample. FIN 3's development groups have been decentralised to bring them closer to their users and they report to the heads of their lines of business. However they retain a central computer division which exercises strong influence on overall computing strategy and allocation of I/S resources. The MNF 3 and FIN 4 I/S functions have split reporting lines. Since the resignation of the last I/S manager at MNF 3 about two years ago, the I/S development and facilities managers have reported separately to the Financial Director. Since 1987 FIN 4's operations and development groups have reported to a deputy managing director and senior general manager respectively. FIN 5 has a single I/S group now, but this has come about through the combining of the two groups that served the needs of the parent firms that merged in 1985. At the time of the survey, the stresses accompanying this merger were still quite evident. PUB 1 and PUB 2 I/S functions are also split. PUB 1 obtains development support from its own people and other departments in the provincial authority, as well as the Commission for Administration. PUB 2 has its own I/S group and also relies on PUB 1 for common systems support.

It is significant that the top five firms in terms of I/S performance ratings each have one central I/S department, whereas the remaining six organisations have or have recently had some form of structural split amongst the providers of their I/S services. This suggests that cohesion and coordination within the I/S operation is most important to success.

7.5.2 Steering Committees and Project Teams.

All of the organisations except RET 1 and FIN 4 have top or senior management I/S steering committees. FIN 5's steering committee was constituted specially to oversee the merger of two I/S groups described above and did not fulfill a classical steering committee function. This committee was restructured subsequent to the survey. In general there is no obvious connection between the nature and stated functions of the steering committees and I/S performance in the current sample. However the author has participated in and

observed the behaviours of several I/S steering committees. This "participant observation" has indicated wide differences in committee behaviours. Steering committees can be active and driven by user-managers or passive and led by I/S management. Such analysis was not carried out here and leaves open the question of the influence of steering committees in the organisations surveyed.

All the organisations here use I/S project teams for carrying out I/S projects. FIN 2 appoints users or I/S professionals to lead their teams, depending on the nature of the problem. MNF 2 ensures that users lead their projects (except for projects such as technical conversions). Otherwise all organisations put I/S personnel at the head of their project teams. In FIN 3, FIN 4, PUB 1 and PUB 2, users provide information when requested, but are not official members of the teams. There is thus an indication that successful I/S associates with a strong and possibly leading role for users in I/S project teams.

7.5.3 I/S and Business Training for I/S and Users.

The seven firms leading in terms of I/S performance ratings all provide training in management skills and business topics to their I/S staff. In some cases this is via formal pre-planned coursework. In at least one it is through positive financial encouragement to take business courses like an MBA and in others through organised job contact between I/S staff and users. One top financial firm now puts new I/S recruits through a year of in-company business training before commencing I/S duties. One of the manufacturers sends its I/S analysts on certificated inventory management courses. There is no business-related training offered to I/S in any of the bottom four organisations. This suggests that business training for I/S staff is important for I/S success.

It was not possible to find a formal programme of I/S training for users in any of the eleven organisations polled here. FIN 2 state that they used to offer such courses, but now assume users will learn better through their close contacts with I/S. FIN 3 state that they offer courses to users, but either users do not take them up, or when they do they complain about the relevance of the content afterwards.

The findings regarding "cross-training" of I/S and users are particularly important in relation to the notions of fit explored in this thesis. Clearly education and training of both I/S staff

in business issues and users in I/S issues should contribute to the respective abilities of these groups to perceive the fit or lack of fit between business needs and I/S capabilities.

7.6 INFORMAL STAFF COMMUNICATIONS

7.6.1 Within the I/S Group

In order to explore further the observed importance-performance correlations within the I/S group, I/S group attitudes were surveyed via a second instrument.

The reasoning behind this is based on the idea that three criteria are necessary for an importance-performance correlation to be observed. Firstly there must be some real association; secondly individuals within a group must be able to perceive such associations; thirdly they must agree with each other on which specific items show high performance and importance and which show low performance and importance. It is conceivable for instance that respondents may individually perceive a variety of I-P correlations, but differ amongst each other as to the rank order of particular items.

To examine this possibility all 188 I/S staff importance-performance correlations were individually calculated and compared with their particular group statistics. No associations could be found between the patterns of individual correlations within a given group and the level of the relevant group correlation coefficient. In other words, groups were not found in which there were many high individual correlations, but a low overall correlation.

It was thus accepted that the high I-P correlations were formed in organisations were there was *a basis in reality* for such an assessment, where individual I/S staff members were *competent in forming such perceptions* and where they *also agreed with each other as to the ranking of particular items.* This conclusion implies effective communications within the I/S group, and possibly other group characteristics as well. Accordingly, some months after the primary survey, the questionnaire shown in Appendix C was administered to senior I/S staff in each participating organisation. In all but two cases the liaison officer despatched the questionnaires to staff with instructions that this was a follow-up to the earlier survey and that responses should be returned anonymously to him for transmission

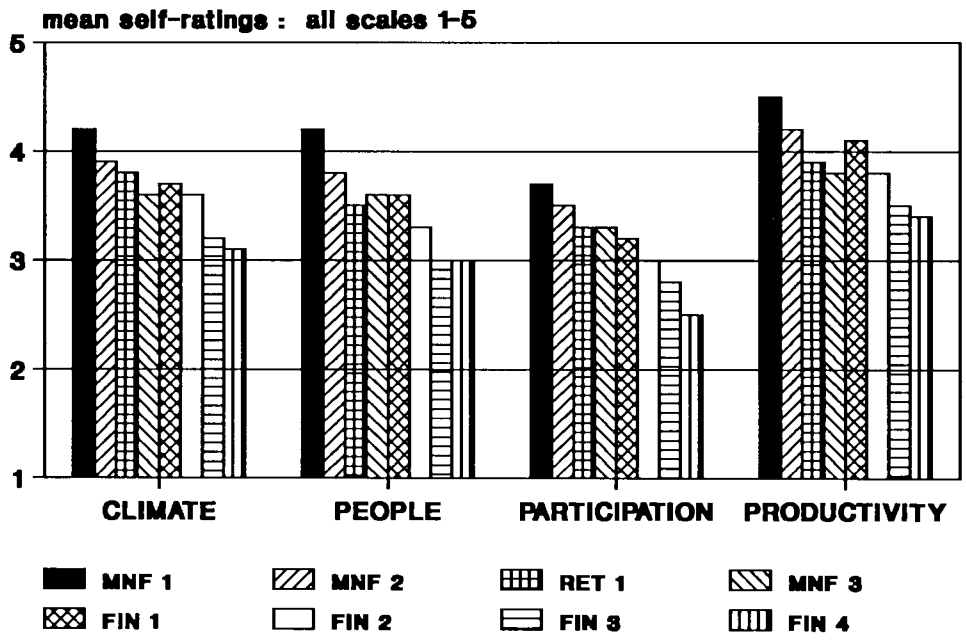
to the author. The response rate was virtually 100% with the numbers being as follows:

MNF 1	10	FIN 1	15
MNF 2	27	FIN 2	27
MNF 3	39	FIN 3	21
RET 1	12	FIN 4	23

There was no evidence of bias in the responses. However, in the case of PUB 1and PUB 2, the author personally administered the questionnaire to all the I/S respondents as they sat around a table, just before a discussion of the overall survey results. The liaison officer, of higher rank than any of the I/S staff present, introduced the topic with a joke about people "being careful not to give the wrong answers". It is felt that the group setting and the introductory remarks are strong factors likely to induce bias and these results have not been used in the analysis.

The questionnaire is derived from one offered in a primer on group behaviour (Lau & Jelinek 1984), but it has not been validated or subjected to any formal tests of reliability. The results must thus be treated with caution. That said, Figure 7.1 shows the I/S group results aggregated according to the four main categories indicated in the questionnaire. Some individual questions were not included in the aggregation because their scales did not approximate interval scales (questions 2, 5, 6, and 12). The organisations are placed in the following order: first the manufacturing and retailing firms, in order of their I/S groups'

FIGURE 7.1 I/S GROUP PROFILES



importance-performance correlations; second the financial services firms in order of their I/S groups' importance-performance correlations.

While it had been hoped that these self-perceptions by the groups would follow the same pattern as the I-P correlations, this is only so if the financial services firms are treated as one set and the manufacturing and retailing firms as another. As seen in Figure 7.1 and listed below, then there is a one-to-one correspondence between I-P correlations and general group characteristics:

Group Quality Rank	**I-P Correlation**
MNF 1	.61
MNF 2	.49
RET 1	.47
MNF 3	.39
FIN 1	.62
FIN 2	.58
FIN 3	.17
FIN 4	.15

Further study would be necessary to establish whether industry characteristics or other factors justify the treatment of the eight firms as two discrete subsets, but it is certainly encouraging that the rankings within the manufacturing and financial sets are preserved. It is also noteworthy that the aggregated scales all show similar patterns. This lends support to the internal consistency of the instrument as a measure of group quality and cohesiveness.

In practical terms it thus appears that cohesiveness within the I/S group, manifesting as positive perceptions of group climate, regard for each other as people and effective participation and communications, may lead to a common view of the importance and performance of facets of I/S. In terms of the larger hypotheses, the fact that the I/S group "speaks with one voice" is thus postulated to lead to high user ratings of I/S performance.

7.6.2 Relationships Between I/S Staff and Users

Information on relationships and communication between I/S staff and users was obtained through the interview process. In terms of the I/S performance ratings, three groupings are described.

(i) The top four firms have strong informal communications links between I/S and users. FIN 1 business analysts in the I/S group stress informal field visits as a supplement to formal planning sessions. FIN 2's I/S mission statement emphasises marketing of I/S services and there is in fact virtually daily contact between I/S managers and project team members and their user counterparts. MNF 2 has dispensed with formal processes such as top-down planning in favour of continuing informal contacts. They believe recent improvements in assessments of I/S by other departments have been a result of this change. MNF 1 has placed special emphasis on marketing and encouraged specific behaviours such as lunches with users to foster closer relationships. These expenses are regarded as investments to facilitate the change process.

(ii) The next two firms in terms of I/S success have recently moved to increase informal contacts with users. RET 1 is making special efforts to engage what they regard as overly passive users. MNF 3 is also stressing this aspect and reports strong bonds forming between I/S analysts and their respective user coordinators.

(iii) By contrast the lower five firms are experiencing communications problems. FIN 3 users remain passive and resist engagement in projects and training programmes, stating that they expect I/S to lead the way. In FIN 4 users are reported to be at the "telling" stage, instructing I/S as to their needs and waiting for results. Tension in an I/S-user workshop conducted as part of this research is attributed to the fact that the I/S and user managers present had hardly spoken to each other in the preceding year. In FIN 5, interaction between I/S and user management has been actively hostile in recent times. Contact between I/S and user-managers in PUB 2 and PUB 1 has until very recently been minimal.

There is a clear association between the extent of informal contacts between I/S and users and user ratings of I/S performance.

7.7 ORGANISATIONAL CONTEXT AND MEASURES OF FIT

Table 7.2 summarises the findings discussed in this chapter. The 'X's indicate that the particular factor has been identified as positive or should be conducive to effective I/S.

TABLE 7.2 CONTEXTUAL FACTORS, MEASURES OF FIT AND I/S PERFORMANCE RATINGS

	ORGANISATIONS										
	FIN 1	FIN 2	MNF 2	MNF 1	RET 1	MNF 3	FIN 3	FIN 4	FIN 5	PUB 2	PUB1
PERFORMANCE RATING	5.13	5.00	4.87	4.82	4.63	4.39	4.16	3.84	3.82	3.77	3.68
I-P CORR.-I/S	.62	.58	.49	.61	.47	.39	.17	.15	n/a	.20	.15
I-P CORR.- USERS	.45	.48	.46	.59	.36	.40	.06	.05	.11	.36	.06
ORG. CULTURE	X	X	X	X	X						
I/S PENETRATION	X	X	X	X	X		X				
EUC / ELEC. MAIL	X	X	X				X				
USERS LEAD I/S TEAMS		X	X								
BUS. TRAINING FOR I/S	X	X	X	X	X	X	X				
I/S GROUP STRUCTURE	X	X	X	X	X						
I/S TEAM COHESIVENESS	X	X	X	X	X	X			n/a	n/a	n/a
I/S - USER COMMS.	X	X	X	X							

The following comments expand on the contents of the table:

ORG. CULTURE - Philosophies/mission statements/cultures that stress the marketing approach and internal and external communications.

I/S PENETRATION - Significant penetration of information systems at all levels of organisational function and for competitive advantage.

EUC/ELEC. MAIL - End-user computing facilities provided and electronic mail facilities in use.

USERS LEAD I/S TEAMS - Specific policies to have users lead I/S project teams where appropriate.

BUS. TRAINING FOR I/S - Emphasis on and in most cases formal training of I/S staff in management and business principles.

I/S GROUP STRUCTURE - The *absence* of divisive structural factors such as split reporting lines.

I/S TEAM COHESIVENESS - Assessments of I/S group by group members that suggest the presence of effective group communications.

I/S-USER COMMS. - High quality and frequent informal communications between I/S staff and users.

Analysis of the empirical data in Chapter Six supports the hypotheses that positive user attitudes towards I/S require a fit between user perceptions of I/S capabilities and business needs and also a fit between the perceptions of I/S staff, who are important referents and influencers in the I/S process. The contextual analysis conducted here helps to understand how a successful fit has been achieved in particular companies and suggests organisational factors that facilitate the informed assessment of needs and capabilities.

For instance, apart from the tangible benefits of extensive penetration of information systems and provision of facilities for end-user computing and communications, this situation also serves to expose users and managers at all levels to information systems and technology thereby enabling them to learn about I/S capabilities and overcome resistance to technological change. If the organisational culture is also one of open communications, then learning will be further facilitated. Users and I/S staff will be able to share their business and technical knowledge effectively and thereby exploit appropriate technological opportunities. More formal "cross-training" for both groups has clear advantages here. The active involvement of users in I/S teams, particularly in leadership roles, will create a strong commitment to the I/S learning process.

Placement of I/S staff in business areas will serve a similar purpose for them and attention to structural and communications issues within the I/S group has special significance in view of the influential role of this group as the provider of the I/S capability.

7.8 TRENDS IN TIME

The state of I/S at any one point in time is clearly the culmination of a historical process. The case reports in the Appendices have attempted to trace the recent history of I/S in the surveyed organisations where prior survey results were available. Two or more I/S surveys have been conducted in all but the PUB 1 and PUB 2 organisations. However in the cases of FIN 1 and FIN 5 (IS performance ratings increased), FIN 4 (rating decreased) and RET 1

(static rating), the sample size in the first survey was very small compared to the latest survey and it may be inappropriate to make any interpretation of the observed differences. In FIN 3 the earlier surveys were small and sampled the whole company, while the latest one focused on one line of business only.

MNF 2 and MNF 3 have both conducted three surveys and found a declining trend in overall I/S performance rating. The figures for MNF 2 are 1985 - 5.5, 1986 - 5.4, and 1988 - 5.0. The I/S manager attributes the recent decline to a significant organisational restructuring in 1985 which I/S staff interpreted as a downgrading of the importance of I/S. Several senior I/S staff resigned and there was a general decline in I/S staff motivation. MNF 3 has recorded the following ratings : 1985 - 5.0, 1986 - 4.8, 1988 - 4.5. Here the decline has been attributed to the departure of the original I/S manager, which led to the split I/S group referred to in 7.5.1 that has still not been united. There has also been a strongly felt lack of top management direction in the last year or two.

FIN 2 has shown virtually no change in ratings over the years :1983 - 5.0, 1986 - 5.0, 1988 - 5.1. This firm has experienced great stability in its organisational structure as it relates to I/S. The I/S manager interviewed noted that the top management in I/S had remained very stable, with the minimum length of service being 10 years.

As reported in Chapter Six, MNF 1 conducted two large surveys twelve months apart. The user ratings were 1987 - 4.3 and 1988 - 4.8. Specific interventions were made to rectify perceived failings in the first survey. These included the purchase and deployment of some 100 PCs in user areas, and a series of behavioural interventions designed to shift the I/S emphasis from products to service. In other words the I/S department was encouraged to adopt a strong marketing stance. The increase in I/S performance ratings has been entirely attributed to the shifts in emphasis successfully implemented by the I/S group. This is the only company in which data is available to compare the measures of fit between importance and performance ratings over time. It is significant that the key measures of fit improved from 1987 to 1988. The I/S staff I-P r^2 went from .30 to .65 and the User I-P r^2 from .25 to .53. This provides encouraging support to the model of I/S effectiveness discussed in this thesis.

7.9 CONCLUSIONS

The analysis in this chapter suggests that the quality and extent of formal and informal communications between senior I/S professionals and user-managers play a crucial role in achieving I/S effectiveness. The specific mechanism is to enable both I/S and users to form intelligent opinions about business needs and I/S capabilities and to set about jointly effecting the appropriate fit between them. In the short run this process may lead to even greater perceived imbalances between needs and capabilities. In the longer run the success achieved in implementing desired capabilities should be measurable by the correlation between importance and performance assessments.

In the next chapter the conceptual and empirical findings of this thesis will be drawn together and the theoretical and practical implications of the work discussed.

CHAPTER EIGHT

SUMMARY AND CONCLUSIONS

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CHAPTER EIGHT

SUMMARY AND CONCLUSIONS

8.1 INTRODUCTION

The chapter summarises the key aspects of this study. A number of guidelines for management are offered and specific directions for future research are suggested. The chapter concludes by assessing whether the intended contributions of the research have been realised and whether answers to the research questions posed in Chapter One have been found.

8.2 I/S IN THE ORGANISATION

Chapter One traces the evolution of computer-based information systems. It is concluded that the change in the contribution of I/S to the organisation is profound enough to require a change in the fundamental paradigm for I/S. Whereas the traditional paradigm focuses exclusively on the internal functioning of organisations, the required paradigm today must cater for the competitive and extra-organisational roles of I/S.

In Chapter Two it is shown that the effectiveness of the I/S function in the modern organisation cannot be regarded as an issue separate from the organisation as a whole. Rather the benefits of I/S have to be assessed in relation to the shifting ground of organisational effectiveness. It would thus appear that, except in narrowly proscribed circumstances, attempts to define I/S effectiveness in terms of exact economic and accounting models have become increasingly futile. The definition and measurement of I/S effectiveness must account for the overall purpose for which the organisation exists and be pragmatic, recognising that effective measurement must be influential in shaping management behaviours.

The Chapter presents powerful models that view the organisation as an information processing entity and stress uncertainty and equivocality in the decision-making functions of managers. This analysis provides strong grounds to reject the utility of contingency theory and simple cause-effect reasoning to explain organisational and information processing phenomena. I/S theorising and empirical research should be based on the so-called "emergent" view of I/S phenomena and adopt a combination of quantitative and qualitative research methodologies.

It is noted that most I/S research has paid scant attention to these issues and there is little overlap between the I/S and organisational research literature.

8.3 PRIOR RESEARCH INTO I/S EFFECTIVENESS

Chapter Two concludes that, as the I/S discipline has developed, there has been a progression from contingency-based empirical research to research more strongly grounded in theory. In particular the behavioural sciences have made a substantial contribution to I/S research. This theme is continued in Chapter Three where it is found that a number of empirical studies have adopted the notion of User Information Satisfaction (UIS) as a surrogate for I/S effectiveness. Twelve instruments purporting to measure UIS are critiqued and shown to be essentially empirical in origin, varying widely in scope and including scales that tap quite different modes of human perception.

Twenty empirical studies using these and other UIS-type instruments are then analysed. Here too a lack of theoretical underpinning in early work is found, but there is a more recent emphasis on social psychology as a reference discipline for I/S theory building. In particular two recent applications of the theory of reasoned action to I/S phenomena are highlighted.

8.4 THE CURRENT STUDY

8.4.1 Development of a New Measurement Instrument

The thesis reports an extended programme of research by the author and colleagues to develop a more strongly grounded and up-to-date instrument for the measurement of

management perceptions of the I/S function - the so-called Miller-Doyle instrument. In comparison with other popular instruments, the content of this instrument is found to be more appropriate to assess the overall I/S function in a modern I/S environment. It also makes specific use of an importance scale to surface insights regarding business needs for I/S. Although first published only recently (Miller & Doyle 1987), the instrument has already been favorably critiqued by members of the international research community. A subset of the results reported here has been accepted for presentation and subsequent publication by the review committee of the important International Conference on Information Systems (Miller 1989).

The instrument has now been used on many occasions to diagnose the I/S function in South African organisations. Practitioners report that the survey results generally accord with their personal observations and where there are differences, the statistical results have shed new light.

8.4.2 Proposed Model of I/S Behaviours

Building on prior research, a model of I/S behaviours is proposed in this thesis (see Figure 4.4). The model builds on the theory of reasoned action which postulates specific relationships between beliefs, attitudes, intentions and behaviours.

This basic model is elaborated in two ways. First it is argued that benefits to the organisation accrue through I/S behaviours such as usage of a system or facility, sanctioning of an I/S investment etc. Thus individual behaviours are regarded as a necessary condition for achieving ultimate benefits in the organisation. Secondly, drawing on motivation theory and the job satisfaction literature, it is postulated that cognitive beliefs about the fit between business needs and I/S capabilities are key to attitude formation in the I/S context. Two prior studies in the I/S environment are cited in support of the theory of reasoned action and early empirical research by the author and colleagues cited to support the fit concept as it applies to the overall I/S function.

8.4.3 Testing the Proposed Model

A partial test of the proposed model of I/S behaviours has been conducted and reported here. The study focuses on the overall I/S function with user-managers as the target group and I/S staff as a group of important referents. The importance and performance scales

in the Miller-Doyle instrument are used to operationalise notions of beliefs and attitudes and to tap perceptions of business needs and I/S capabilities. The perceptions of 1025 user-managers and I/S professionals in eleven organisations are so obtained. To complement the questionnaire survey and explore in more detail the organisational context, in-depth management interviews are conducted and other organisational documents collected.

A positive link is found between statistics involving correlations between importance and performance and the overall attitudes of the user groups. The two strongest associations are between user attitudes on the one hand and the importance-performance correlations within the I/S and user groups on the other. This supports the proposed model and suggests that the strengths of users' beliefs about fit are positively correlated with their attitude towards I/S and also that similar perceptions of fit on the part of the I/S group influence user perceptions. The results are encouraging because strong associations are evident and they are based on a variety of organisations in four widely differing economic sectors.

The results also show that, irrespective of overall user attitude towards I/S, I/S staff and users generally agree about the important needs for I/S and the performance of individual aspects of I/S. This agreement is a useful contribution to the debate as to the commonality of I/S and user perceptions (see 3.4.1), but also shows that these particular associations between I/S and user perceptions do not predict overall user satisfaction with I/S.

Important support for the practical significance of the model and the related approach to measurement is found in the case of MNF 1. As that case report shows, particular problem areas were identified as a result of a first questionnaire survey. Real changes (such as providing end-user computing facilities) were made *and* the new ideas were marketed. The results of a second survey then showed that user attitudes towards I/S had improved and so had the various correlations of interest, including I/S and user importance-performance correlations.

Various limitations to this research are noted. First the results do not separate the influences of user and I/S beliefs about fit, so the relative contribution of these to user attitudes is not clear. Second, while the results suggest that fit may be a necessary

condition for positive user attitudes, it is not possible to assert that fit is a necessary *and* sufficient condition. Third no attempt is made to measure directly any associations between user attitudes and intentions to behave, or behaviours themselves.

8.4.4 Analysis of Context

The focus of the study is broadened to examine the organisational contexts within which I/S activity occurs. This provides a larger perspective on the role of I/S and environmental conditions that might explain the observed correlations.

A fundamental issue is whether information systems activity makes any difference to organisational success. The qualitative data gathered here offers some indirect evidence for a linkage between I/S and organisational well-being. To start with the negative, interviewees in FIN 4, ranked 8th out of 11 in terms of I/S success, note that this firm's policy has led to dramatic increases in numbers of clients and transaction volumes, but the firm is experiencing unsatisfactory profit performance. This situation has been partially attributed to the failure of the information systems capability to keep up with organisational growth and allow the expected reductions in unit administrative costs. By contrast the annual reports of FIN 1 and FIN 2, 1st and 2nd in I/S ratings here, both single out information systems and technology as key factors in their overall success. In the case of FIN 2 explicit credit is given to the computer systems operation for the company's industry leadership in administrative costs.

A number of features of the participating organisations emerge that are relevant to the achievement of fit. The organisations showing high values for fit have cultures that focus explicitly on customer service and communications within the organisation. There is particularly good and frequent informal contact between I/S and users and the measured self-perceptions of these I/S groups indicate a high level of I/S group cohesiveness and productivity.

The qualitative analysis also indicates differences between organisations as regards formal structures and processes. In the more successful firms the I/S groups are single structures, whereas in the less successful, the I/S groups have been split. There is a strong emphasis on formal business training for I/S staff in the more successful companies and also some emphasis on the appointment of users to lead I/S project teams.

Each of the elements described contributes to the building of a common knowledge base amongst I/S staff and users regarding the fit between I/S capabilities and priority business needs. This is achieved as an outcome of the overall corporate culture, through specific interventions to foster informal communications between I/S and users, through conscious practices geared to training and education of these people, and by recognising and implementing appropriate formal structures and processes.

8.4.5 Related Perspectives on Fit

Apart from the present work and its antecedents and Srinivasan's (1985) study of fit described earlier, the author has been unable to find empirical work on fit in the I/S domain. Indeed few substantial tests of fit in the broader organisational context have been identified. One study of relevance to I/S in this latter area examines the structure and technology employed by 27 nursing subunits. Support is found for the hypothesis that fit between technology and departmental structure is a better predictor of quality of health care than either technology or structure alone, or the two together (Alexander & Randolph 1985). Application of this result to the fit between information technology and departmental structure in the business context should be a useful exercise.

Three prescriptive articles on the concept of fit in management science and I/S implementations are noted. Schultz and Slevin (1975a) contrast the technical and organisational validity of management science implementations. The *technical validity* of a management decision model is defined as its capability to provide a solution to a stated problem. Its *organisational validity* refers to its compatibility with the user organisation. The authors explore what they term the "behavioural congruence" of the model and the organisation and identify individual, small group and total organisational factors as relevant to the achievement of organisational validity. In a follow-on article (Schultz & Slevin 1975b), an instrument is proposed to assess organisational validity, but has received little application in the literature (see also 3.3.1).

Ginzberg (1980) explores system acceptance/resistance and success/failure in relation to fit. He postulates that designer, user, system and organisational characteristics are relevant to the extent that they result in designer/user fit, individual/system fit and system/organisation fit. He develops a series of propositions regarding fit to enable systems developers to

assess the potential ease or difficulty of a particular implementation. He notes that testing of the propositions in the model presents a major challenge.

The concept of organisational validity is applied to management information systems by Markus and Robey (1983). They define it as "the 'fit' between an information system and its organisational context of use" (p.203). Four types of fit are identified, including user-system fit, organisational structure-system fit and power distribution-system fit. Two processes are suggested as being pertinent to achievement of fit. These are integration of differences between I/S and user interests and negotiation among interests. The authors do not address the question of measurement, but offer their findings as a basis for further theorising.

Each of the three I/S-related papers above concerns itself with the fit of individual systems or models to the organisation and with the implementation process. This is in contrast to the present work which appears to be unusual in testing the *overall I/S function* and its *on-going* fit with business priorities. Nonetheless, the cultural, structural and communications-related features associated with the organisations evincing high fit discovered in the present study are fully in line with the processes of integration and negotiation prescribed by Markus and Robey.

8.5 DEFINING AND MEASURING I/S EFFECTIVENESS

8.5.1 Defining I/S Effectiveness

The results of this study provide ample evidence of the difficulty of devising comprehensive scientific definitions and measures of I/S effectiveness. Indeed the variable time lags between key I/S-related decisions and their outcomes, the demonstrated shifts in perceptions over time and many other facets recorded in the case reports might suggest that it is pointless to continue the search. Rather it is concluded that the definition of I/S effectiveness must take into account individual perceptions and organisational purpose. The following definition of information systems effectiveness is proposed as a new base upon which to build:

'An effective information system is one which achieves the purposes of its users.'

This definition recognises that I/S effectiveness depends on the larger purposes of individuals and the organisation, whether these purposes be individual decision-making tasks, improved organisational processes, or ultimate economic benefits. Achievement of these purposes can only occur if there is a fit between the relevant business needs and the I/S capabilities provided and the notion of fit is contained in the definition. For instance a computer that provides subsecond response times when five seconds is adequate is irrelevant. Conversely no matter how effective are the available systems for operational control, if a need for strategic planning support is perceived and not met, maximum I/S effectiveness has not been achieved.

The definition allows for various realities. First, it recognises that the *detailed* definition of effectiveness is unique to a particular organisation, a subunit and ultimately the single individual. In the final analysis I/S effectiveness is a matter of judgement and will be rated differently at the individual, group and organisational level. Second, as organisational objectives change, the criteria for I/S effectiveness will change (a low degree of fit today may simply reflect a change in organisational needs). Thus there needs to be a constant re-evaluation of business needs and priorities and the extent to which current and planned I/S capabilities fit with these priorities. Third, there can be no such thing as ultimate I/S effectiveness. All that can be hoped for is the best possible match between the needs of the business as seen by a selection of individuals at a particular point in time and the I/S facilities provided. It follows from this that I/S effectiveness can only be conceptualised in terms of the knowledge and vision of the organisational actors and is constrained by these factors. Text book theory and published success stories may provide direction, but not prescriptions.

8.5.2 Measuring I/S Effectiveness

The definition of I/S effectiveness requires that the organisation assess the purposes of its members, detail the contribution I/S should be making to achievement of those purposes and determine the extent to which I/S is assisting in their accomplishment. In other words, measurement of I/S effectiveness is the measurement of *fit*. Such measurement relies on the perceptions of the organisational participants and should focus on two aspects -

business needs and the extent to which I/S is meeting those needs. Cognitive rather than affective perceptions should be assessed and respondents should be required to act as dispassionate observers of the organisational process - "expert witnesses". The choice of respondent is crucial and should be as broad and representative of the I/S domain being investigated as possible. Assessors of I/S effectiveness could certainly include participants other than users themselves (eg top management, I/S staff, auditors, etc.). This thesis offers an appropriate measurement tool, but certainly not the final answer (see 8.6.1 ahead).

8.5.3 Beliefs, Attitudes and User Information Satisfaction

Given that UIS is often regarded as a surrogate for I/S effectiveness, the UIS construct needs to be considered in light of the definition of I/S effectiveness presented here. User Information Satisfaction is a confused construct. The most common definition states that UIS is "the extent to which users believe the information system available to them meets their information requirements" (Ives et al 1983). "Belief" suggests the cognitive dimension, but UIS is commonly regarded as an attitude. Then again the measures of UIS tend to mix belief scales and attitude scales. The definition implies meeting a need with an available system, but the measurement instruments employed do not measure such fit. And finally, by definition, UIS is restricted to "user" perceptions.

There are thus several differences between UIS and the current definition of I/S effectiveness. The current definition is grounded in the *cognitive* rather than the affective domain and requires the *explicit measurement of fit*. Respondents are regarded as *expert witnesses* providing their cognitive assessments of *task and organisational process needs*, and different facets of I/S. With regard to survey procedure, respondents should match the purposes of the investigation, which might be a general assessment of the total I/S function, an evaluation of a specific system, a comparison between functional groups etc. Respondents thus should not be restricted to users, but could well include I/S staff, top management or other stakeholders. The scales appropriate to measuring I/S effectiveness as currently defined must specifically tap cognitive belief structures.

One outcome of an evaluation of I/S effectiveness as described above may indeed be a measure of users' feelings towards their I/S, but this is a by-product and should not be

regarded as a surrogate for I/S effectiveness. The term "attitude" can usefully be reserved for the affective reaction or feeling the user has towards I/S and proper definition of UIS can lead to its use as a broad measure of this construct. If attitude is to be measured explicitly via UIS, then items and scales must be designed specifically to tap affective responses towards chosen aspects of I/S.

Finally in this section the theory of reasoned action needs to be revisited with the current definition of I/S effectiveness in mind. It has already been established in this study that there is a close relationship between fit and attitude and the theory might suggest that this relationship is exact. If that were so, then the need for a cognitive I/S effectiveness construct would fall away and efforts could be redirected to the best possible measurement of user attitudes.

There is, however, active debate about the definition and measurement of attitude embodied in the theory of reasoned action and the strength of the linkage between attitudes and behaviours. Melone (1988) discusses these issues and notes that attitudes may serve users in ways other than "true" evaluation of an object (e.g. holding an attitude to maintain a positive self-image). She also draws on current research in cognitive psychology to distinguish the relevance of attitudes stored in memory from those that are "computed on the spot" (Fazio 1986). In general her conclusion is that attitudes are considerably more complex than conceptualised in most user-satisfaction research and that user satisfaction alone is not sufficient to capture the full meaning of effectiveness. Exploration of the utility of a cognitive construct for I/S effectiveness, its full relationship with attitudes and the role of attitudes in predicting behaviour thus remains a fruitful area for research and will be discussed again in section 8.7.

8.6 IMPLICATIONS FOR MANAGEMENT

8.6.1 I/S in South African Organisations

The management responses in the eleven organisations studied here reveal a wide spectrum of "fit" and attitudes towards I/S. The top organisations regard I/S as one of the keys to their success while the bottom ones may well be experiencing unnecessary costs

and falling behind their competitors. There is generally high penetration of I/S in all the organisations surveyed, with the organisations successful in I/S showing the most extensive and wide-ranging exploitation of information systems. The data on I/S effectiveness over time suggests that, if unattended to, I/S effectiveness can remain at undesirably low levels for extended periods of time (FIN 3) or deteriorate fairly quickly (MNF 2). However it is possible to effect beneficial change through a planned programme of interventions (MNF 1). These observations underline the major role that I/S plays in the modern organisation, the importance of assessing the I/S contribution, and the fact that beneficial change can be effected.

The thesis demonstrates that it *is* possible to measure I/S effectiveness. In fact, compared with the traditional approaches that rely on extensive and ultimately suspect cost-benefit analyses, the approach proposed here is relatively inexpensive and has been found to capture the interest of most managers polled. Given the costs of I/S and the continuing threat that departing international firms will cause local firms to fall behind in terms of world technology trends, it is imperative that organisations measure the effectiveness of their I/S functions and exploit whatever opportunities are available to maximise the return on their I/S investment.

8.6.2 Measurement of I/S Effectiveness

The first recommendation then is to organise regular planned surveys of perceptions regarding the I/S function. These surveys should be rigorously planned and administered in the expectation that they will be repeated at regular intervals. Issues such as questionnaire fatigue then arise and may suggest successive random samples of respondents. Trade-offs must be weighed up between the likelihood of increased variance in surveys of random samples and the risk that repeated use of the same population will result in mechanical responses and poor quality data.

As is clear from the previous discussion, the recommendation is *not* for attitude surveys, although attitudes may be a by-product. Rather, the selected members of the organisation are being asked to give their professional assessment regarding business needs for I/S and the extent to which current I/S capabilities appear to be meeting those needs. All levels of management and professionals in the I/S group should participate. Interpretation of the

results should be done in conjunction with the participants and feedback of the results should be seen as an essential part of the process.

The recommended survey process will enable the on-going monitoring of the extent to which I/S is keeping in tune with the changing business environment. It will also serve a vital educational purpose. The analysis of missing values in 6.2.2 shows significant gaps in management knowledge of strategic issues in I/S. Properly administered surveys with feedback will help to fill in these gaps in a meaningful context. A further benefit of such surveys will be the implicit acknowledgment of the expertise and opinions of users in improving the I/S function. And finally I/S professionals will be required to express their opinions about business issues, probably an unusual experience for most I/S people.

8.6.3 Training and Education

The second recommendation concerns training and education. The need for I/S-related training and education for both the user and I/S community is widely recognised. Surveys of top priorities in I/S repeatedly cite this as a key issue (Brancheau & Wetherbe 1987), and many establishments offer such services commercially. What is striking is the minimal evidence of organised training of the user community in basic principles of I/S. This is evident from this survey, where virtually no I/S education or training other than task-specific instruction is provided to users. There is also minimal evidence of formal exposure of I/S staff to the nature and purpose of the businesses they are serving. The results of this study suggest that a radical change in the philosophy of training and education is required. Planned educational interventions should have the specific objective of achieving fit. In other words the topics chosen and the pedagogic techniques used should emphasise the information processing content of the business and potential connections with computer-based I/S. Where possible, I/S staff and users should participate together in these training programmes.

Keen and Bronsema describe a programme of "strategic computing education". They propose that target audiences and topics be identified along the lines shown in Figure 8.1 and that organisations adopt a formal long term programme to inculcate the necessary ideas (Keen & Bronsema 1982). Here it is recommended that organisations use this schema as a basis for formal education of organisational participants.

FIGURE 8.1 STRATEGIC COMPUTING EDUCATION MATRIX

(Based on: Keen & Bronsema 1982)

	TOP MGMT	USER MGMT	DP MGMT
INTRODUCING TECHNOLOGY		X	
I/S AS A MANAGERIAL RESOURCE	X	X	X
MANAGING TECHNOLOGY	X	X	
TECHNOLOGY UPDATES	X		
STRATEGIC I/S PLANNING	X	X	X
INFORMATION NEEDS ANALYSIS		X	X
BUILDING SYSTEMS			X
IMPLEMENTING SYSTEMS		X	
COMPUTER LITERACY	X		
BUSINESS KNOWLEDGE			X

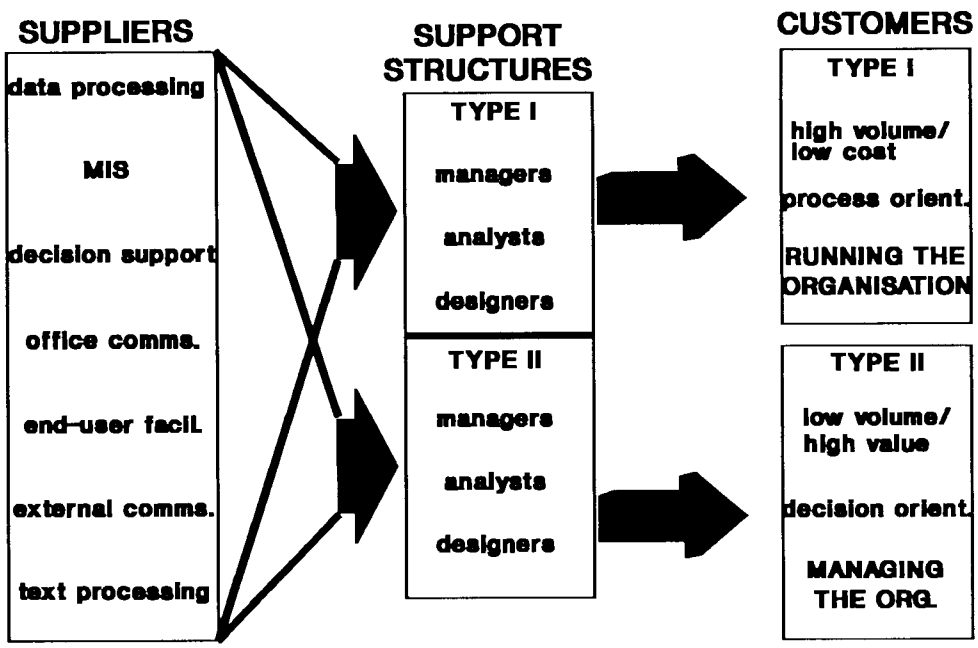
8.6.4 I/S Structures and Processes

Interventions other than education and training can also be used to enhance communications between I/S and users. Attention to the composition of I/S project teams is one that emerged from this analysis. McFarlan (1981) has stressed the role of users as leaders and members of project teams and it is somewhat surprising that more organisations in this sample have not implemented user-led I/S teams. There is widespread acceptance of the value of user involvement and participation in project teams is a primary means to realise this opportunity.

Appropriate structuring of the I/S group is a further implication to arise from this analysis. First, the need for a cohesive group is clear, presenting interesting coordination problems when central groups are split into decentralised development groups and a central computer utility (FIN 3). Second, the structuring of I/S groups has followed "product" lines in the past, with specialist groups to look after mainframe operations, others to look after communications facilities etc. This study brings to the surface the value of marketing the I/S function (MNF 1) and I/S departmental structures facilitating marketing are thus indicated. Sprague and McNurlin (1986) offer recommendations here, noting that the marketing approach requires a service orientation, and a focus on customer groups rather than product groups. Figure 8.2 is a schematic of a marketing-orientated I/S structure. It identifies two classes of "customer" and a range of information services. Type I customers

are concerned with large-scale operational control applications and Type II with low-volume/high-value analytical computation. The schematic indicates that each type of customer may wish to draw on any of the information services offered. Therefore each provider of information services should be knowledgeable in the full range of options but specialise in a particular customer type.

FIGURE 8.2 STRUCTURE FACILITATING MARKETING OF I/S
(Source: Based on Sprague & McNurlin 1986)



8.7 IMPLICATIONS FOR FUTURE RESEARCH

8.7.1 Instrument Design and Validation

In Chapter Three various instruments for measuring UIS were discussed. The analysis in this thesis offers a basis to evaluate them with a view to differentiating between measures of belief and attitude and coverage of items. For instance, the development of the "Short Form" of the Bailey-Pearson questionnaire was based on the statistical properties of the items and scales. The end result was indeed a short form, but the coverage became limited and the instrument has been subjected to several criticisms. It is suggested that future instrument evaluations should address the content and coverage of items as well as the

statistical properties of the questionnaires.

The Miller-Doyle instrument used in this study measures beliefs about a wide range of aspects of I/S and particular scales are provided. It is now important to re-evaluate the instrument in terms of both content and scales. With regard to content, the instrument has been shown to address six underlying I/S constructs. These constructs map well with those from other studies and there is no obvious evidence that they are out of date or limiting. Nevertheless there is scope for refinement and enhancement of the instrument. The total number of items could usefully be reduced to 20 or fewer in order to maintain respondents' interest and commitment to careful assessment. Equal numbers of items loading onto particular factors could be sought. Ongoing enquiry could refine and add to the range of facets of I/S included in the instrument. Specific versions of the content could be devised to address particular needs. For instance the author is currently field-testing a version containing more detailed items designed to evaluate the effectiveness of individual information systems. There is also a need for an instrument to evaluate the end-user computing arena (Howard 1987, Doll & Torkzadeh 1988, Greathead & Franszen 1988). Progressive analyses of the content validity of revised instruments would have to accompany such developments. The wording and structure of scales needs careful attention to ensure effective tapping of cognitive rather than affective dimensions. The reader is referred to the thorough discussion of this topic in the source literature (Fishbein & Ajzen 1975).

8.7.2 Testing Models of I/S Behaviour

This study has focused on the theory of reasoned action, extended to account for notions of fit. Promising results have been obtained and provide encouragement for further empirical tests of the model. As mentioned in 8.5.3, there are also other models addressing beliefs, attitudes and behaviours. Research aimed at refining insights into these constructs and the relationships between them is likely to be most fruitful.

Similarities in the views of I/S and user managers have been found here. There is a growing body of research into organisational politics as it affects I/S-user relations (e.g. Markus & Bjørn-Andersen 1988). Incorporation of these ideas may further explain the perceptions of these two groups. Similarities and differences between levels of management or

functional areas have not been explored here. It is likely, however, that beliefs and attitudes about I/S will vary considerably between, say, the typical accounting and marketing departments. A study of such differences should throw great light on the receptivity of employees in different organisational settings and provide guidance for management of the technological change process.

Although not reported, there are clear indications in some organisations studied here of significant differences between the attitudes of managers at different levels in the organisation towards I/S. There is also the suggestion that negative perceptions at higher levels "drag down" lower level perceptions. This supports the findings described in section 8.4.5 (Ginzberg, Lucas & Schultz 1986) and is also consistent with the role of managers as referents in the theory of reasoned action. Empirical research to determine hierarchical influences on attitudes thus offers rich opportunities to understand I/S behaviours.

Longitudinal studies of shifting perceptions of I/S effectiveness hold major potential. This study has explored in some detail one example of changes over time in I/S effectiveness (MNF 1), and referred more briefly to several others. Planned organisational experiments such as that conducted amongst personnel and payroll employees by Baronas and Louis (1988) offer an exciting opportunity to effect changes and monitor their impact on the perceptions and behaviours of organisational members. For instance an I/S innovation (eg analytical facilities to monitor sales performance) could be selected, prior perceptions of fit and beliefs about the views of important others could be measured, and intentions to use the new facility determined. After implementation, actual use and resultant perceptions of value and fit could be measured. The experiment could be extended by splitting the sample and offering training programmes and other interventions to enhance acceptability.

8.7.3 Definitions of I/S Effectiveness

This thesis has proposed a new definition of I/S effectiveness and offered empirical and theoretical support for it. The discussion makes it clear however that much work needs to be done to explore in great detail the role of beliefs, attitudes and behaviours and their relationship to I/S effectiveness. These studies should be broadened to include user perceptions of organisational outcomes and the direct influence these outcomes may have

on reshaping beliefs and attitudes. The definition also refers to *user purposes*. This element needs extensive study in its own right.

8.8 CONCLUDING REMARKS

The search for conditions necessary to achieve a more effective I/S function is reported in this document. In the process it is believed that the intended contributions listed in 1.7 have been achieved. The fundamental relevance of organisational theory to I/S has been brought to the surface and the rich contribution social psychology can make to the understanding of I/S phenomena is revealed in the empirical results. A grounded model of I/S behaviours is proposed and is amenable to detailed testing.

Answers to the research questions posed in 1.4 are also offered. Specifically I/S effectiveness is defined, a basis for measurement is proposed and guidelines to improve I/S effectiveness are suggested. The particular importance of aligning the multiplicity of organisational needs with I/S capabilities has been demonstrated and is shown to be an achievable goal of management.

Management scientists contrast "tame" and "wicked" problems. Tame problems are bounded, well-structured and lend themselves to exact solution. Wicked problems have no definitive formulation and no single explanation for the same discrepancy. Every wicked problem can be considered as a symptom of another problem and there is no stopping rule:

> *"Wicked problems are not necessarily wicked in the perverse sense of being evil. Rather, they are wicked like the head of a hydra. They are an ensnarled web of tentacles. The more you attempt to tame them, the more complicated they become" (Mason & Mitroff 1981, p.10).*

The nature and contribution of computer-based information systems in organisations has undergone radical change. In the process I/S has become a wicked problem, demanding new ways of analysis and fresh approaches to solution. There are great rewards for those I/S researchers and practitioners who meet the challenge.

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APPENDICES

A. MILLER-DOYLE INSTRUMENT

B. STRUCTURED INTERVIEW GUIDE

C. QUESTIONNAIRE :
CHARACTERISTICS OF THE INFORMATION SYSTEMS GROUP

D. ANALYSIS OF MISSING VALUES

E. ASSIGNMENT OF QUESTIONNAIRE ITEMS TO FACTORS

F. DATA SETS FOR CORRELATION AND GAP ANALYSIS

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F2: FIN 2
F3: MNF 2
F4a: MNF 1 1987
F4b: MNF 1 1988
F5: RET 1
F6: MNF 3
F7: FIN 3
F8: FIN 4
F9: FIN 5
F10: PUB 2
F11: PUB 1

G. CASE REPORTS FOR PARTICIPATING ORGANISATIONS

G1: FIN 1
G2: FIN 2
G3: MNF 2
G4: MNF 1
G5: RET 1
G6: MNF 3
G7: FIN 3
G8: FIN 4
G9: FIN 5
G10: PUB 2
G11: PUB 1

APPENDIX A

MILLER-DOYLE INSTRUMENT

QUESTIONNAIRE

INFORMATION SYSTEMS EFFECTIVENESS

The overall effectiveness of the firm's computer-based information systems is of much interest. However it is difficult to measure this aspect of business activity because of the ever-widening scope of computer support. Also effectiveness covers many aspects in areas such as the efficiency of computer operations and the nature of support provided to the business.

This questionnaire examines your personal perceptions of a variety of aspects of information systems activity in your firm.

Firstly rate your firm's overall information systems effort by circling the appropriate number on the following scale

Very Poor		Poor		Good		Excellent
1	2	3	4	5	6	7

Now briefly scan through the 37 items listed on the next three pages.

In relation to the scale shown, consider how IMPORTANT each aspect is to your firm's business activities. Starting from item 1, circle the number from 1 to 7 that most represents YOUR OWN assessment of the importance of each item.

Once you have completed the 37 ratings, move on to the next section of the questionnaire.

(Please try to assess relative importance rather than assigning the same value to all items. Also, if you are unfamiliar with a particular item, or have nothing to do with it in your firm, please leave it blank.)

PART ONE: THE IMPORTANCE OF INFORMATION SYSTEMS

Please assess the importance of each item *to your organisation's activities* by circling the appropriate number on the scales provided.

		Irrelevant		Possibly Useful		Important		Very Critical
		1	2	3	4	5	6	7
1.	Availability and timeliness of output information supplied to users.	1	2	3	4	5	6	7
2.	Quality and competence of systems analysts.	1	2	3	4	5	6	7
3.	Communications between Information Systems staff and managerial users.	1	2	3	4	5	6	7
4.	Integration of office communication and information services.	1	2	3	4	5	6	7
5.	Prompt processing of requests for changes to existing systems.	1	2	3	4	5	6	7
6.	Efficient running of current systems (ease of use, costs, documentation, maintenance)	1	2	3	4	5	6	7
7.	Use of a management committee for overseeing and monitoring all major information systems activity.	1	2	3	4	5	6	7
8.	Access to data and models by users without involving the Information Systems Department	1	2	3	4	5	6	7
9.	Information Systems support for users in preparing proposals for new systems.	1	2	3	4	5	6	7
10.	Ease of access for users to computer facilities via terminals/P.C.'s.	1	2	3	4	5	6	7
11.	Currency (up-to-dateness) of output information.	1	2	3	4	5	6	7
12.	Short development time required for new systems.	1	2	3	4	5	6	7
13.	A low percentage of hardware and systems downtime.	1	2	3	4	5	6	7
14.	The improving of new systems development (with respect to time, cost, quality and disruptions).	1	2	3	4	5	6	7
15.	High degree of technical competence of the staff in the Information Systems department.	1	2	3	4	5	6	7
16.	Effective training programs for users in general information systems capabilities.	1	2	3	4	5	6	7

	Irrelevant		Possibly Useful		Important		Very Critical
	1	2	3	4	5	6	7

17.	User confidence in systems.	1	2	3	4	5	6	7
18.	Accuracy and completeness of output information.	1	2	3	4	5	6	7
19.	Preparation of a strategic plan for Information Systems.	1	2	3	4	5	6	7
20.	User-oriented systems analysts who KNOW user operations.	1	2	3	4	5	6	7
21.	The influence the user has over which information services are provided.	1	2	3	4	5	6	7
22.	Users' feeling of participation.	1	2	3	4	5	6	7
23.	Flexibility of data and reports available from systems.	1	2	3	4	5	6	7
24.	Positive attitude of Information Systems personnel towards users.	1	2	3	4	5	6	7
25.	Quick and flexible access to computer data.	1	2	3	4	5	6	7
26.	Data security and privacy.	1	2	3	4	5	6	7
27.	Information systems providing competitive advantage for the firm.	1	2	3	4	5	6	7
28.	Users' understanding of systems.	1	2	3	4	5	6	7
29.	Setting of systems priorities to reflect overall organisational objectives.	1	2	3	4	5	6	7
30.	Systems responsiveness to changing user needs.	1	2	3	4	5	6	7
31.	Relevance of report contents to intended functions.	1	2	3	4	5	6	7
32.	Increasing the effort to develop new systems relative to maintaining existing systems.	1	2	3	4	5	6	7
33.	Application of modern information technology.	1	2	3	4	5	6	7
34.	Top management involvement in defining and monitoring information systems policies.	1	2	3	4	5	6	7
35.	Overall cost-effectiveness of information systems.	1	2	3	4	5	6	7
36.	The availability of models to analyse business alternatives.	1	2	3	4	5	6	7
37.	Data analysis capabilities to support decision making.	1	2	3	4	5	6	7

PART TWO:

INFORMATION SYSTEMS PERFORMANCE ACHIEVED BY THE ORGANISATION

The same 37 items as in Part One are listed below. Now please assess your organisation's PERFORMANCE in each case by circling the appropriate number on the scales provided.

Very Poor **Poor** **Good** **Excellent**

1 2 3 4 5 6 7

1.	Availability and timeliness of output information supplied to users.	1	2	3	4	5	6	7
2.	Quality and competence of systems analysts.	1	2	3	4	5	6	7
3.	Communications between Information Systems staff and managerial users.	1	2	3	4	5	6	7
4.	Integration of office communication and information services.	1	2	3	4	5	6	7
5.	Prompt processing of requests for changes to existing systems.	1	2	3	4	5	6	7
6.	Efficient running of current systems (ease of use, costs, documentation, maintenance)	1	2	3	4	5	6	7
7.	Use of a management committee for overseeing and monitoring all major information systems activity.	1	2	3	4	5	6	7
8.	Access to data and models by users without involving the Information Systems Department	1	2	3	4	5	6	7
9.	Information Systems support for users in preparing proposals for new systems.	1	2	3	4	5	6	7
10.	Ease of access for users to computer facilities via terminals/P.C.'s.	1	2	3	4	5	6	7
11.	Currency (up-to-dateness) of output information.	1	2	3	4	5	6	7
12.	Short development time required for new systems.	1	2	3	4	5	6	7
13.	A low percentage of hardware and systems downtime.	1	2	3	4	5	6	7
14.	The improving of new systems development (with respect to time, cost, quality and disruptions).	1	2	3	4	5	6	7
15.	High degree of technical competence of the staff in the Information Systems department.	1	2	3	4	5	6	7
16.	Effective training programs for users in general information systems capabilities.	1	2	3	4	5	6	7

	Very Poor	Poor		Good		Excellent
	1	2	3	4	5	6	7

17.	User confidence in systems.	1	2	3	4	5	6	7
18.	Accuracy and completeness of output information.	1	2	3	4	5	6	7
19.	Preparation of a strategic plan for Information Systems.	1	2	3	4	5	6	7
20.	User-oriented systems analysts who KNOW user operations.	1	2	3	4	5	6	7
21.	The influence the user has over which information services are provided.	1	2	3	4	5	6	7
22.	Users' feeling of participation.	1	2	3	4	5	6	7
23.	Flexibility of data and reports available from systems.	1	2	3	4	5	6	7
24.	Positive attitude of Information Systems personnel towards users.	1	2	3	4	5	6	7
25.	Quick and flexible access to computer data.	1	2	3	4	5	6	7
26.	Data security and privacy.	1	2	3	4	5	6	7
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28.	Users' understanding of systems.	1	2	3	4	5	6	7
29.	Setting of systems priorities to reflect overall organisational objectives.	1	2	3	4	5	6	7
30.	Systems responsiveness to changing user needs.	1	2	3	4	5	6	7
31.	Relevance of report contents to intended functions.	1	2	3	4	5	6	7
32.	Increasing the effort to develop new systems relative to maintaining existing systems.	1	2	3	4	5	6	7
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34.	Top management involvement in defining and monitoring information systems policies.	1	2	3	4	5	6	7
35.	Overall cost-effectiveness of information systems.	1	2	3	4	5	6	7
36.	The availability of models to analyse business alternatives.	1	2	3	4	5	6	7
37.	Data analysis capabilities to support decision making.	1	2	3	4	5	6	7

PART THREE

DEMOGRAPHIC DATA

(sample)

1. What is your age at present (in years)?

2. What is the name of the company you work for?

3. Which of the following best describes the nature of your work?

    1 Accounting or Financial
    2 DP/IS
    3 General Management
    4 Human resources, Personnel or Industrial Relations
    5 Manufacture or Production
    6 Marketing, Retailing or Sales
    7 Other (Please specify).....

4. Which of the following best describes your current position?

    1 Top management
    2 Senior management
    3 Middle management
    4 Junior management
    5 Non-managerial

5. Where is your office situated?

    1 At the national Head Office
    2 At a Divisional/Regional office
    3 At a Branch office

Thank You Very Much For Completing This Questionnaire

APPENDIX B

STRUCTURED INTERVIEW GUIDE

STRUCTURED INTERVIEW GUIDE

1. **Nature of the Organisation.** Products/services marketed, size in terms of staff complement, turnover, profits, profit growth. Overall organisational structure. Request access to annual reports for more detailed information.

2. **Corporate Focus**. Existence and nature of any mission statement, expressed vision for the future, corporate philosophy. Explicit strategic thrusts, overall goals and objectives, critical success factors. Features of the general corporate culture and current management climate. Any particular shifts in recent times.

3. **I/S Capabilities**. Hardware components, main frame and micro, and communications network in place. Programming languages, operating systems, batch and on-line facilities, fourth generation tools. Distinguish traditional data processing capabilities and end-user computing facilities. Request I/S planning documents, annual reports etc.

4. **I/S Systems and Data Management**. Major systems in place or planned for the near future. Data structures and data base management systems if any.

5. **I/S Structures and Processes**. Formal structure, size and placement of I/S department(s). Titles/qualifications of senior I/S staff. Management processes for I/S including formal planning process, methods for prioritising projects, project management techniques, project team structures and approach to selection of project leaders, systems development processes, post-audit of operational systems. Training and education of I/S staff on technological and business issues, training and education of users on technological issues.

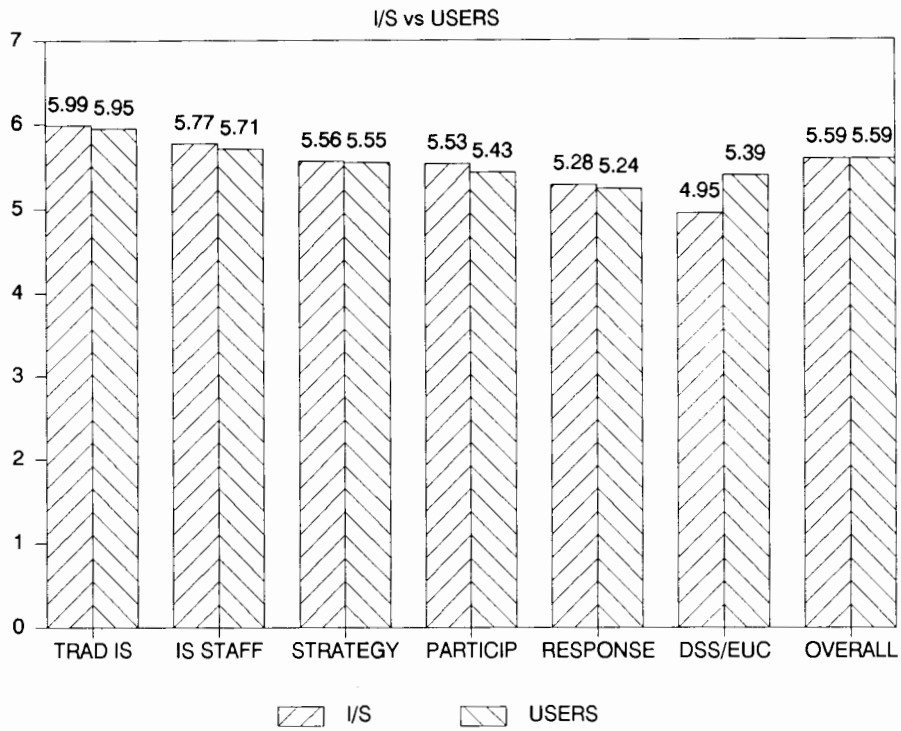
6. **Results of Survey.** After discussion on above topics is completed, present graphs and histograms of statistical outcomes. First cover overall performance and importance ratings, then by subfactor, then by detailed items, importance-performance gaps and comparison of I/S and user responses. (See examples of statistics presented overleaf.) Check for agreement and disagreement between prior interviewee comments and statistics. Probe latter. "Are there any surprises?". "Why do you think I/S and users agree/disagree on factor n, item m? Has it always been this way? Why?"

   Show association between Importance-Performance correlations and overall user performance ratings for several firms. Does the correlation make sense? Why? How have you achieved a high level of fit? (or conversely: how come your people don't seem to see any association between the important items and those you're doing well?)

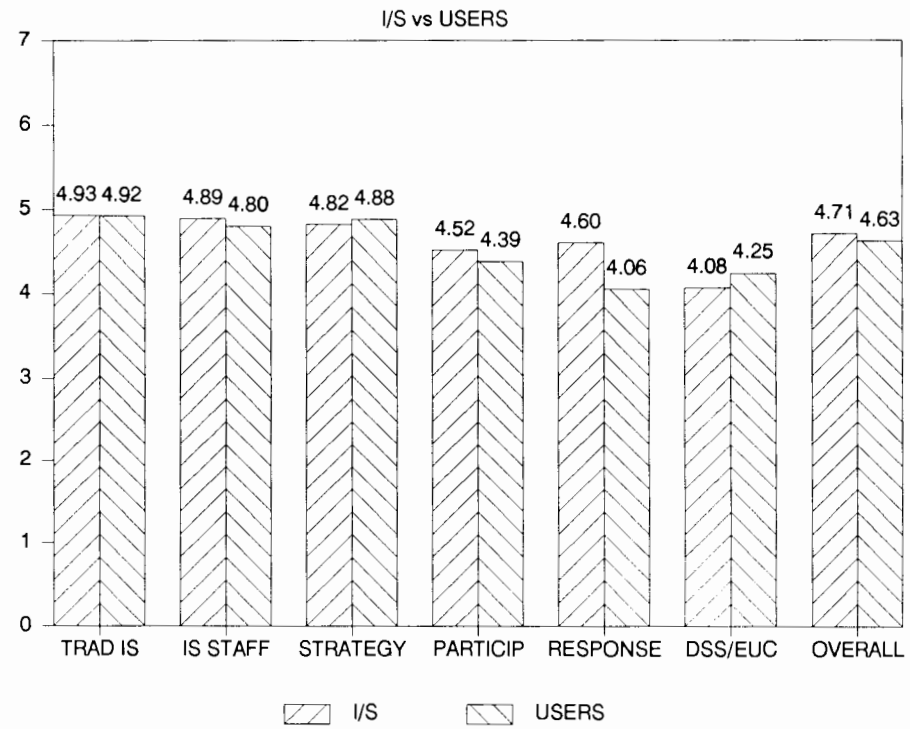
7. **Concluding the Interview.** Walk interviewee through interview notes. Any errors of fact? Have we left any important topics out? Request interviewee's time to review formal writeup of case report.

EXAMPLES OF RESULTS SHOWN TO INTERVIEWEES.

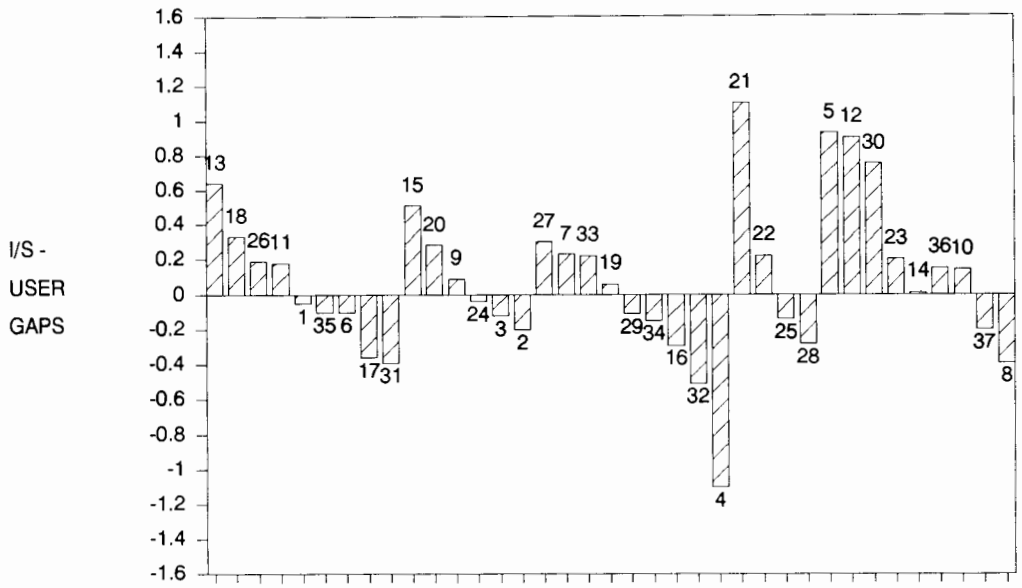
RET 1 IMPORTANCE RATINGS



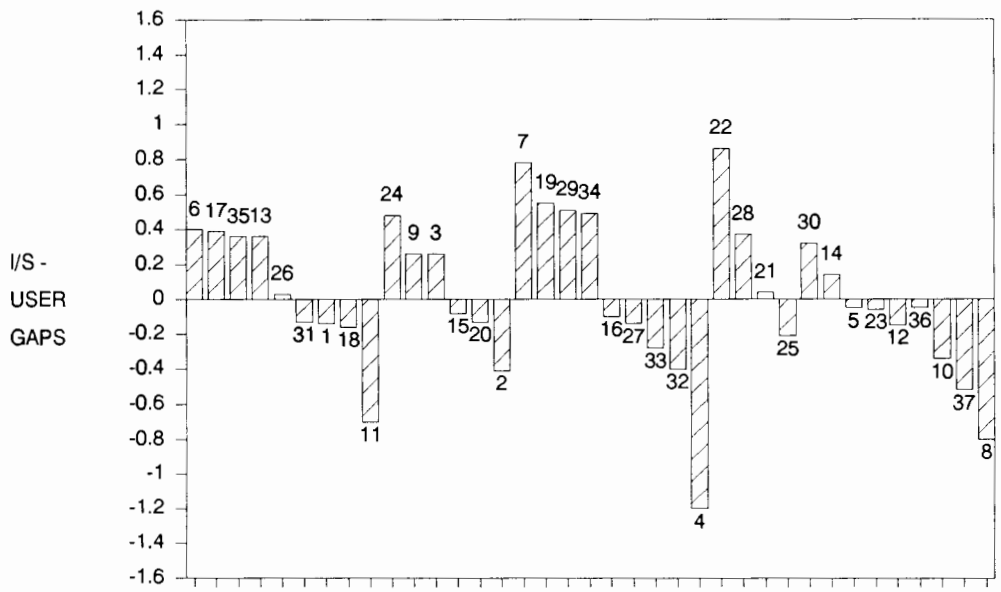
RET 1 PERFORMANCE RATINGS



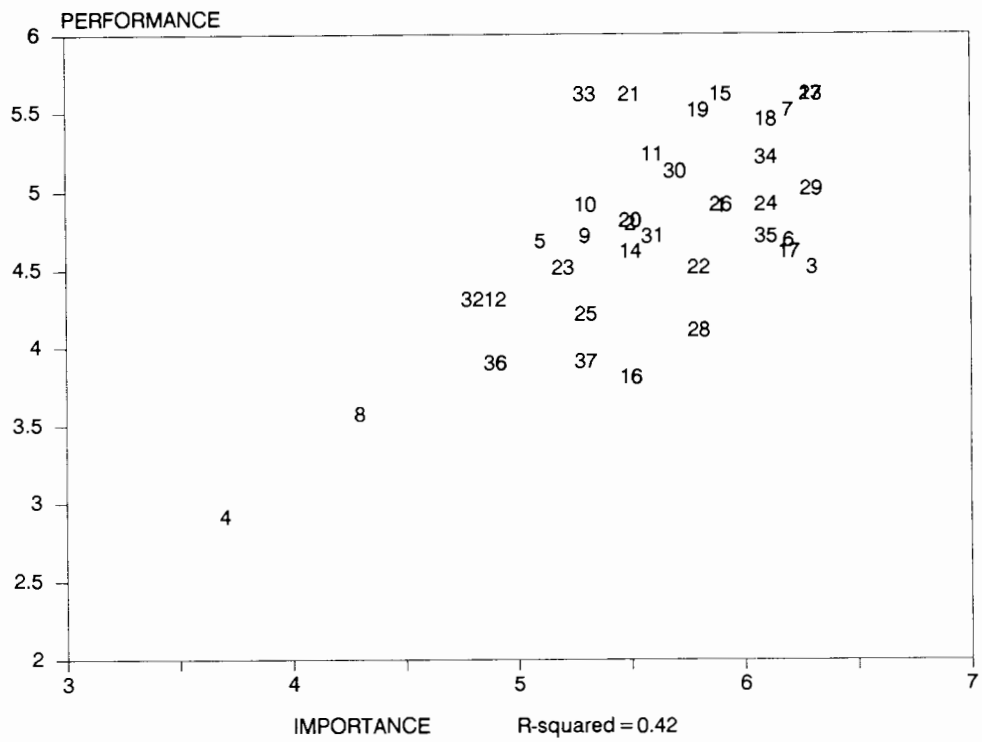
RET 1 PERFORMANCE GAPS : I/S vs USERS



RET 1 IMPORTANCE GAPS : I/S vs USERS



RET 1 IMP vs PERF : I/S STAFF



APPENDIX C

QUESTIONNAIRE TO ASSESS CHARACTERISTICS OF I/S GROUP

CHARACTERISTICS OF THE INFORMATION SYSTEMS GROUP

Work groups vary widely in their characteristics, depending on many factors such as the overall company environment, leadership issues and so on. The effectiveness with which the group performs its functions depends on these characteristics.

Please describe the following elements of the information systems group for which you have been requested to respond. You should circle the numbers most closely reflecting your personal views. All responses will be anonymous.

CLIMATE

1. The degree to which my group shows enthusiasm and spirit

not much enthusiasm — **highly enthusiastic**

1 2 3 4 5

2. Regarding task and social orientation, my group is

   1 mostly task oriented
   2 more task oriented than social
   3 equally task and social in orientation
   4 more social than task oriented
   5 mostly social

PEOPLE

3. The degree to which we are interested in one another as people is

Low — **High**

1 2 3 4 5

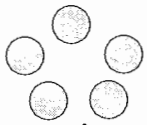
4. Our regard for each individual as a resource (knowledge, skills, abilities, viewpoints) for achieving group goals is

Low — **High**

1 2 3 4 5

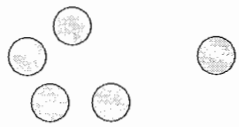
5. Extent to which individuals feel included in the group

inclusion
people like each other



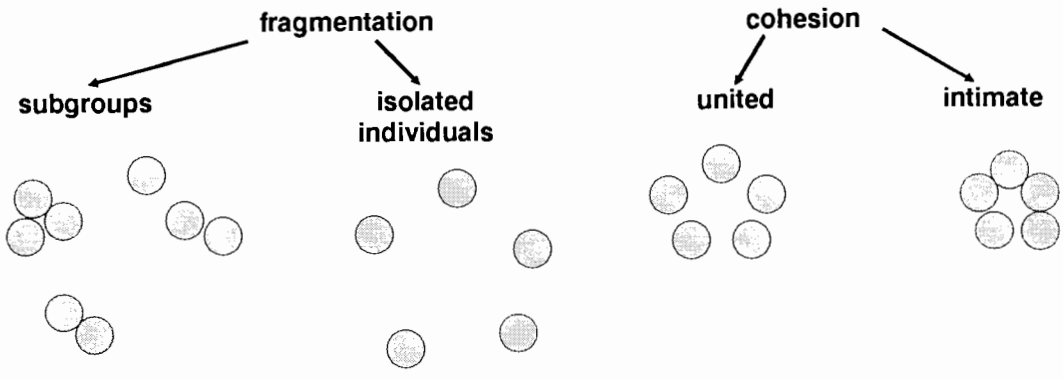
1

exclusion
some disliked/excluded



2

6. Extent of group cohesion



PRODUCTIVITY

7. Degree to which the group clearly understands what is expected of it (goals, tasks, priorities)

Low **High**

1 2 3 4 5

8. Extent to which individuals in the group are committed to the prescribed goals, tasks and priorities

Low **High**

1 2 3 4 5

9. Actual quantity of work produced

Low **High**

1 2 3 4 5

10. Quality of work produced

Low **High**

1 2 3 4 5

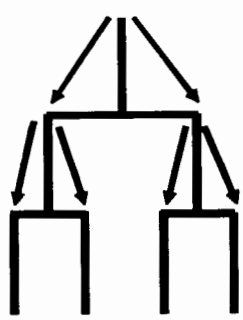
11. Interest in learning

Low **High**

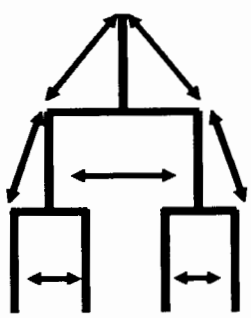
1 2 3 4 5

PARTICIPATION AND COMMUNICATION

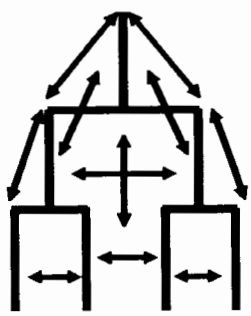
12. Which pattern of communication best reflects your group?



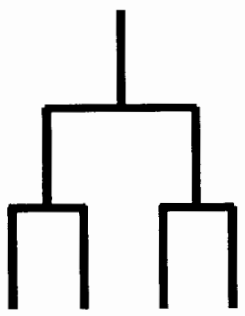
top-down



two-way



all-channel



other (show with arrows)

1 2 3 4

13. Typically decisions relating to the group or a particular sub-group are made

by one person **by a few members of the relevant subgroup** **by the whole relevant sub-group** **decisions are not made**

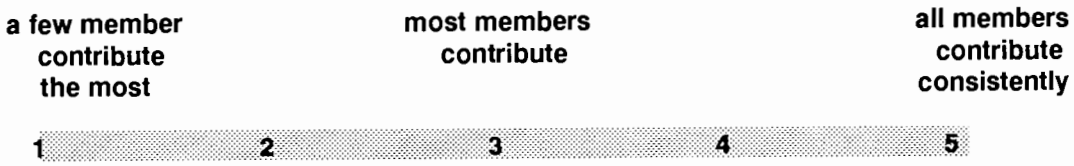
1 2 3 4

14. The orientation of members of the group is:

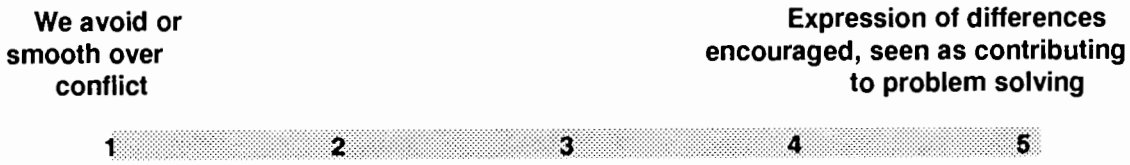
mainly self-oriented: concerned with own work requirements **mainly group-oriented concerned with group work requirements**

1 2 3 4 5

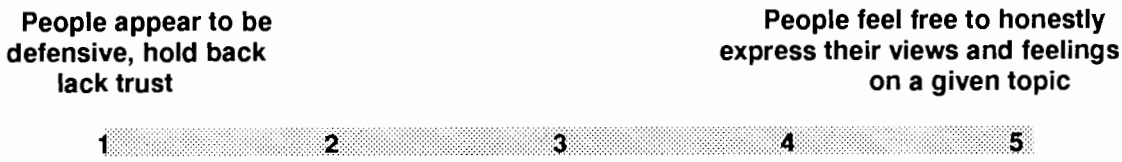
15. Participation



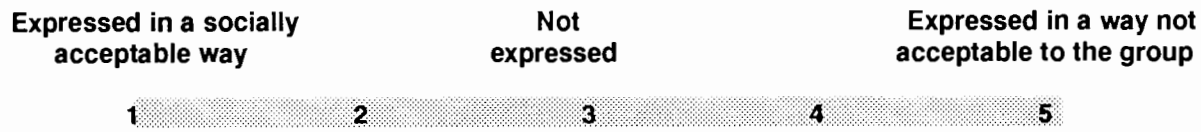
16. Where the group falls in "handling conflict"



17. Openness in communications



18. Expression of personal feelings:



19. Degree to which we listen, and actually hear, each other's views

Additional Comments.

Are there any other features of the information systems group or sub-groups that you feel have an important bearing on its effectiveness? Please feel free to note these and also to comment on the questionnaire in general.

Thank you very much for your contribution.

APPENDIX D

ANALYSIS OF MISSING VALUES

PERCENTAGE OF IMPORTANCE RATINGS OMITTED

	FIN 1	MNF 1	FIN 2	MNF 2	RET 1	MNF 3	FIN 4	FIN 5	PUB 1	PUB 2	TOTAL
RESP.	89	49	131	84	57	89	185	77	25	75	861
ITEM	%	%	%	%	%	%	%	%	%	%	%
1	1.1	2.0	3.8	2.4	0.0	2.2	1.6	0.0	0.0	1.3	1.7
2	3.4	4.1	6.9	1.2	8.8	2.2	6.5	1.3	8.0	12.0	5.3
3	0.0	2.0	7.6	0.0	0.0	4.5	1.1	0.0	4.0	4.0	2.4
4	0.0	4.1	9.2	3.6	15.8	16.9	10.8	2.6	4.0	17.3	8.9
5	1.1	4.1	3.1	0.0	1.8	3.4	5.4	0.0	0.0	2.7	2.7
6	0.0	4.1	7.6	0.0	3.5	3.4	4.9	0.0	0.0	5.3	3.5
7	3.4	2.0	13.7	2.4	3.5	10.1	12.4	0.0	0.0	2.7	7.0
8	1.1	4.1	11.5	3.6	8.8	9.0	14.6	0.0	4.0	6.7	7.8
9	2.2	4.1	15.3	1.2	3.5	2.2	7.0	0.0	4.0	5.3	5.5
10	0.0	2.0	2.3	0.0	0.0	2.2	3.8	1.3	0.0	6.7	2.2
11	0.0	2.0	5.3	0.0	0.0	3.4	2.2	1.3	0.0	2.7	2.1
12	2.2	4.1	7.6	0.0	5.3	5.6	11.9	1.3	0.0	6.7	5.8
13	0.0	4.1	20.6	1.2	0.0	2.2	2.7	0.0	16.0	6.7	5.3
14	3.4	6.1	13.0	1.2	8.8	5.6	4.9	0.0	0.0	8.0	5.7
15	2.2	4.1	7.6	0.0	3.5	1.1	6.5	1.3	0.0	5.3	3.9
16	0.0	2.0	2.3	0.0	0.0	1.1	1.6	0.0	0.0	2.7	1.2
17	0.0	2.0	2.3	0.0	0.0	3.4	1.1	0.0	0.0	1.3	1.2
18	0.0	2.0	3.1	0.0	0.0	4.5	1.1	0.0	0.0	1.3	1.4
19	3.4	2.0	17.6	2.4	7.0	21.3	17.8	0.0	4.0	13.3	11.1
20	3.4	4.1	15.3	1.2	1.8	3.4	6.5	2.6	4.0	2.7	5.5
21	2.2	2.0	9.2	2.4	1.8	6.7	9.7	1.3	4.0	2.7	5.3
22	0.0	2.0	3.8	1.2	1.8	3.4	5.9	0.0	0.0	4.0	2.9
23	0.0	2.0	5.3	1.2	1.8	4.5	2.2	0.0	0.0	4.0	2.4
24	1.1	2.0	5.3	1.2	3.5	2.2	2.2	0.0	4.0	4.0	2.6
25	0.0	2.0	1.5	0.0	0.0	4.5	4.3	0.0	0.0	5.3	2.2
26	0.0	2.0	2.3	0.0	1.8	2.2	8.1	0.0	0.0	4.0	2.9
27	2.2	4.1	6.1	1.2	3.5	14.6	6.5	0.0			4.6
28	0.0	4.1	1.5	0.0	0.0	3.4	4.9	1.3	4.0	2.7	2.3
29	3.4	6.1	14.5	4.8	7.0	12.4	15.7	3.9	4.0	20.0	10.7
30	2.2	2.0	3.8	1.2	0.0	3.4	5.4	0.0	0.0	4.0	2.9
31	2.2	8.2	31.3	4.8	5.3	5.6	9.7	1.3	4.0	16.0	10.6
32	3.4	4.1	13.7	1.2	3.5	5.6	12.4	1.3	0.0	13.3	7.5
33	4.5	6.1	9.2	1.2	12.3	6.7	13.5	2.6	0.0	10.7	7.9
34	4.5	2.0	13.0	1.2	5.3	9.0	9.7	0.0	0.0	8.0	6.7
35	2.2	2.0	6.9	3.6	7.0	7.9	11.9	0.0	4.0	8.0	6.4
36	4.5	2.0	19.1	6.0	10.5	11.2	24.9	2.6	12.0	25.3	14.1
37	3.4	2.0	10.7	1.2	5.3	7.9	10.8	3.9	4.0	5.3	6.6
MEAN	1.7	3.3	9.0	1.4	3.8	5.9	7.6	0.8	2.4	7.0	5.1

PERCENTAGE OF PERFORMANCE RATINGS OMITTED

	FIN 1	MNF 1	FIN 2	MNF 2	RET 1	MNF 3	FIN 4	FIN 5	PUB 1	PUB 2	TOTAL
RESP.	89	49	131	84	57	89	185	77	25	75	861
ITEM	%	%	%	%	%	%	%	%	%	%	%
1	1.1	2.0	0.8	2.4	1.8	5.6	3.2	0.0	4.0	12.0	3.1
2	12.4	12.2	6.9	7.1	12.3	12.4	35.7	5.2	16.0	30.7	17.1
3	4.5	8.2	6.9	3.6	0.0	16.9	8.6	7.8	8.0	10.7	7.8
4	15.7	12.2	11.5	14.3	14.0	15.7	23.2	2.6	12.0	30.7	16.3
5	20.2	8.2	1.5	3.6	3.5	6.7	12.4	2.6	12.0	14.7	8.6
6	12.4	12.2	6.1	7.1	7.0	9.0	17.3	6.5	28.0	22.7	12.1
7	53.9	10.2	17.6	11.9	17.5	34.8	57.3	2.6	28.0	29.3	30.7
8	27.0	10.2	15.3	11.9	10.5	16.9	38.9	3.9	24.0	22.7	20.7
9	27.0	22.4	19.1	9.5	7.0	12.4	29.2	7.8	16.0	20.0	18.8
10	1.1	8.2	0.0	6.0	1.8	3.4	10.3	0.0	12.0	17.3	5.7
11	3.4	10.2	6.1	2.4	3.5	7.9	4.3	1.3	8.0	16.0	5.8
12	37.1	18.4	12.2	4.8	7.0	10.1	20.5	6.5	16.0	20.0	15.9
13	2.2	12.2	21.4	7.1	3.5	5.6	3.8	0.0	40.0	24.0	9.8
14	38.2	24.5	19.8	13.1	10.5	15.7	16.2	3.9	20.0	30.7	19.0
15	29.2	10.2	13.7	8.3	7.0	10.1	42.7	3.9	20.0	29.3	20.7
16	10.1	8.2	6.1	6.0	3.5	5.6	15.1	1.3	20.0	18.7	9.4
17	1.1	6.1	3.1	3.6	0.0	9.0	3.2	0.0	4.0	9.3	3.8
18	1.1	6.1	3.8	3.6	1.8	7.9	3.2	0.0	8.0	13.3	4.4
19	60.7	24.5	38.2	20.2	22.8	42.7	65.4	7.8	28.0	41.3	40.5
20	38.2	10.2	19.8	9.5	8.8	14.6	50.8	3.9	24.0	26.7	24.9
21	15.7	12.2	12.2	10.7	1.8	14.6	17.8	5.2	4.0	13.3	12.4
22	5.6	8.2	11.5	4.8	1.8	11.2	14.6	1.3	8.0	9.3	8.8
23	6.7	10.2	5.3	2.4	0.0	9.0	9.7	3.9	12.0	14.7	7.3
24	3.4	6.1	7.6	4.8	0.0	5.6	23.2	1.3	8.0	17.3	9.8
25	4.5	12.2	1.5	2.4	0.0	9.0	1.6	1.3	12.0	14.7	4.6
26	13.5	12.2	7.6	4.8	8.8	13.5	26.5	5.2	16.0	28.0	14.8
27	20.2	26.5	8.4	10.7	7.0	30.3	21.6	0.0	0.0		14.2
28	2.2	8.2	2.3	4.8	0.0	11.2	5.9	0.0	4.0	9.3	4.9
29	40.4	20.4	17.6	21.4	17.5	30.3	49.7	9.1	28.0	42.7	30.4
30	12.4	16.3	6.1	6.0	1.8	13.5	11.4	1.3	12.0	18.7	9.8
31	18.0	14.3	32.8	11.9	3.5	18.0	16.8	0.0	16.0	26.7	17.3
32	31.5	22.4	16.8	14.3	8.8	20.2	22.2	10.4	16.0	25.3	19.5
33	31.5	16.3	11.5	8.3	17.5	27.0	36.2	9.1	12.0	30.7	22.3
34	46.1	22.4	22.1	13.1	17.5	33.7	52.4	7.8	16.0	28.0	30.2
35	49.4	28.6	19.8	23.8	29.8	33.7	52.4	13.0	36.0	45.3	35.0
36	42.7	12.2	35.1	22.6	29.8	31.5	51.4	11.7	52.0	60.0	36.7
37	27.0	8.2	22.1	14.3	10.5	24.7	35.7	6.5	16.0	32.0	22.8
MEAN	20.7	13.3	12.7	9.1	8.1	16.2	24.6	4.2	17.1	23.8	16.1

APPENDIX E

ALLOCATION OF INDIVIDUAL QUESTIONNAIRE ITEMS TO FACTORS THROUGH PRIOR FACTOR ANALYSES

QUESTIONNAIRE NO.	ITEM	ASSIGNED TO FACTOR
1.	Availability and timeliness of output information supplied to users.	TRADITIONAL SYSTEMS
6.	Efficient running of current systems (ease of use costs, documentation, maintenance)	
11.	Currency (up-to-dateness) of output information.	
13.	A low percentage of hardware and systems downtime	
17.	User confidence in systems.	
18.	Accuracy and completeness of output information.	
26.	Data security and privacy.	
31.	Relevance of report contents to intended functions.	
35.	Overall cost-effectiveness of information systems	
2.	Quality and competence of systems analysts.	I/S STAFF QUALITY
3.	Communications between Information Systems staff and managerial users.	
9.	I/S support for users in preparing proposals for new systems.	
15.	High degree of technical competence of the staff in the Information Systems department.	
20.	User-oriented systems analysts who KNOW user operations.	
24.	Positive attitude of I/S personnel towards users.	
4.	Integration of office communication and information services.	STRATEGIC ISSUES
7.	Use of a management committee for overseeing and monitoring all major information systems activity	
16.	Effective training programs for users in general information systems capabilities.	(Also Assigned to User Participation)
19.	Preparation of a strategic plan for Information Systems.	

QUESTIONNAIRE

NO.	ITEM	ASSIGNED TO FACTOR
27.	Information systems providing competitive advantage for the firm.	STRATEGIC ISSUES (Cont.)
29.	Setting of systems priorities to reflect overall organisational objectives.	
32.	Increasing the effort to develop new systems relative to maintaining existing systems.	
33.	Application of modern information technology.	
34.	Top management involvement in defining and monitoring information systems policies.	
10.	Ease of access for users to computer facilities via terminals/P.C.'s.	USER PARTICIPATION (Also DSS/EUC)
16.	Effective training programs for users in general information systems capabilities.	(Also Strategic Issues)
21.	The influence the user has over which information services are provided.	
22.	Users' feeling of participation.	
25.	Quick and flexible access to computer data.	
28.	Users' understanding of systems.	
5.	Prompt processing of requests for changes to existing systems.	RESPONSIVENESS TO CHANGING NEEDS
12.	Short development time required for new systems.	
14.	The improving of new systems development (with respect to time, cost, quality and disruptions).	
23.	Flexibility of data and reports available from systems.	
30.	Systems responsiveness to changing user needs.	
8.	Access to data and models by users without involving the Information Systems Department.	DECISION-SUPPORT/ END-USER COMPUTING
10.	Ease of access for users to computer facilities via terminals/P.C.'s.	(also User Participation)
36.	The availability of models to analyse business alternatives.	
37.	Data analysis capabilities to support decision making.	

APPENDIX F

DATA SETS UPON WHICH CORRELATION AND GAP ANALYSES WERE CONDUCTED

F1 : DATA SET FOR FIN 1

ITEM	FACTOR	I/S RESPONSES (16) IMP	PERF	GAP	USER RESPONSES (73) IMP	PERF	GAP	IMP GAP	PERF GA	ALL RESPONDENTS IMP	PERF	GAPabs I/S	USER
GLOBAL			6.00			5.47					5.57		
1	11	6.19	6.07	0.12	6.10	5.34	0.76	0.09	0.73	6.12	5.47	0.12	0.76
2	21	5.60	5.53	0.07	5.79	5.46	0.33	(0.19)	0.07	5.76	5.47	0.07	0.33
3	22	5.75	4.93	0.82	5.47	5.07	0.40	0.28	(0.14)	5.52	5.04	0.82	0.40
4	31	4.94	4.80	0.14	4.90	4.63	0.27	0.04	0.17	4.91	4.66	0.14	0.27
5	51	5.06	5.07	(0.01)	4.92	4.21	0.71	0.14	0.86	4.95	4.36	0.01	0.71
6	12	5.88	5.53	0.35	6.12	5.46	0.66	(0.24)	0.07	6.08	5.47	0.35	0.66
7	32	5.19	4.50	0.69	4.19	5.07	(0.88)	1.00	(0.57)	4.37	4.97	0.69	0.88
8	61	4.69	4.40	0.29	4.26	4.74	(0.48)	0.43	(0.34)	4.34	4.68	0.29	0.48
9	23	5.47	5.07	0.40	4.40	4.32	0.08	1.07	0.75	4.59	4.45	0.40	0.08
10	64	5.75	5.40	0.35	6.19	5.66	0.53	(0.44)	(0.26)	6.11	5.61	0.35	0.53
11	13	6.06	6.27	(0.21)	6.47	5.90	0.57	(0.41)	0.37	6.40	5.97	0.21	0.57
12	52	5.56	4.57	0.99	4.61	4.48	0.13	0.95	0.09	4.78	4.50	0.99	0.13
13	14	6.44	6.87	(0.43)	6.43	5.78	0.65	0.01	1.09	6.43	5.98	0.43	0.65
14	53	5.50	5.21	0.29	5.29	5.24	0.05	0.21	(0.03)	5.33	5.23	0.29	0.05
15	24	6.00	5.87	0.13	5.29	5.35	(0.06)	0.71	0.52	5.42	5.44	0.13	0.06
16	33	5.00	4.14	0.86	5.62	4.62	1.00	(0.62)	(0.48)	5.51	4.53	0.86	1.00
17	15	5.75	5.40	0.35	5.94	5.68	0.26	(0.19)	(0.28)	5.91	5.63	0.35	0.26
18	16	6.19	5.93	0.26	6.59	5.75	0.84	(0.40)	0.18	6.52	5.78	0.26	0.84
19	34	6.06	5.73	0.33	3.59	4.70	(1.11)	2.47	1.03	4.03	4.89	0.33	1.11
20	25	5.00	4.79	0.21	4.47	4.66	(0.19)	0.53	0.13	4.57	4.68	0.21	0.19
21	42	5.44	5.20	0.24	4.75	4.32	0.43	0.69	0.88	4.87	4.48	0.24	0.43
22	43	5.44	4.64	0.80	4.86	4.50	0.36	0.58	0.14	4.96	4.53	0.80	0.36
23	54	5.06	5.33	(0.27)	5.27	5.03	0.24	(0.21)	0.30	5.23	5.08	0.27	0.24
24	26	5.62	5.13	0.49	5.83	5.61	0.22	(0.21)	(0.48)	5.79	5.52	0.49	0.22
25	44	5.44	5.00	0.44	6.07	5.34	0.73	(0.63)	(0.34)	5.96	5.28	0.44	0.73
26	17	6.00	5.80	0.20	6.00	5.73	0.27	0.00	0.07	6.00	5.74	0.20	0.27
27	35	6.12	5.80	0.32	5.92	5.61	0.31	0.20	0.19	5.96	5.64	0.32	0.31
28	45	5.50	4.60	0.90	6.04	5.03	1.01	(0.54)	(0.43)	5.94	4.95	0.90	1.01
29	36	5.88	5.07	0.81	4.87	4.90	(0.03)	1.01	0.17	5.05	4.93	0.81	0.03
30	55	5.88	5.07	0.81	5.46	4.95	0.51	0.42	0.12	5.54	4.97	0.81	0.51
31	18	5.20	5.21	(0.01)	4.83	5.19	(0.36)	0.37	0.02	4.90	5.19	0.01	0.36
32	37	5.30	5.40	(0.10)	4.49	5.50	(1.01)	0.81	(0.10)	4.64	5.48	0.10	1.01
33	38	5.75	5.73	0.02	4.67	5.65	(0.98)	1.08	0.08	4.86	5.66	0.02	0.98
34	39	5.60	5.13	0.47	4.70	5.33	(0.63)	0.90	(0.20)	4.86	5.29	0.47	0.63
35	19	5.56	5.47	0.09	5.11	4.80	0.31	0.45	0.67	5.19	4.92	0.09	0.31
36	62	5.06	3.79	1.27	4.41	4.08	0.33	0.65	(0.29)	4.53	4.03	1.27	0.33
37	63	4.79	4.21	0.58	4.95	3.89	1.06	(0.16)	0.32	4.91	3.97	0.58	1.06
												0.91	0.47
SUB-FACTORS:													
TRAD SYSTEMS		5.93	5.84	0.09	5.96	5.58	0.38	(0.03)	0.26	5.95	5.63	15.45	18.16
IS STAFF CHAR.		5.59	5.23	0.36	5.22	5.18	0.04	0.37	0.05	5.29	5.19		
STRATEGIC ISSU		5.54	5.16	0.38	4.80	5.11	(0.31)	0.74	0.05	4.93	5.12		
USER PARTICIP.		5.43	4.83	0.60	5.59	4.94	0.65	(0.16)	(0.11)	5.56	4.92		
RESPONSIVENESS		5.41	5.05	0.36	5.11	4.85	0.26	0.30	0.20	5.16	4.89		
DSS/EUC		5.22	4.55	0.67	5.00	5.15	(0.15)	0.22	(0.60)	5.04	5.04		
OVERALL		5.57	5.20	0.37	5.32	5.13	0.19	0.25	0.07	5.36	5.14		

F2 : DATA SET FOR FIN 2

		I/S RESPONSES (20)			USER RESPONSES (111)			I/S-USER GAP		ALL RESPONDENTS		GAPabs	
ITEM	FACTOR	IMP	PERF	GAP	IMP	PERF	GAP	IMP	PERF	IMP	PERF	I/S	USER
GLOBAL			5.47			5.41					5.42		
1	1	6.22	5.47	0.75	6.06	5.26	0.80	0.16	0.21	6.08	5.29	0.75	0.80
2	2	5.70	5.20	0.50	5.91	5.33	0.58	(0.21)	(0.13)	5.88	5.31	0.50	0.58
3	2	6.06	5.00	1.06	5.67	5.01	0.66	0.39	(0.01)	5.73	5.01	1.06	0.66
4	3	5.12	4.38	0.74	5.22	4.59	0.63	(0.10)	(0.21)	5.20	4.56	0.74	0.63
5	5	5.80	4.95	0.85	5.64	4.13	1.51	0.16	0.82	5.66	4.25	0.85	1.51
6	1	6.28	4.90	1.38	6.00	5.13	0.87	0.28	(0.23)	6.04	5.09	1.38	0.87
7	3	5.42	4.84	0.58	5.37	5.05	0.33	0.05	(0.21)	5.38	5.01	0.58	0.33
8	6	5.06	4.35	0.71	5.01	4.66	0.35	0.05	(0.31)	5.02	4.61	0.71	0.35
9	2	5.47	4.88	0.60	5.25	4.80	0.45	0.22	0.08	5.28	4.81	0.60	0.45
10	6	5.60	5.25	0.35	5.91	5.51	0.39	(0.31)	(0.26)	5.86	5.47	0.35	0.39
11	1	6.21	5.59	0.62	6.24	5.44	0.80	(0.03)	0.15	6.23	5.47	0.62	0.80
12	5	5.20	4.55	0.65	5.12	4.05	1.07	0.08	0.50	5.13	4.13	0.65	1.07
13	1	6.70	6.00	0.70	5.86	5.01	0.85	0.84	0.99	5.99	5.16	0.70	0.85
14	5	5.79	5.16	0.63	5.56	4.97	0.59	0.23	0.19	5.59	4.99	0.63	0.59
15	2	6.00	5.70	0.30	5.86	5.32	0.54	0.14	0.38	5.88	5.38	0.30	0.54
16	3	5.55	4.60	0.95	5.58	4.56	1.02	(0.03)	0.04	5.58	4.57	0.95	1.02
17	1	6.15	5.53	0.62	5.64	5.25	0.39	0.51	0.28	5.72	5.29	0.62	0.39
18	1	6.50	5.67	0.83	6.44	5.47	0.97	0.06	0.20	6.45	5.50	0.83	0.97
19	3	6.22	4.65	1.57	5.37	4.89	0.48	0.85	(0.24)	5.50	4.85	1.57	0.48
20	2	5.85	4.65	1.20	5.46	4.99	0.47	0.39	(0.34)	5.52	4.94	1.20	0.47
21	4	5.21	5.05	0.16	5.43	4.84	0.59	(0.22)	0.21	5.40	4.87	0.16	0.59
22	4	5.15	4.89	0.26	4.98	4.88	0.10	0.17	0.01	5.01	4.88	0.26	0.10
23	5	5.65	5.05	0.60	5.49	4.66	0.83	0.16	0.39	5.51	4.72	0.60	0.83
24	2	5.85	5.15	0.70	5.59	5.05	0.54	0.26	0.10	5.63	5.07	0.70	0.54
25	4	5.80	5.10	0.70	5.89	5.11	0.78	(0.09)	(0.01)	5.88	5.11	0.70	0.78
26	1	6.50	5.75	0.75	6.01	5.53	0.48	0.49	0.22	6.08	5.56	0.75	0.48
27	3	6.37	5.72	0.65	5.93	5.56	0.37	0.44	0.16	6.00	5.58	0.65	0.37
28	4	5.40	4.25	1.15	5.42	4.49	0.93	(0.02)	(0.24)	5.42	4.45	1.15	0.93
29	3	5.84	5.11	0.73	5.54	4.98	0.56	0.30	0.13	5.58	5.00	0.73	0.56
30	5	5.75	5.26	0.49	5.63	4.63	1.01	0.12	0.63	5.65	4.72	0.49	1.01
31	1	5.11	5.00	0.11	5.53	5.03	0.50	(0.42)	(0.03)	5.46	5.02	0.11	0.50
32	3	5.45	4.68	0.77	5.47	4.88	0.59	(0.02)	(0.20)	5.47	4.85	0.77	0.59
33	3	5.84	5.00	0.84	5.73	5.43	0.30	0.11	(0.43)	5.75	5.36	0.84	0.30
34	3	5.26	4.68	0.58	5.38	5.28	0.10	(0.12)	(0.60)	5.36	5.19	0.58	0.10
35	1	5.47	5.37	0.10	5.51	5.36	0.14	(0.04)	0.01	5.50	5.36	0.10	0.14
36	6	4.89	4.00	0.89	4.77	4.21	0.57	0.12	(0.21)	4.79	4.17	0.89	0.57
37	6	5.55	4.84	0.71	5.29	4.76	0.53	0.26	0.08	5.33	4.77	0.71	0.53
FACTORS:													
TRAD. SYSTEMS		6.15	5.44	0.71	5.93	5.29	0.65	0.22	0.15	5.97	5.31	25.79	22.65
IS STAFF CHAR.		5.83	5.10	0.73	5.62	5.12	0.50	0.21	(0.02)	5.65	5.11		
STRATEGIC ISS.		5.68	4.84	0.84	5.52	5.02	4.20	0.16	(0.18)	5.54	4.99		
USER PARTICIP		5.45	4.85	0.61	5.54	4.93	0.61	(0.09)	(0.08)	5.53	4.92		
RESPONSIVENESS		5.64	4.96	0.68	5.48	4.50	0.98	0.16	0.46	5.50	4.57		
DSS/EUC		5.33	4.70	0.63	5.32	4.95	0.37	0.01	(0.25)	5.32	4.91		
OVERALL		5.74	5.02	0.72	5.59	5.00	0.59	0.15	0.02	5.61	5.00		

F3: DATA SET FOR MNF 2

ITEM	FACTOR	I/S RESPONSES(21)			USER RESPONSES(63)			I/S -USER GAPS		ALL RESPONDENTS		GAPabs	
		IMP	PERF	GAP	IMP	PERF	GAP	IMP	PERF	IMP	PERF	I/S	USER
GLOBAL			5.62			5.20					5.31		
1	1	6.10	5.81	0.29	6.20	5.07	1.13	-0.10	0.74	6.17	5.25	0.29	1.13
2	2	5.91	5.48	0.43	6.07	5.19	0.87	-0.16	0.28	6.03	5.26	0.43	0.87
3	2	5.95	5.38	0.57	5.86	5.15	0.71	0.09	0.23	5.88	5.21	0.57	0.71
4	3	5.00	4.10	0.90	5.15	3.92	1.23	-0.15	0.18	5.11	3.97	0.90	1.23
5	5	5.62	4.76	0.86	5.57	4.33	1.24	0.05	0.43	5.58	4.44	0.86	1.24
6	1	5.91	5.24	0.67	5.94	4.93	1.01	-0.03	0.31	5.93	5.01	0.67	1.01
7	3	5.52	5.00	0.52	5.25	4.55	0.70	0.28	0.46	5.32	4.66	0.52	0.70
8	6	4.81	4.55	0.26	5.05	4.54	0.51	-0.24	0.01	4.99	4.54	0.26	0.51
9	2	5.48	5.45	0.03	5.60	5.09	0.51	-0.12	0.36	5.57	5.18	0.03	0.51
10	6	6.14	5.76	0.38	6.02	5.31	0.71	0.13	0.45	6.05	5.42	0.38	0.71
11	1	6.57	6.29	0.29	6.38	5.43	0.96	0.19	0.86	6.43	5.64	0.29	0.96
12	5	5.76	5.05	0.71	5.54	4.34	1.20	0.22	0.71	5.60	4.52	0.71	1.20
13	1	6.48	6.25	0.23	6.26	5.03	1.22	0.22	1.22	6.31	5.34	0.23	1.22
14	5	5.43	5.16	0.27	5.63	4.72	0.91	-0.20	0.44	5.58	4.83	0.27	0.91
15	2	5.81	5.70	0.11	5.94	5.12	0.81	-0.13	0.58	5.91	5.27	0.11	0.81
16	3	5.33	4.29	1.05	5.83	4.48	1.34	-0.49	-0.20	5.70	4.43	1.05	1.34
17	1	6.24	5.30	0.94	6.05	5.08	0.97	0.19	0.22	6.10	5.14	0.94	0.97
18	1	6.57	5.95	0.62	6.46	5.27	1.19	0.11	0.68	6.49	5.44	0.62	1.19
19	3	6.14	5.44	0.70	5.49	4.59	0.90	0.65	0.85	5.65	4.80	0.70	0.90
20	2	5.57	5.26	0.31	5.76	4.90	0.86	-0.19	0.37	5.71	4.99	0.31	0.86
21	4	5.38	5.35	0.03	5.41	5.04	0.37	-0.03	0.31	5.40	5.11	0.03	0.37
22	4	6.00	5.25	0.75	5.57	4.88	0.69	0.43	0.37	5.67	4.97	0.75	0.69
23	5	5.43	5.43	0.00	5.71	4.64	1.07	-0.28	0.79	5.64	4.84	0.00	1.07
24	2	6.38	5.55	0.83	5.98	5.28	0.70	0.40	0.27	6.08	5.35	0.83	0.70
25	4	5.71	5.38	0.33	6.00	4.95	1.05	-0.29	0.43	5.93	5.06	0.33	1.05
26	1	6.00	5.43	0.57	6.30	5.46	0.84	-0.30	-0.03	6.23	5.45	0.57	0.84
27	3	6.43	5.35	1.08	5.92	5.13	0.79	0.51	0.22	6.05	5.18	1.08	0.79
28	4	6.14	4.90	1.24	5.83	4.70	1.13	0.31	0.20	5.90	4.75	1.24	1.13
29	3	5.95	5.47	0.48	5.63	4.62	1.01	0.32	0.85	5.71	4.83	0.48	1.01
30	5	5.67	5.33	0.34	5.74	4.72	1.02	-0.07	0.61	5.72	4.88	0.34	1.02
31	1	5.50	5.33	0.17	5.62	5.05	0.56	-0.12	0.28	5.59	5.12	0.17	0.56
32	3	4.81	5.05	-0.24	5.19	4.87	0.33	-0.38	0.18	5.10	4.91	0.24	0.33
33	3	5.95	5.52	0.43	5.47	5.30	0.16	0.48	0.22	5.59	5.36	0.43	0.16
34	3	6.10	4.65	1.44	5.60	4.68	0.92	0.50	-0.03	5.72	4.67	1.44	0.92
35	1	5.65	5.21	0.44	5.90	4.67	1.23	-0.25	0.54	5.84	4.80	0.44	1.23
36	6	5.00	4.61	0.39	5.18	4.11	1.08	-0.18	0.50	5.14	4.23	0.39	1.08
37	6	5.38	4.79	0.59	5.74	4.42	1.33	-0.36	0.37	5.65	4.51	0.59	1.33
FACTORS:													
TRAD. SYSTEMS		6.12	5.64	0.48	6.12	5.14	5.14	0.00	0.50	6.12	5.26	19.48	33.26
IS STAFF CHAR.		5.85	5.44	0.41	5.86	5.11	5.11	-0.01	0.33	5.86	5.19		
STRATEGIC ISS.		5.70	4.94	0.76	5.50	4.71	4.71	0.20	0.23	5.55	4.76		
USER PARTICIP.		5.79	5.14	0.65	5.78	4.87	4.87	0.01	0.26	5.78	4.94		
RESPONSIVENESS		5.58	5.13	0.45	5.64	4.55	4.55	-0.05	0.59	5.62	4.69		
DSS/EUC		5.35	4.96	0.38	5.51	4.65	4.65	-0.16	0.31	5.47	4.73		
OVERALL		5.78	5.24	0.54	5.76	4.87	4.87	0.02	0.37	5.77	4.96		

F4a: DATA SET FOR MNF1 1987

ITEM	I/S RESPONSES (13)			USER RESPONSES (40)			I/S-USER GAPS		ALL RESPONDENTS		GAPabs	
	IMP	PERF	GAP	IMP	PERF	GAP	IMP	PERF	IMP	PERF	I/S	USER
1	6.23	5.31	0.92	5.88	4.40	1.48	0.35	0.91	5.97	4.62	0.92	1.48
2	5.62	4.62	1.00	4.38	3.97	0.41	1.24	0.65	4.68	4.13	1.00	0.41
3	6.38	5.54	0.84	5.38	4.18	1.20	1.00	1.36	5.63	4.51	0.84	1.20
4	6.77	6.38	0.39	6.02	4.68	1.34	0.75	1.70	6.20	5.10	0.39	1.34
5	6.77	6.00	0.77	5.72	4.84	0.88	1.05	1.16	5.98	5.12	0.77	0.88
6	6.85	4.92	1.93	5.85	4.47	1.38	1.00	0.45	6.10	4.58	1.93	1.38
7	6.70	6.00	0.70	6.28	4.95	1.33	0.42	1.05	6.38	5.21	0.70	1.33
8	6.92	5.62	1.30	5.30	4.37	0.93	1.62	1.25	5.70	4.68	1.30	0.93
9	6.54	6.00	0.54	5.52	4.58	0.94	1.02	1.42	5.77	4.93	0.54	0.94
10	6.54	5.38	1.16	5.45	4.16	1.29	1.09	1.22	5.72	4.46	1.16	1.29
11	6.23	5.54	0.69	5.30	4.55	0.75	0.93	0.99	5.53	4.79	0.69	0.75
12	6.23	5.92	0.31	5.50	4.60	0.90	0.73	1.32	5.68	4.92	0.31	0.90
13	5.92	4.69	1.23	5.25	4.03	1.22	0.67	0.66	5.41	4.19	1.23	1.22
14	5.62	5.08	0.54	5.15	4.26	0.89	0.47	0.82	5.27	4.46	0.54	0.89
15	6.23	5.54	0.69	5.30	4.84	0.46	0.93	0.70	5.53	5.01	0.69	0.46
16	6.31	4.38	1.93	5.65	4.21	1.44	0.66	0.17	5.81	4.25	1.93	1.44
17	6.38	5.69	0.69	5.28	3.74	1.54	1.10	1.95	5.55	4.22	0.69	1.54
18	6.31	5.85	0.46	5.35	4.68	0.67	0.96	1.17	5.59	4.97	0.46	0.67
19	5.31	4.85	0.46	4.92	4.03	0.89	0.39	0.82	5.02	4.23	0.46	0.89
20	6.08	5.23	0.85	4.92	4.08	0.84	1.16	1.15	5.20	4.36	0.85	0.84
21	6.00	5.31	0.69	5.32	4.05	1.27	0.68	1.26	5.49	4.36	0.69	1.27
22	5.38	5.23	0.15	4.18	4.40	(0.22)	1.20	0.83	4.47	4.60	0.15	0.22
23	6.31	6.15	0.16	5.02	4.90	0.12	1.29	1.25	5.34	5.21	0.16	0.12
24	5.92	5.54	0.38	5.38	4.45	0.93	0.54	1.09	5.51	4.72	0.38	0.93
25	5.08	5.00	0.08	4.67	4.03	0.64	0.41	0.97	4.77	4.27	0.08	0.64
26	6.00	5.92	0.08	5.02	4.08	0.94	0.98	1.84	5.26	4.53	0.08	0.94
27	5.92	4.62	1.30	5.30	3.79	1.51	0.62	0.83	5.45	3.99	1.30	1.51
28	5.46	5.08	0.38	4.70	3.79	0.91	0.76	1.29	4.89	4.11	0.38	0.91
29	5.23	4.54	0.69	4.35	3.79	0.56	0.88	0.75	4.57	3.97	0.69	0.56
30	5.77	5.46	0.31	4.88	4.18	0.70	0.89	1.28	5.10	4.49	0.31	0.70
31	6.08	5.77	0.31	5.25	4.03	1.22	0.83	1.74	5.45	4.46	0.31	1.22
32	6.62	5.85	0.77	5.62	4.32	1.30	1.00	1.53	5.87	4.70	0.77	1.30
33	5.46	5.46	0.00	5.46	4.03	1.43	0.00	1.43	5.46	4.38	0.00	1.43
34	5.92	5.62	0.30	5.32	4.47	0.85	0.60	1.15	5.47	4.75	0.30	0.85
35	5.92	5.38	0.54	5.35	3.97	1.38	0.57	1.41	5.49	4.32	0.54	1.38
											23.54	34.76
FACTORS:												
TRAD. SYSTEMS	6.51	5.57	0.94	5.55	4.47	1.08	0.96	1.10	5.79	4.74		
IS STAFF CHAR.	6.14	5.31	0.83	5.35	4.34	1.01	0.79	0.97	5.54	4.58		
STRATEGIC ISS.	5.83	5.38	0.45	4.96	4.28	0.68	0.87	1.10	5.17	4.55		
USER PARTICIP.	5.67	5.18	0.49	4.96	3.93	1.03	0.71	1.25	5.13	4.24		
RESPONSIVENESS	5.77	5.36	0.41	5.02	4.02	1.00	0.75	1.34	5.20	4.35		
DSS/EUC	5.92	5.50	0.42	5.34	4.22	1.12	0.58	1.28	5.48	4.53		
OVERALL	6.09	5.41	0.68	5.26	4.27	0.99	0.83	1.14	5.46	4.55		

F4b: DATA SET FOR MNF1 1988

ITEM	FACTOR	I/S RESPONSES (9)			USER RESPONSES (40)			I/S-USER GAPS		ALL RESPONDENTS		GAPabs	
		IMP	PERF	GAP	IMP	PERF	GAP	IMP	PERF	IMP	PERF	I/S	USER
1	1	6.33	6.00	0.33	5.88	4.95	0.93	0.45	1.05	5.96	5.14	0.33	0.93
2	2	6.44	6.11	0.33	5.84	5.36	0.48	0.60	0.75	5.95	5.49	0.33	0.48
3	2	6.11	5.33	0.78	5.53	4.78	0.75	0.58	0.55	5.63	4.88	0.78	0.75
4	3	4.67	3.78	0.89	4.09	3.44	0.65	0.58	0.34	4.20	3.50	0.89	0.65
5	5	6.00	5.67	0.33	5.53	4.74	0.79	0.47	0.93	5.62	4.91	0.33	0.79
6	1	6.33	5.78	0.55	5.79	5.26	0.52	0.54	0.52	5.89	5.36	0.55	0.52
7	3	5.67	5.11	0.56	4.80	4.86	-0.06	0.87	0.25	4.96	4.91	0.56	0.06
8	6	5.22	4.89	0.33	5.07	4.91	0.16	0.15	-0.02	5.10	4.90	0.33	0.16
9	2	6.11	5.57	0.54	5.24	4.91	0.33	0.87	0.66	5.40	5.03	0.54	0.33
10	4	6.33	6.22	0.11	6.00	5.34	0.67	0.33	0.88	6.06	5.50	0.11	0.67
11	1	6.67	6.33	0.34	6.08	5.64	0.44	0.59	0.69	6.19	5.77	0.34	0.44
12	5	4.89	4.75	0.14	4.58	4.58	0.00	0.31	0.17	4.64	4.61	0.14	0.00
13	1	6.89	6.22	0.67	5.85	5.44	0.40	1.04	0.78	6.04	5.59	0.67	0.40
14	5	5.67	5.50	0.17	4.96	5.40	-0.44	0.71	0.10	5.09	5.42	0.17	0.44
15	2	6.33	5.75	0.58	5.71	5.87	-0.16	0.62	-0.12	5.82	5.84	0.58	0.16
16	3	6.11	5.33	0.78	5.88	5.02	0.86	0.23	0.31	5.92	5.08	0.78	0.86
17	1	6.78	5.67	1.11	6.13	5.58	0.55	0.65	0.09	6.25	5.60	1.11	0.55
18	1	6.56	6.11	0.45	6.23	5.40	0.83	0.33	0.71	6.29	5.53	0.45	0.83
19	3	6.11	5.25	0.86	5.27	4.83	0.44	0.84	0.42	5.43	4.91	0.86	0.44
20	2	6.44	5.88	0.56	5.57	5.01	0.57	0.87	0.88	5.73	5.17	0.56	0.57
21	4	5.22	5.22	0.00	5.27	4.79	0.49	-0.05	0.43	5.26	4.87	0.00	0.49
22	4	5.78	5.56	0.22	5.19	4.80	0.39	0.59	0.76	5.30	4.94	0.22	0.39
23	5	5.67	5.67	0.00	5.55	4.79	0.76	0.12	0.88	5.57	4.95	0.00	0.76
24	2	6.56	6.00	0.56	5.61	5.51	0.10	0.95	0.49	5.78	5.60	0.56	0.10
25	4	5.78	5.33	0.45	5.78	5.32	0.46	0.00	0.01	5.78	5.32	0.45	0.46
26	1	6.78	5.89	0.89	5.71	4.86	0.85	1.07	1.03	5.90	5.05	0.89	0.85
27	1	4.89	2.75	2.14	4.14	4.17	-0.03	0.75	-1.42	4.28	3.91	2.14	0.03
28	4	6.11	5.11	1.00	5.63	4.64	1.00	0.48	0.48	5.72	4.72	1.00	1.00
29	3	5.88	5.86	0.02	5.24	4.63	0.61	0.64	1.23	5.36	4.86	0.02	0.61
30	5	5.78	5.89	-0.11	4.96	4.73	0.23	0.82	1.16	5.11	4.94	0.11	0.23
31	1	6.44	5.56	0.88	5.73	4.83	0.90	0.71	0.73	5.86	4.97	0.88	0.90
32	3	5.00	4.67	0.33	4.65	4.79	-0.14	0.35	-0.12	4.71	4.77	0.33	0.14
33	3	6.22	5.67	0.55	5.25	5.06	0.19	0.97	0.61	5.42	5.17	0.55	0.19
34	3	5.78	5.75	0.03	5.16	5.20	-0.04	0.62	0.55	5.28	5.30	0.03	0.04
35	1	5.89	5.78	0.11	5.28	5.02	0.26	0.61	0.76	5.40	5.16	0.11	0.26
36	6	5.78	5.89	-0.11	5.64	5.37	0.27	0.14	0.52	5.66	5.46	0.11	0.27
37	6	6.11	5.67	0.44	5.62	5.00	0.62	0.49	0.67	5.71	5.12	0.44	0.62
												18.25	17.38

F5: DATA SET FOR RET 1

		I/S RESPONSES(10)			USER RESPONSES(47)			I/S-USER GAPS		ALL RESPONDENTS		GAPabs	
		IMP	PERF	GAP	IMP	PERF	GAP	IMP	PERF	IMP	PERF	I/S	USER
ITEM	FACTOR												
GLOBAL			5.90			5.09					5.23		
1	1	5.90	4.89	1.01	6.04	4.94	1.10	(0.14)	(0.05)	6.02	4.93	1.01	1.10
2	2	5.50	4.78	0.72	5.91	4.98	0.93	(0.41)	(0.20)	5.84	4.94	0.72	0.93
3	2	6.30	4.50	1.80	6.04	4.62	1.42	0.26	(0.12)	6.09	4.60	1.80	1.42
4	3	3.70	2.90	0.80	4.90	4.00	0.90	(1.20)	(1.10)	4.69	3.81	0.80	0.90
5	5	5.10	4.67	0.43	5.15	3.74	1.41	(0.05)	0.93	5.14	3.90	0.43	1.41
6	1	6.20	4.67	1.53	5.80	4.77	1.03	0.40	(0.10)	5.87	4.75	1.53	1.03
7	3	6.20	5.50	0.70	5.42	5.27	0.15	0.78	0.23	5.56	5.31	0.70	0.15
8	6	4.30	3.56	0.74	5.10	3.95	1.15	(0.80)	(0.39)	4.96	3.88	0.74	1.15
9	2	5.30	4.70	0.60	5.04	4.61	0.43	0.26	0.09	5.09	4.63	0.60	0.43
10	6	5.30	4.90	0.40	5.64	4.76	0.88	(0.34)	0.14	5.58	4.78	0.40	0.88
11	1	5.60	5.22	0.38	6.30	5.04	1.26	(0.70)	0.18	6.18	5.07	0.38	1.26
12	5	4.90	4.30	0.60	5.05	3.40	1.65	(0.15)	0.90	5.02	3.56	0.60	1.65
13	1	6.30	5.60	0.70	5.94	4.96	0.98	0.36	0.64	6.00	5.07	0.70	0.98
14	5	5.50	4.60	0.90	5.36	4.59	0.77	0.14	0.01	5.38	4.59	0.90	0.77
15	2	5.90	5.60	0.30	5.98	5.09	0.89	(0.08)	0.51	5.97	5.18	0.30	0.89
16	3	5.50	3.80	1.70	5.60	4.09	1.51	(0.10)	(0.29)	5.58	4.04	1.70	1.51
17	1	6.20	4.60	1.60	5.81	4.96	0.85	0.39	(0.36)	5.88	4.90	1.60	0.85
18	1	6.10	5.44	0.66	6.26	5.11	1.15	(0.16)	0.33	6.23	5.17	0.66	1.15
19	3	5.80	5.50	0.30	5.25	5.44	(0.19)	0.55	0.06	5.35	5.45	0.30	0.19
20	2	5.50	4.80	0.70	5.63	4.52	1.11	(0.13)	0.28	5.61	4.57	0.70	1.11
21	4	5.50	5.60	(0.10)	5.46	4.50	0.96	0.04	1.10	5.47	4.69	0.10	0.96
22	4	5.80	4.50	1.30	4.94	4.28	0.66	0.86	0.22	5.09	4.32	1.30	0.66
23	5	5.20	4.50	0.70	5.26	4.30	0.96	(0.06)	0.20	5.25	4.34	0.70	0.96
24	2	6.10	4.90	1.20	5.62	4.94	0.68	0.48	(0.04)	5.70	4.93	1.20	0.68
25	4	5.30	4.20	1.10	5.51	4.34	1.17	(0.21)	(0.14)	5.47	4.32	1.10	1.17
26	1	5.90	4.90	1.00	5.87	4.71	1.16	0.03	0.19	5.88	4.74	1.00	1.16
27	3	6.30	5.60	0.70	6.44	5.30	1.14	(0.14)	0.30	6.42	5.35	0.70	1.14
28	4	5.80	4.10	1.70	5.43	4.38	1.05	0.37	(0.28)	5.49	4.33	1.70	1.05
29	3	6.30	5.00	1.30	5.79	5.11	0.68	0.51	(0.11)	5.88	5.09	1.30	0.68
30	5	5.70	5.11	0.59	5.38	4.36	1.02	0.32	0.75	5.44	4.49	0.59	1.02
31	1	5.60	4.70	0.90	5.73	5.09	0.64	(0.13)	(0.39)	5.71	5.02	0.90	0.64
32	3	4.80	4.30	0.50	5.20	4.81	0.39	(0.40)	(0.51)	5.13	4.72	0.50	0.39
33	3	5.30	5.60	(0.30)	5.58	5.38	0.20	(0.28)	0.22	5.53	5.42	0.30	0.20
34	3	6.10	5.20	0.90	5.61	5.35	0.26	0.49	(0.15)	5.70	5.32	0.90	0.26
35	1	6.10	4.70	1.40	5.74	4.80	0.94	0.36	(0.10)	5.80	4.78	1.40	0.94
36	6	4.90	3.89	1.01	4.95	3.74	1.21	(0.05)	0.15	4.94	3.77	1.01	1.21
37	6	5.30	3.90	1.40	5.82	4.10	1.72	(0.52)	(0.20)	5.73	4.06	1.40	1.72
FACTORS:												32.67	34.60
TRAD SYSTEMS		5.99	4.93	1.06	5.95	4.92	1.03	0.04	0.01	5.96	4.92		
IS STAFF CHAR.		5.77	4.89	0.88	5.71	4.80	0.91	0.06	0.09	5.72	4.82		
STRATEGIC ISS.		5.56	4.82	0.74	5.55	4.88	0.67	0.01	(0.06)	5.55	4.87		
USER PARTICIP.		5.53	4.52	1.01	5.43	4.39	1.04	0.10	0.13	5.45	4.41		
RESPONSIVENESS		5.28	4.60	0.68	5.24	4.06	1.18	0.04	0.54	5.25	4.15		
DSS/EUC		4.95	4.08	0.87	5.39	4.25	1.14	(0.44)	(0.17)	5.31	4.22		
OVERALL		5.59	4.71	0.88	5.59	4.63	0.96	0.00	0.08	5.59	4.64		

F6: DATA SET FOR MNF 3

ITEM	FACTOR	I/S RESPONSES (36)			USER RESPONSES (53)			I/S-USER GAPS		ALL RESPONDENTS		GAPabs	
		IMP	PERF	GAP	IMP	PERF	GAP	IMP	PERF	IMP	PERF	I/S	USER
GLOBAL			4.86			5.00					4.94		
1	1	5.94	5.27	0.68	6.11	4.96	1.15	(0.17)	0.30	6.04	5.08	0.68	1.15
2	2	5.86	4.91	0.95	5.78	4.91	0.87	0.08	(0.00)	5.81	4.91	0.95	0.87
3	2	5.74	4.69	1.05	5.38	4.58	0.80	0.36	0.11	5.53	4.62	1.05	0.80
4	3	4.81	3.90	0.91	4.88	4.07	0.81	(0.07)	(0.16)	4.85	4.00	0.91	0.81
5	5	5.14	4.70	0.45	5.49	3.66	1.83	(0.35)	1.04	5.35	4.08	0.45	1.83
6	1	5.78	4.60	1.18	5.92	4.39	1.53	(0.14)	0.21	5.86	4.48	1.18	1.53
7	3	5.06	4.62	0.45	4.92	4.03	0.88	0.15	0.58	4.97	4.27	0.45	0.88
8	6	4.64	3.55	1.09	5.06	4.58	0.48	(0.43)	(1.03)	4.89	4.16	1.09	0.48
9	2	5.22	5.03	0.19	5.47	4.91	0.56	(0.25)	0.12	5.37	4.96	0.19	0.56
10	6	5.69	5.49	0.20	5.78	5.24	0.55	(0.09)	0.25	5.75	5.34	0.20	0.55
11	1	6.28	5.67	0.61	6.46	5.20	1.26	(0.18)	0.46	6.39	5.39	0.61	1.26
12	5	4.91	4.40	0.51	5.12	3.18	1.94	(0.21)	1.22	5.03	3.67	0.51	1.94
13	1	6.28	5.56	0.72	5.88	4.94	0.94	0.40	0.62	6.04	5.19	0.72	0.94
14	5	5.67	4.84	0.82	5.29	3.77	1.53	0.37	1.08	5.44	4.20	0.82	1.53
15	2	6.03	5.37	0.66	5.81	5.07	0.74	0.22	0.30	5.90	5.19	0.66	0.74
16	3	5.47	4.44	1.04	5.35	3.83	1.52	0.13	0.61	5.40	4.07	1.04	1.52
17	1	5.86	4.56	1.30	6.06	4.71	1.35	(0.20)	(0.15)	5.98	4.65	1.30	1.35
18	1	6.44	5.27	1.17	6.45	4.84	1.61	(0.01)	0.44	6.45	5.01	1.17	1.61
19	3	5.47	4.16	1.31	4.86	3.65	1.21	0.61	0.51	5.11	3.86	1.31	1.21
20	2	5.50	4.68	0.82	5.68	4.31	1.37	(0.18)	0.37	5.61	4.46	0.82	1.37
21	4	4.80	4.68	0.12	5.38	4.33	1.05	(0.58)	0.35	5.14	4.47	0.12	1.05
22	4	5.67	4.45	1.22	5.26	4.46	0.80	0.41	(0.01)	5.42	4.46	1.22	0.80
23	5	5.20	5.00	0.20	5.46	4.39	1.07	(0.26)	0.61	5.35	4.64	0.20	1.07
24	2	5.78	5.09	0.69	5.57	4.90	0.67	0.21	0.19	5.65	4.97	0.69	0.67
25	4	5.83	4.97	0.86	5.64	4.42	1.22	0.19	0.55	5.72	4.64	0.86	1.22
26	1	5.94	4.97	0.97	5.73	4.96	0.77	0.22	0.01	5.81	4.96	0.97	0.77
27	3	5.58	4.93	0.64	5.21	4.56	0.65	0.37	0.37	5.36	4.71	0.64	0.65
28	4	5.97	4.33	1.64	5.70	4.10	1.60	0.27	0.23	5.81	4.20	1.64	1.60
29	3	5.42	4.39	1.03	5.36	4.29	1.06	0.06	0.10	5.38	4.33	1.03	1.06
30	5	5.39	4.63	0.76	5.62	3.89	1.73	(0.23)	0.74	5.53	4.19	0.76	1.73
31	1	5.66	5.00	0.66	5.96	4.86	1.10	(0.30)	0.14	5.84	4.91	0.66	1.10
32	3	5.03	4.61	0.42	4.92	4.16	0.76	0.11	0.44	4.97	4.34	0.42	0.76
33	3	5.42	5.09	0.33	5.11	4.67	0.44	0.31	0.42	5.23	4.84	0.33	0.44
34	3	5.47	4.26	1.21	5.28	4.34	0.93	0.19	(0.08)	5.36	4.31	1.21	0.93
35	1	5.31	4.61	0.69	5.41	4.11	1.31	(0.11)	0.51	5.37	4.31	0.69	1.31
36	6	5.33	3.64	1.69	4.98	3.03	1.95	0.35	0.61	5.12	3.28	1.69	1.95
37	6	5.53	3.97	1.56	5.54	4.08	1.46	(0.01)	(0.11)	5.54	4.03	1.56	1.46
TRAD. SYSTEMS		5.95	5.07	0.88	6.02	4.81	1.22	(0.07)	0.26	5.99	4.91	30.78	41.49
IS STAFF CHAR.		5.68	4.98	0.70	5.61	4.75	0.86	0.07	0.22	5.64	4.84		
STRATEGIC ISS.		5.29	4.48	0.81	5.16	4.20	0.96	0.13	0.28	5.21	4.31		
USER PARTICIP.		5.57	4.74	0.83	5.55	4.44	1.11	0.02	0.30	5.56	4.56		
RESPONSIVENESS		5.28	4.68	0.60	5.39	3.83	1.56	(0.11)	0.85	5.34	4.17		
DSS/EUC		5.33	4.36	0.97	5.36	4.48	0.88	(0.03)	(0.12)	5.35	4.43		
OVERALL		5.55	4.71	0.83	5.53	4.39	1.14	0.02	0.32	5.54	4.52		

F7 : DATA SET FOR FIN 3

ITEM	FACTOR	I/S RESPONSES (29) IMP	PERF	GAP	USER RESPONSES (82) IMP	PERF	GAP	I/S-USER GAPS IMP	PERF	ALL RESPONDENTS IMP	PERF	GAPabs I/S	USER
GLOBAL			4.27			4.51					4.45		
1	1	5.41	4.17	1.24	5.93	4.10	1.83	(0.52)	0.07	5.79	4.12	1.24	1.83
2	2	5.83	4.69	1.14	5.82	4.72	1.10	0.01	(0.03)	5.82	4.71	1.14	1.10
3	2	5.72	4.00	1.72	5.54	3.89	1.65	0.18	0.11	5.59	3.92	1.72	1.65
4	3	4.24	4.07	0.17	4.60	4.20	0.40	(0.36)	(0.13)	4.51	4.17	0.17	0.40
5	5	5.07	4.00	1.07	5.51	3.43	2.08	(0.44)	0.57	5.40	3.58	1.07	2.08
6	1	5.69	4.14	1.55	5.96	3.94	2.02	(0.27)	0.20	5.89	3.99	1.55	2.02
7	3	4.41	3.72	0.69	4.62	4.00	0.62	(0.21)	(0.28)	4.57	3.93	0.69	0.62
8	6	4.28	3.83	0.45	5.24	4.08	1.16	(0.96)	(0.25)	4.99	4.01	0.45	1.16
9	2	4.72	4.45	0.27	5.07	4.23	0.84	(0.35)	0.22	4.98	4.29	0.27	0.84
10	4	5.55	4.83	0.72	5.79	4.48	1.31	(0.24)	0.35	5.73	4.57	0.72	1.31
11	1	5.93	4.35	1.58	5.98	4.07	1.91	(0.05)	0.28	5.97	4.14	1.58	1.91
12	5	4.72	3.66	1.06	4.94	3.39	1.55	(0.22)	0.27	4.88	3.46	1.06	1.55
13	1	6.07	4.72	1.35	5.58	4.39	1.19	0.49	0.33	5.71	4.48	1.35	1.19
14	5	5.38	4.21	1.17	5.24	4.24	1.00	0.14	(0.03)	5.28	4.23	1.17	1.00
15	2	5.69	4.59	1.10	5.55	4.84	0.71	0.14	(0.25)	5.59	4.77	1.10	0.71
16	3	5.07	4.10	0.97	5.23	3.72	1.51	(0.16)	0.38	5.19	3.82	0.97	1.51
17	1	5.97	3.86	2.11	6.10	4.11	1.99	(0.13)	(0.25)	6.07	4.04	2.11	1.99
18	1	6.48	4.55	1.93	6.50	4.66	1.84	(0.02)	(0.11)	6.49	4.63	1.93	1.84
19	3	5.10	3.97	1.13	5.01	4.34	0.67	0.09	(0.37)	5.03	4.24	1.13	0.67
20	2	5.52	4.45	1.07	5.76	4.07	1.69	(0.24)	0.38	5.70	4.17	1.07	1.69
21	4	4.66	3.90	0.76	5.01	3.83	1.18	(0.35)	0.07	4.92	3.85	0.76	1.18
22	4	5.38	3.87	1.51	5.06	3.80	1.26	0.32	0.07	5.14	3.82	1.51	1.26
23	5	4.72	3.59	1.13	5.26	3.99	1.27	(0.54)	(0.40)	5.12	3.89	1.13	1.27
24	2	5.24	4.41	0.83	5.51	4.67	0.84	(0.27)	(0.26)	5.44	4.60	0.83	0.84
25	4	5.34	3.86	1.48	5.80	3.89	1.91	(0.46)	(0.03)	5.68	3.88	1.48	1.91
26	1	5.28	4.38	0.90	5.58	4.71	0.87	(0.30)	(0.33)	5.50	4.62	0.90	0.87
27	1	5.48	4.59	0.89	5.83	4.68	1.15	(0.35)	(0.09)	5.74	4.66	0.89	1.15
28	4	4.93	3.76	1.17	5.26	3.70	1.56	(0.33)	0.06	5.17	3.72	1.17	1.56
29	3	5.21	3.93	1.28	5.20	4.20	1.00	0.01	(0.27)	5.20	4.13	1.28	1.00
30	5	5.17	3.93	1.24	5.58	3.80	1.78	(0.41)	0.13	5.47	3.83	1.24	1.78
31	1	5.41	4.34	1.07	5.27	4.54	0.73	0.14	(0.20)	5.31	4.49	1.07	0.73
32	3	3.90	4.34	(0.44)	4.30	4.32	(0.02)	(0.40)	0.02	4.20	4.33	0.44	0.02
33	3	4.76	5.10	(0.34)	5.07	4.89	0.18	(0.31)	0.21	4.99	4.94	0.34	0.18
34	3	4.76	3.67	1.09	4.90	4.21	0.69	(0.14)	(0.54)	4.86	4.07	1.09	0.69
35	1	5.10	3.97	1.13	5.65	4.04	1.61	(0.55)	(0.07)	5.51	4.02	1.13	1.61
36	6	4.52	3.79	0.73	4.67	3.71	0.96	(0.15)	0.08	4.63	3.73	0.73	0.96
37	6	4.79	4.21	0.58	4.95	3.89	1.06	(0.16)	0.32	4.91	3.97	0.58	1.06
FACTORS:													
TRAD. SYSTEMS		5.68	4.31	1.37	5.84	4.32	1.52	(0.16)	(0.01)	5.80	4.32	39.06	45.14
IS STAFF CHAR.		5.45	4.43	1.02	5.54	4.40	1.14	(0.09)	0.03	5.52	4.41		
STRATEGIC ISS.		4.74	4.12	0.62	4.91	4.24	0.67	(0.17)	(0.12)	4.87	4.21		
USER PARTICIP.		5.16	4.05	1.11	5.36	3.90	1.46	(0.20)	0.15	5.31	3.94		
RESPONSIVENESS		5.01	3.88	1.13	5.31	3.77	1.54	(0.30)	0.11	5.23	3.80		
DSS/EUC		4.78	4.16	0.62	5.16	4.04	1.12	(0.38)	0.12	5.06	4.07		
OVERALL		5.18	4.16	1.02	5.38	4.16	1.22	(0.20)	0.00	5.33	4.16		

F8: DATA SET FOR FIN 4

ITEM	FACTOR	I/S RESPONSES (14)			USER RESPONSES (185)			I/S-USER GAPS		ALL RESPONDENTS		GAPabs	
		IMP	PERF	GAP	IMP	PERF	GAP	IMP	PERF	IMP	PERF	I/S	USER
GLOBAL			4.71			4.06					4.11		
1	1	6.67	4.13	2.54	6.08	3.85	2.23	0.59	0.28	6.12	3.87	2.54	2.23
2	2	6.33	4.07	2.26	6.13	4.16	1.97	0.20	(0.09)	6.14	4.15	2.26	1.97
3	2	5.93	3.64	2.29	5.82	3.51	2.31	0.11	0.13	5.83	3.52	2.29	2.31
4	3	5.13	3.00	2.13	5.41	3.70	1.71	(0.28)	(0.70)	5.39	3.65	2.13	1.71
5	5	5.07	3.50	1.57	5.56	3.43	2.13	(0.49)	0.07	5.53	3.43	1.57	2.13
6	1	6.27	4.21	2.06	6.19	3.82	2.37	0.08	0.39	6.20	3.85	2.06	2.37
7	3	3.47	4.08	(0.61)	4.82	4.18	0.64	(1.35)	(0.10)	4.73	4.17	0.61	0.64
8	6	4.53	2.55	1.98	4.86	3.47	1.39	(0.33)	(0.92)	4.84	3.41	1.98	1.39
9	2	5.27	4.08	1.19	5.15	3.73	1.42	0.12	0.35	5.16	3.75	1.19	1.42
10	6	5.47	4.47	1.00	5.65	4.48	1.17	(0.18)	(0.01)	5.64	4.48	1.00	1.17
11	1	6.07	5.40	0.67	6.33	4.61	1.72	(0.26)	0.79	6.31	4.67	0.67	1.72
12	5	5.20	3.07	2.13	4.98	3.17	1.81	0.22	(0.10)	5.00	3.16	2.13	1.81
13	1	6.80	3.93	2.87	6.52	3.29	3.23	0.28	0.64	6.54	3.34	2.87	3.23
14	5	5.87	4.50	1.37	6.00	3.84	2.16	(0.13)	0.66	5.99	3.89	1.37	2.16
15	2	6.27	5.20	1.07	6.27	4.45	1.82	0.00	0.75	6.27	4.50	1.07	1.82
16	3	5.80	3.46	2.34	5.47	4.11	1.36	0.33	(0.65)	5.49	4.06	2.34	1.36
17	1	6.20	3.21	2.99	5.91	3.84	2.07	0.29	(0.63)	5.93	3.80	2.99	2.07
18	1	6.53	5.07	1.46	6.35	4.54	1.81	0.18	0.53	6.36	4.58	1.46	1.81
19	3	6.00	4.57	1.43	5.44	3.99	1.45	0.56	0.58	5.48	4.03	1.43	1.45
20	2	5.53	3.75	1.78	5.97	3.93	2.04	(0.44)	(0.18)	5.94	3.92	1.78	2.04
21	4	5.79	4.15	1.64	5.23	3.53	1.70	0.56	0.62	5.27	3.57	1.64	1.70
22	4	5.79	3.64	2.15	4.96	3.45	1.51	0.83	0.19	5.02	3.46	2.15	1.51
23	5	5.13	4.13	1.00	5.40	4.08	1.32	(0.27)	0.05	5.38	4.08	1.00	1.32
24	2	5.93	4.67	1.26	5.80	4.12	1.68	0.13	0.55	5.81	4.16	1.26	1.68
25	4	5.87	4.40	1.47	5.95	4.12	1.83	(0.08)	0.28	5.94	4.14	1.47	1.83
26	1	6.00	4.87	1.13	5.85	4.91	0.94	0.15	(0.04)	5.86	4.91	1.13	0.94
27	3	6.43	3.93	2.50	5.95	3.80	2.15	0.48	0.13	5.98	3.81	2.50	2.15
28	4	5.20	3.47	1.73	5.61	4.32	1.29	(0.41)	(0.85)	5.58	4.26	1.73	1.29
29	3	6.07	4.67	1.40	5.63	4.06	1.57	0.44	0.61	5.66	4.10	1.40	1.57
30	5	5.73	4.00	1.73	5.69	3.97	1.72	0.04	0.03	5.69	3.97	1.73	1.72
31	1	5.87	4.75	1.12	5.47	4.61	0.86	0.40	0.14	5.50	4.62	1.12	0.86
32	3	5.47	4.79	0.68	5.28	4.69	0.59	0.19	0.10	5.29	4.70	0.68	0.59
33	3	5.87	4.93	0.94	5.60	4.77	0.83	0.27	0.16	5.62	4.78	0.94	0.83
34	3	5.13	5.00	0.13	5.04	4.57	0.47	0.09	0.43	5.05	4.60	0.13	0.47
35	1	5.80	4.36	1.44	5.83	3.95	1.88	(0.03)	0.41	5.83	3.98	1.44	1.88
36	6	5.07	2.91	2.16	4.94	3.53	1.41	0.13	(0.62)	4.95	3.49	2.16	1.41
37	6	5.47	3.75	1.72	5.45	3.93	1.52	0.02	(0.18)	5.45	3.92	1.72	1.52
												59.94	60.08

F9: DATA SET FOR FIN 5

USER RESPONSES (77)

ITEM	IMP	PERF	GAP
1	5.82	3.88	1.94
2	6.15	4.34	1.81
3	5.68	3.75	1.93
4	4.59	4.41	0.18
5	5.47	3.03	2.44
6	5.92	3.57	2.35
7	5.25	4.52	0.73
8	4.9	3.73	1.17
9	5.09	3.39	1.7
10	5.92	4.49	1.43
11	6.28	4.3	1.98
12	5	2.88	2.12
13	6.05	3.62	2.43
14	5.87	3.61	2.26
15	6.26	4.26	2
16	5.95	3.12	2.83
17	6.01	3.57	2.44
18	6.64	4.35	2.29
19	5.6	4.04	1.56
20	5.92	3.65	2.27
21	4.59	3.53	1.06
22	4.99	3.62	1.37
23	5.46	3.61	1.85
24	5.92	4.24	1.68
25	6	3.92	2.08
26	5.96	4.19	1.77
27	6.05	4.22	1.83
28	5.86	3.51	2.35
29	5.73	3.91	1.82
30	5.73	3.5	2.23
31	5.51	4	1.51
32	5.03	3.86	1.17
33	5.31	4.03	1.28
34	5.69	4.04	1.65
35	5.77	3.67	2.1
36	4.97	3.03	1.94
37	5.58	3.49	2.09
			67.64

(Note: No IS Staff data available)

F10: DATA SET FOR PUB 2

ITEM	FACTOR	I/S RESPONSES (9)			USER RESPONSES (66)			ALL RESPONDENTS	
		IMP	PERF	GAP	IMP	PERF	GAP	IMP	PERF
GLOBAL									
1	1	5.67	4.78	0.89	5.79	4.04	1.75	5.78	4.13
2	2	5.75	5.29	0.46	5.55	4.91	0.64	5.57	4.96
3	2	5.56	5.22	0.34	5.48	4.19	1.29	5.49	4.31
4	3	4.57	3.63	0.94	4.78	2.91	1.87	4.75	3.00
5	5	5.33	4.33	1.00	5.30	3.06	2.24	5.30	3.21
6	1	5.50	4.89	0.61	5.76	4.16	1.60	5.73	4.25
7	3	5.44	5.25	0.19	4.63	3.84	0.79	4.73	4.01
8	6	3.75	3.63	0.12	4.58	3.32	1.26	4.48	3.36
9	2	5.78	5.25	0.53	5.57	4.42	1.15	5.60	4.52
10	6	5.44	4.50	0.94	5.84	3.78	2.06	5.79	3.87
11	1	6.22	4.44	1.78	5.95	4.35	1.60	5.98	4.36
12	5	4.78	3.78	1.00	4.80	3.12	1.68	4.80	3.20
13	1	6.22	3.89	2.33	6.25	4.44	1.81	6.25	4.37
14	5	4.89	4.67	0.22	5.02	3.65	1.37	5.00	3.77
15	2	4.67	5.33	(0.66)	5.69	5.00	0.69	5.57	5.04
16	3	5.11	3.44	1.67	5.61	3.65	1.96	5.55	3.62
17	1	6.22	4.56	1.66	5.82	3.90	1.92	5.87	3.98
18	1	6.33	5.11	1.22	6.51	4.27	2.24	6.49	4.37
19	3	6.00	5.25	0.75	5.26	3.97	1.29	5.35	4.12
20	2	6.00	5.22	0.78	5.67	4.57	1.10	5.71	4.65
21	4	4.78	4.33	0.45	5.53	3.50	2.03	5.44	3.60
22	4	4.89	4.11	0.78	5.19	3.68	1.51	5.15	3.73
23	5	5.33	4.78	0.55	5.46	3.73	1.73	5.44	3.86
24	2	5.89	5.78	0.11	5.67	4.53	1.14	5.70	4.68
25	4	5.67	4.44	1.23	5.82	3.60	2.22	5.80	3.70
26	1	6.67	4.56	2.11	5.92	3.91	2.01	6.01	3.99
28	4	5.56	3.67	1.89	5.11	3.73	1.38	5.16	3.72
29	3	5.57	4.75	0.82	5.28	3.94	1.34	5.31	4.04
30	5	5.33	4.22	1.11	5.62	3.30	2.32	5.59	3.41
31	1	5.22	5.11	0.11	6.07	4.24	1.83	5.97	4.34
32	3	5.44	5.11	0.33	5.05	4.06	0.99	5.10	4.19
33	3	5.67	4.67	1.00	5.47	3.63	1.84	5.49	3.75
34	3	5.50	4.13	1.37	5.46	4.20	1.26	5.46	4.19
35	1	5.89	4.25	1.64	5.48	4.06	1.42	5.53	4.08
36	6	4.67	2.67	2.00	4.30	2.79	1.51	4.34	2.78
37	6	5.22	4.13	1.09	5.44	3.56	1.88	5.41	3.63
FACTORS:									
TRAD SYSTEMS		6.00	4.61	1.39	5.92	4.09	1.83		
IS STAFF CHAR.		5.79	5.31	0.48	5.60	4.46	1.14		
STRATEGIC ISS.		5.42	4.44	0.98	5.14	3.63	1.51		
USER PARTICIP.		5.24	4.06	1.18	5.51	3.66	1.85		
RESPONSIVENESS		5.13	4.36	0.77	5.25	3.36	1.89		
DSS/EUC		4.80	3.76	1.04	5.11	3.40	1.71		
OVERALL		5.48	4.48	1.00	5.43	3.77	1.66		
SUM OF GAPSabs :				33.36			56.72		

F11: DATA SET FOR PUB 1

ITEM	FACTOR	I/S RESPONSES (11)			USER RESPONSES (14)			I/S-USER GAPS		ALL RESPONDENTS	
		IMP	PERF	GAP	IMP	PERF	GAP	IMP	PERF	IMP	PERF
1	1	5.46	4.46	1.00	6.07	3.46	2.61	(0.61)	1.00	5.80	3.92
2	2	6.20	4.13	2.07	5.77	4.69	1.08	0.43	(0.56)	5.96	4.48
3	2	5.60	4.20	1.40	5.36	4.15	1.21	0.24	0.05	5.46	4.17
4	3	4.50	3.44	1.06	5.07	3.23	1.84	(0.57)	0.21	4.83	3.32
5	5	5.18	3.55	1.63	5.07	4.00	1.07	0.11	(0.45)	5.12	3.77
6	1	5.91	4.00	1.91	5.86	4.00	1.86	0.05	0.00	5.88	4.00
7	3	5.46	4.00	1.46	4.29	4.33	(0.04)	1.17	(0.33)	4.80	4.17
8	6	5.20	3.89	1.31	4.57	3.20	1.37	0.63	0.69	4.83	3.53
9	2	5.10	4.00	1.10	5.07	4.27	0.80	0.03	(0.27)	5.08	4.14
10	6	5.64	4.50	1.14	5.29	2.92	2.37	0.35	1.58	5.44	3.64
11	1	6.00	4.80	1.20	6.43	3.69	2.74	(0.43)	1.11	6.24	4.17
12	5	5.36	3.11	2.25	4.79	3.33	1.46	0.57	(0.22)	5.04	3.24
13	1	6.30	4.67	1.63	5.82	4.56	1.26	0.48	0.11	6.05	4.60
14	5	5.73	3.70	2.03	5.14	3.80	1.34	0.59	(0.10)	5.40	3.75
15	2	5.46	4.50	0.96	5.93	4.30	1.63	(0.47)	0.20	5.72	4.40
16	3	5.46	3.67	1.79	5.43	3.18	2.25	0.03	0.49	5.44	3.40
17	1	5.64	4.09	1.55	5.57	4.00	1.57	0.07	0.09	5.60	4.04
18	1	6.64	4.90	1.74	6.21	4.00	2.21	0.43	0.90	6.40	4.39
19	3	5.60	3.44	2.16	5.43	2.89	2.54	0.17	0.55	5.50	3.17
20	2	5.70	4.00	1.70	5.29	3.82	1.47	0.41	0.18	5.46	3.90
21	4	5.30	4.34	0.96	5.29	4.31	0.98	0.01	0.03	5.29	4.33
22	4	5.55	4.09	1.46	5.07	4.08	0.99	0.48	0.01	5.28	4.09
23	5	5.64	3.70	1.94	5.00	4.00	1.00	0.64	(0.30)	5.28	3.86
24	2	5.90	4.50	1.40	5.21	4.92	0.29	0.69	(0.42)	5.50	4.74
25	4	6.00	4.00	2.00	5.50	3.54	1.96	0.50	0.46	5.72	3.77
26	1	6.09	4.90	1.19	5.64	4.64	1.00	0.45	0.26	5.84	4.76
28	4	5.64	3.64	2.00	4.92	3.46	1.46	0.72	0.18	5.25	3.54
29	3	5.70	3.00	2.70	5.21	3.44	1.77	0.49	(0.44)	5.42	3.22
30	5	5.46	3.20	2.26	5.21	3.08	2.13	0.25	0.12	5.32	3.14
31	1	5.70	4.56	1.14	5.07	4.33	0.74	0.63	0.23	5.33	4.43
32	3	5.82	3.09	2.73	4.43	3.80	0.63	1.39	(0.71)	5.04	3.43
33	3	6.36	3.46	2.90	5.07	3.64	1.43	1.29	(0.18)	5.64	3.55
34	3	6.00	3.50	2.50	5.43	3.64	1.79	0.57	(0.14)	5.68	3.57
35	1	5.50	4.00	1.50	5.50	4.12	1.38	0.00	(0.12)	5.50	4.06
36	6	4.63	3.57	1.06	4.36	1.60	2.76	0.27	1.97	4.46	2.75
37	6	5.40	3.56	1.84	5.93	3.00	2.93	(0.53)	0.56	5.71	3.24
FACTORS:											
TRAD SYSTEMS		5.92	4.48	1.44	5.78	4.03	1.75			5.84	4.24
IS STAFF CHAR.		5.76	4.26	1.50	5.44	4.37	1.07			5.58	4.32
STRATEGIC ISS.		5.66	3.27	2.39	5.04	3.58	1.46			5.32	3.44
USER PARTICIP.		5.61	4.05	1.56	5.25	3.58	1.67			5.41	3.79
RESPONSIVENESS		5.47	3.50	1.97	5.04	3.62	1.42			5.23	3.56
DSS/EUC		5.30	3.98	1.32	5.04	2.88	2.16			5.15	3.38
OVERALL		5.67	3.83	1.84	5.30	3.68	1.62			5.46	3.75
		SUM OF GAPS abs:		59.67			53.27				

APPENDIX G

CASE REPORTS FOR PARTICIPATING ORGANISATIONS

G1 FIN 1

1 The Organisation

As a financial institution, FIN 1 has been a major player for many years. Its net assets in 1987 amounted to R5.5 billion and it employs 4600 people. According to the 1987 Chairman's report, FIN 1 was the third largest institution of its type in South Africa and is a leader in several aspects of marketing and technology.

Recently FIN 1 converted from a mutual society to a public company and entered the banking sector. These changes are indicative of the volatility of an environmental setting in which deregulation is causing building societies and banks to find a variety of ways to accommodate each other and merge as the boundaries of the financial services sector change.

FIN 1's Mission Statement aims in the future

> *"to provide a comprehensive range of financial services to all South Africans and South African corporate bodies in an honest, approachable, professional manner while optimising shareholders' wealth together with the upliftment and well-being of staff. Emphasis is placed on client empathy and on the provision of quality service."*

The launch of the banking arm led to substantial restructuring of the company and five operations are now identified: consumer, corporate, treasury, administration and information services. The changes that are taking place have been accompanied by major reshuffles in management at the highest levels. Due to the changes in the nature and scope of the business, the top management structure of FIN 1, with the exception of the information services director, has changed. High level company processes are changing at the same time. Planning processes have been revised and FIN 1 is starting to alter its directions in strategic planning to meet the needs of the larger market. It appears that the slogan "People you can talk to" is applied equally within the organization. The Group MD believes in communications to all levels of staff and various conferences are organised in which he communicates on a personal level. He also attends weekly operational meetings and the working environment of FIN 1 is regarded as good.

2 I/S Capabilities and Systems

FIN 1 has two IBM 3090s and operates under MVS and VM. The emphasis continues to be to acquire the latest appropriate technology and to keep up to date. There are some 400-500 PCs in place (mainly at Head Office). Most of these act as work stations to the mainframes. FIN 1 uses the IMS database and is also experimenting with DB/2. AS, PROFS and SAS are in place for end user computing and communications. Within FIN 1's bank environment there are local area networks connecting PCs and IBM System 36s in place. Regarding applications, there has been a policy to acquire packages where appropriate, but in practice it is being found that very few packages suit FIN 1's environment. All FIN 1 product lines are supported by information systems. Applications include savings, loans, general ledger, client information and payroll. Transaction histories are maintained and standard reports and enquiries are possible. A new payroll system has been developed in conjunction with I/SM and is also been made available commercially. The I/S group is a separate company and has a policy to provide bureau services as well. It already provides basic processing for two other large financial services companies. PROFS is in wide use particularly in the Head Office environment although there may be some resistance to extensive use at the top of the organization. There is extensive and growing use of SAS and AS at head office. Some resistance may be evident since FIN 1 has switched from using RAMIS. There is a good deal of potential still to be exploited at the branch level.

Overall penetration of I/S is indicated below.

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)					*
MANAGEMENT SUPPORT (monitoring, controlling)			*		
STRATEGIC PLANNING (strategy formulation)			*		
COMPETITIVE THRUST			*		

3 I/S Structures and Processes

The I/S staff complement is some 272 people and there are a further 45 information systems people separate from the I/S company located within the FIN 1 bank. I/S is hierarchically structured with separate groups supporting Development (systems development project teams, development support personnel), Business Services (information centre consultants, business analysts and application support), Facilities (operations, technical support, telematics, change control and systems support services), Resources (finance and administration), and Strategy and Planning.

There is a strong policy to grow I/S staff from within and it is deemed to be working very effectively. Staff turnover is deteriorating but is relatively low by industry standards at about 16% per annum. It appears that most of the resignations are due to emigration, persons starting their own business etc. rather than people leaving to join other I/S organisations. A good deal of emphasis is placed on training which attracts a large budget. Personnel objectives include approximately 3 weeks per annum of training. The training covers technical management, decision making and motivational aspects. There is also a formal attempt to rotate jobs particularly to move people from operations to programming and between development teams. Because of the specialist nature of functions within the facilities group, there is less job rotation there. There is also an emphasis on the formal monitoring and measuring of staff attitudes within the information services division of FIN 1 and regular surveys are carried out.

In addition to the business analysts within I/S, there are also business analysts in the user areas. The I/S planning process starts with the user business analysts preparing an applications requirement plan for the next five years. These requirements are reviewed by the top management I/S Steering Committee (which includes the I/S MD) and priorities are set there to preserve a balance between all interests. Another level of communication is between I/S management and the regions. Separately from the planning function of the user business analysts, I/S management visits the regions and obtains information both formally and informally regarding needs. This information is passed to the user business analysts who need to structure the information into a five year plan. It does not appear that the contents of the FIN 1 applications plan are effectively disseminated to the branches.

Concern has been expressed that the presence of business analysts within I/S and the

user areas may be adding an unnecessary element to the communication chain to the detriment of free communication between the different interested groups.

4 I/S Effectiveness

FIN 1 has participated in two surveys supervised or undertaken by the author and using the Miller-Doyle instrument. The overall performance ratings were:

1983 - 4.7
1988 - 5.1

In 1983 FIN 1 rated 7th out of the 21 financial services companies polled. In 1988 FIN 1 recorded the highest rating of the 12 sets analysed. In discussing the results with the I/S Planning manager, several aspects were highlighted. 1983 was the beginning of a complete conversion from ICL to IBM equipment. With this came management changes and changes in the approach to education for I/S and users. Much stronger I/S disciplines were put in place and for the first time management training was offered to I/S managers. Communications with users improved a lot. The high I/S performance rating is essentially due to the positive attitude revealed in the regions. Head Office perceptions are only average. This is attributed in part to the conscious efforts on the part of I/S to maintain contact with the regions and ensure a high standard of service. While this also applies in Head Office, the additional layer of business analysts residing there may actually militate against I/S success. The I/S group is far more involved with strategic planning issues than the user community. It is suggested that the I/S emphasis here contributes to the creation of an effective information service.

5 Measures of Fit

The various correlations between importance and performance ratings of I/S and users are average except for the I/S group correlation between importance and performance, which, at an r^2 of .62 is the highest encountered. This has been interpreted as further evidence of the value of the strong business planning orientation within I/S. In the I/S group climate survey, FIN 1 I/S rated itself third or fourth on the various scales, compared withother firms. Extensive surveys of climate within I/S have previously (and recently) been conducted. These surveys have indicated generally positive attitudes towards conditions within I/S.

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G2 FIN 2

1 The Organisation

FIN 2 is one of the two largest life assurance companies in South Africa. The corporate philosophy includes community involvement and an emphasis on direct contact with clients. Over the last few years the general affairs of FIN 2 have been discussed with tens of thousands of policy-holders and clients at some 200 gatherings. The company has a formal published mission statement and real efforts are made to have the contents absorbed and applied at all levels. There is a structured approach to goal setting and to measuring achievement against goals.

Key goals are to provide the best product and service at the lowest possible administrative cost and the company takes pride in the fact that its unit administrative costs are much lower than the industry average. In the 1987 annual report a significant reduction in operating costs as a percentage of income was reported and attributed in part to "sound management, expert application of computer technology and service of such a quality that problems are restricted to a minimum".

2 I/S Capabilities and Systems

Two large mainframe computers are in place. There are large numbers of stand alone PC's throughout the organisation as well as a large number of terminals and PC's linked into the mainframes. The primary databases have been developed in-house over time and there are systems supporting all functional areas of the business (eg policies, pensions, new business, personnel, accounting, etc). The company maintains expertise in Assembler and Cobol to maintain and enhance its systems. An integrated database and development language is in use and most current applications are on-line, real-time. Major development and rewriting is underway and there is a lot of activity in the areas of investments, properties, marketing and medical aid systems. Extensive facilities are in place for systems development and end-user computing. Users are trained to access the mainframe and, where capable, do their own downloading of data. These facilities are most commonly used in the investments, actuarial and pensions divisions. All regional locations are on line to the mainframes. The philosophy is that clients should obtain the same level of service wherever they might be in the country. Electronic communication is effected via the network and there is extensive use of message switching throughout the organisation.

Overall penetration of I/S into the organisation is shown below.

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)					*
MANAGEMENT SUPPORT (monitoring, controlling)				*	
STRATEGIC PLANNING (strategy formulation)			*		
COMPETITIVE THRUST					*

3 Information Systems Structures and Processes

I/S in FIN 2 is a separate company that also provides development and operational services to other organisations. The managing director of the I/S company is a member of the top level EDP Committee for FIN 2. Reporting to him are five senior managers, two handling the development project teams and the others looking after technical support, software, operations and the network, and training and personnel functions. It is a feature of this group of managers that the shortest period of service is 10 years. The development teams are structured on a project basis and dedicated project teams are assigned to the different functional areas within FIN 2. There are also steering committees that are associated with each one of the functions, and priorities are set by function. Senior management from EDP and the functional areas sit on these steering committees and there is also representation on a particular steering committee by the senior I/S and senior line person on a particular project team. The project teams are headed up by a systems person or a line person, depending on the nature of the project and the quality of people available. There is also a top level EDP committee that meets monthly to review overall I/S policy. A senior general manager in FIN 2 is chairman of this committee and the chief information officer is also on this committee. The steering committees in different functional areas meet regularly, the frequency depending on the activity at the time. They have formal agendas and generate formal minutes. Apart from the formal communications channels effected through the committee structure, there is continuous informal communication at all levels. In particular the development managers within EDP meet with their users and their own staff on an informal and continuous basis.

EDP is driven by a mission statement that is spelled out in detail. It focuses on the fact that FIN 2 is a marketing organisation and it stresses three areas. With regard to systems and facilities the mission is to provide the best possible service to policy holders and marketers and to achieve maximum effectiveness for the organisation through reduction of administrative costs and provision of management information on a timely basis. Secondly, equipment and the network must offer the lowest possible downtime at the lowest cost and provide acceptable response times and the best possible security. Hardware must be expandable in an evolutionary way. Thirdly, information systems personnel must be maintained at an adequate level and the highest standards must be achieved through training and retraining. Efforts must be made to increase staff productivity and this area must be continuously evaluated. Staff must be given a chance to develop as individuals.

EDP takes the leading role in preparation of a formal information systems plan. However there is a strong emphasis on co-commitment and co-responsibility for informations systems and technology initiatives. The plan is thus the synthesis of input from all functional areas by the formal steering committees and project teams and informal communications between EDP and the users. The plan is presented to the EDP committee for ratification.

Approximately 80% of the staff within EDP have at least a three year university degree. Turnover is much lower than the national average. However even at a 10-15% level this is regarded as a cause for concern. Attempts are made to recruit from within the organisation but otherwise by advertising. A current strategy is to recruit newcomers to EDP and to provide business training for a year before taking the recruits into EDP for training in programming and allocation to project teams. As it turns out very few EDP people move into line areas.

With regard to management of the I/S function, a considerable number of statistics are generated to monitor performance of the mainframes, the network and the development teams. This practice has been in place for several years and it is now possible to present to user managers a strong perspective on the extent of support and the performance of the information systems function in the organisation. A charge-out system is in place to charge operational costs to the different functional areas. Detailed monthly reports are provided to each division and are reviewed at the steering committee level. While project teams are structured in a matrix fashion to support the user community, the overall EDP

function is centralised in order to standardise on training and systems development and operations standards. There is a strong focus on training within FIN 2 as a whole and information systems in particular. Managers and staff go on courses that include executive education at university level, internal courses and technical training. Video courses are also provided. Previously there was more emphasis on technical training for users, but now it is assumed that users will pick up adequate technical knowledge through their day to day contacts with informations systems personnel. Wherever possible users are given appropriate responsibility for the quality of their data, access to their data and levels of security required. One of the criticisms of EDP within FIN 2 is the degree of red tape and the time it takes to implement new strategies. However the feeling within I/S management is that the time is taken up by meaningful analysis of requirements and discussion amongst the key groups within EDP. This prevents teams going off at a tangent and ensures a high quality of service in the longer run.

4 I/S Effectiveness

FIN 2 has participated in three questionnaire surveys using versions of the Miller-Doyle instrument, supervised or personally conducted by the author. The first two were limited to 15-25 respondents and the latest generated 131 responses. The mean I/S performance ratings were:

1983 - 5.1
1986 - 5.1
1988 - 5.0

In the 1983 survey, FIN 2 rated highest of 21 financial services companies surveyed. In 1986 separate structured interviews were conducted with a senior user group and with EDP managers. Without knowledge of the results of the prior or concurrent surveys, the interviewer rated the effectiveness of I/S as perceived in the two interviews relative to six other firms in that study. He concluded that FIN 2 was second highest in terms of this assessment, the same ranking as obtained from the questionnaire survey (Emanuel 1986).

In the 1988 survey, FIN 2 ranked second out of the 12 sets of data analysed.

Another measure of I/S effectiveness relates to the recent launch of a major flexible product offering. This product came to market in less than six months, compared with a user expectation of two years. This success is attributed in large part to the flexibility of the

existing systems which had to be enhanced to accomodate the new product.

5 Measures of Fit

The history of positive perceptions of I/S and the relatively high correlation between importance and performance as perceived by the I/S group ($r^2 = .58$) could well be the outcome of FIN 2's generally high emphasis on formal and informal communications, the elaborate committee structures linking I/S and users, joint project teams, the focus on I/S and business training, and the long service record of senior management in I/S. All these perspectives suggest that the senior staff in I/S should have a strong appreciation for the fit between the needs of the business and I/S functionality.

The subsidiary survey of I/S group characteristics reveals a generally favorable climate within the I/S group that is consistent with the other findings. It suggests a degree of cohesiveness that should contribute to consistency in the I/S approach to the business, benefitting perceptions of fit and fostering I/S effectiveness.

It can further be argued that the I/S group's commonality in perceptions and focus on "fit" is well communicated to users thanks to the factors mentioned above, thus contributing along with actual successes to the positive perceptions of the users.

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G3 MNF 2

1 The Organisation

MNF 2 is one of the "big five" motor manufacturers and distributors in South Africa, enjoying a market share of approximately 15%. The company has a philosophy of centralised management. It employs over 7000 people engaged in four areas, a stamping plant for manufacturing steel body pressings, a trim plant, an assembly plant and an export operation. The company also has a dealer operation consisting of about 230 dealers.

A new managing director was appointed in 1984. Under his direction a new mission statement has been devised, stressing and favouring quality, service and customer care. Since then MNF 2 has come out of a loss situation and 1987 enjoyed a return to profitability. In that year MNF 2 won the National Productivity Institute's productivity award. Quality has also improved and this has led to a larger and growing market share. The most recent major development has being the decision to assemble a new vehicle at MNF 2. Components will be imported and assembly will start in 1990.

In light of poor business performance, appropriate management action was taken two or three years ago by reorganising the company structure and streamlining the operation to become more productive. Since then the mood of the company has improved considerably. Recently the Customer Care philosophy has been extended to internal operations and this is leading to a significant change in attitudes and the company culture. One of the practical outcomes of this change has been a series of formal, three-monthly divisional appraisals. Each division appraises the others with which it has contact. It is stated that on an individual level the courtesy of employees towards each other has already improved. There is a mood of enthusiasm in the company as a whole and in general targets have been met or exceeded.

2 I/S Capabilities and Systems

MNF 2 has well established basic systems as well as an end user computing operation. The mainframe hardware is Hitachi and Adabas and Natural software is used. Main applications include parts and accessories, material requirements planning, human resources, financial systems and computer-aided design. All major systems are on-line real-time. There is also a communication system that links dealers and provides interna-

tional links with supply sources.

Regarding end user computing there are approximately two hundred PCs in the company, the majority being linked to the mainframes. Users are given access to the main data base, and to subsidiary information centre databases. System W and SAS are also used.

The Software AG product CON-NECT is used as the basis for the "MNF 2 Office System". This system has been introduced at the top management level and comprises PC workstations with a menu that offers a variety of options. These include interoffice mail, access to standard marketing and financial reports, and access to PC tools such as Supercalc and Multimate. It is also possible for users to write their own reports using Supernatural and some work has started there in the personnel and parts areas.

The diagramme below indicates the penetration of I/S into the company.

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)					*
MANAGEMENT SUPPORT (monitoring, controlling)				*	
STRATEGIC PLANNING (strategy formulation)			*		
COMPETITIVE THRUST			*		

3 I/S Structure and Processes

For many years I/S reported to the Financial Director of the company. However with the general reorganisation of the MNF 2 group under the new MD, a Group Planning and Financial Director was appointed over the financial directors of manufacturing and marketing. The I/S group now reports to this director, a move that is proving to be most successful. At one stage I/S had the lowest turnover in the company. Turnover of I/S staff has risen recently, even though it is less than the industry average.

Over time the I/S group has been reducing in numbers as part of a conscious move to shift functions into the user areas. From a high of 102 it has dropped to 92 and will continue

to decline. Users are being asked to take over all routine functions such as initializing batch runs and invoking enquiries into the database. Senior I/S people have also been transferred into the user areas, eg. an I/S project manager for marketing has now been appointed as data administrator in the Marketing Division. While the I/S group is becoming smaller, policy will be to bring in contract workers when needed for major projects.

The structure of the I/S group used to be a formal one with several layers reporting to the I/S manager. This has now been changed into a very flat structure to provide greater flexibility for rewarding specialists for their technical expertise. With the new reporting level for the I/S Manager, there are significantly more contacts at the highest levels between I/S and the rest of the company, particularly since the I/S manager maintains an open door policy and is available throughout the day for consultation by any member of the I/S department.

In 1980 a formal I/S plan was devised in order to establish a corporate database. This plan has been progressively implemented with success. Subsequently I/S planning has been found to be difficult. Attempts have been made to apply techniques used by MNF 2's overseas supplier but there has been little user support for the outcome of this exercise. At present the I/S group deals directly with individual users to ascertain their requirements and puts the pieces together within I/S. As it is, with the major systems and the corporate database in place, the emphasis has tended to shift towards providing service and improving the quality of existing systems rather then new developments.

There used to be a corporate I/S steering committee, but this disappeared with the corporate restructuring. I/S steering committees within the manufacturing and marketing divisions have now been constituted and a new central steering committee is planned.

I/S recruitment policy is one of internal growth and recruitment of high level personnel from the outside. Formal training programmes are organised for I/S within the company in I/S matters and management techniques. MNF 2 makes full use of its membership of the Butler-Cox foundation as well, using its reports and participating in local presentations and members' workshops. There is no formal policy of job rotation within the I/S group.

Training is also provided to users eg. dealers are trained in the communications links with head office and on the in-house dealer system. There is a centre providing training in

end-user computing techniques. With regard to project management, the policy of MNF 2 is that users lead all I/S project teams.

An important contribution to communications within the company is made by formal departmental assessments mentioned in section 1. The Information Systems department in particular has come out very well from this appraisal process. Two surveys have been conducted already with I/S being perceived better on the second survey than in the first. It is thought that this indicates a learning process about I/S matters on the part of users.

4 I/S Effectiveness

MNF 2 has participated in three surveys using versions of the Miller-Doyle questionnaire. The average ratings of I/S performance were:

1985 - 5.5
1986 - 5.4
1988 - 5.0

The first two surveys polled only 15-20 respondents and the third 84. The 1985 rating was the highest amongst 44 manufacturing firms. The 1986 rating was the highest amongst the seven firms studied. In that study interviews were conducted with a senior I/S manager (not the head of I/S since he was overseas) and with a group of senior users. The qualitative rating derived independently of the survey also placed MNF 2 highest amongst that sample of firms. The researcher's comments included:

> *"[I/S] is an innovative environment with a strong company loyalty ... although the I/S manager does not report directly to the MD, he has a lot of informal influence and managerial experience ... he is well-respected by his staff and is seen as an excellent communicator ... I/S staff believe in their ability and one can feel the enthusiasm and positive culture in the division ... out of all the companies studied, MNF 2's I/S division identified most strongly with the rest of the company". (Emanuel 1986)*

In terms of these results, the more widely spread survey in 1988 reflects a decline in attitudes towards I/S. This is also suggested by the fact that MNF 2 ranks third out of 12 in that study. The average of 5.0 in the I/S performance rating is made up of 5.2 for the I/S group and 4.9 for the user group, indicating quite a wide discrepancy. Factors that may explain this decline include disruption caused by the changing reporting lines and restructuring of the I/S group, the increase in I/S staff turnover, the disbanding of the

corporate I/S steering committee. The lack of overall I/S planning to help in the transition from the strong basis of transaction processing systems to more communications-orientated and management support systems may also be a factor.

5 Measures of Fit

The measures of fit reflected in the coefficients of determination are middling and consistent with the user ratings of I/S performance. For instance the importance-performance r^2 for I/S staff is .49. This may be further evidence of a drifting apart of I/S and users and a failure to communicate the key corporate directions to I/S management and within I/S.

Within the I/S group, however, there is a very positive climate. In the subsidiary survey of I/S staff attitudes towards their own group, MNF 2 rated themselves second only to MNF 1. The positive attitudes towards the I/S group climate, each other as people, and productivity and participation within the group indicate a high degree of cohesion. This result is consistent with the comments made by the previous researcher quoted above. It strengthens the thought that the decline in user attitudes may be the result of failure to communicate corporate directions to I/S rather than lack of coordination and cohesion within the I/S group.

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G4 MNF 1

1 The Organisation

MNF 1 is the South African producer of primary aluminium. It is owned 72% by IDC, 22% by Alusuisse and 6% by other shareholders. It is likely that up to 50% of the IDC shareholding will be sold off to bidders in the near future. MNF 1 has experienced rapid growth and now has a production capacity of 170 000 tons and a turnover of R700 million per annum. If it were a quoted company it would be in the top twenty of the Financial Mail's top 100 companies. Profits have increased steadily over the last few years, but since MNF 1 is operating at full capacity, external factors such as the exchange rate and prices on the London Metal Exchange have a strong bearing on this performance.

Sales are split 50/50 between local demand and exports. MNF 1 imports 90% of its raw materials, but the favourable exchange rate and growing price for aluminium on the London Metal Exchange makes for a very bright future for the organisation. Studies into substantial expansion of capacity are underway.

MNF 1 employs 2800 staff and has a centralised organisational structure. Over the last two or three years there has been a move towards strategic planning at corporate level and divisional level. A company mission and objectives have been published and each of the major divisions in the company is now expressing subsidiary missions and objective sets.

The primary strategic thrusts of the organisation include cost reduction through production efficiencies and product quality. With the advent of a new MD in 1982 came a new style of management. The approach is more participative and the cohesiveness of the top management team has improved. Through a series of conferences and strategic planning sessions a common view and management process hasbeen growing and is working through the organisation. The organisation has an informal climate. It is relaxed and there is a high degree of social contact. Formal structures are also in place and there are for instance weekly technical meetings, monthly senior management meetings and quarterly financial meetings.

2 I/S Capabilities and Systems

Originally MNF 1's data processing was conducted by a bureau. MNF 1 then went

in-house with Sperry hardware and under capacity pressures switched to Hewlett Packard equipment in 1984. Currently the firm operates two HP 3000/70's each with eight megabytes of primary storage. There are large disk drives and tape drives, 150 terminals and 100 PCs mainly connected to the main frames. The firm uses the IMAGE database with its associated Business Report Writer. The path to PCs started 12 - 15 months ago and one of the outcomes has been a scheme to assist with private purchases of PCs. There are about 120 PCs in the scheme already. As a basic policy the firm has elected to go with purchased software wherever possible and now has packages to service its payroll, stores procurement and maintenance, financial, quality control, production and sales systems. A move towards office automation has started and all secretaries use word processing facilities. Some also use Lotus and graphics.

Desk top publishing is in use and the firm is moving towards electronic mail. Current plans coming out of a strategic planning conference for MI/S are to integrate existing systems and to exploit these by generating new management reports. Some users are accessing data using a 4th Generation Language and the Business Report Writer, but this usage is still relatively limited.

The only basis for competition MNF 1 has is cost reduction. Accordingly this has been a particular emphasis in systems support. The finished stock system has for example enabled a reduction in average stock holdings from 40 days to 15 days.

Overall penetration of I/S has been assessed as shown below.

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)				*	
MANAGEMENT SUPPORT (monitoring, controlling)				*	
STRATEGIC PLANNING (strategy formulation)				*	
COMPETITIVE THRUST				*	

3 I/S Structures and Processes

The MI/S department has recently been reorganised and the MI/S Manager now reports

to the Senior Manager Management Services alongside Corporate Administration and Audit Services. The department consists of 10 people split into three subsections, Systems (systems controller, support analysts and programmers), Technical Support (technical assistant and PC assistant) and Operations (supervisor and three operators).

There is a steering committee with the Technical Director as chairman and the Finance Director, Management Services Manager, MI/S Manager and Technical Process System Manager as members. This committee meets annually. There is a desire to establish a new MI/S policy committee at the highest level. There has been an attempt to set up a formal planning process involving users but this has not come to fruition. However, the strategic planning conference for MI/S referred to above is providing the long term guidance for the MI/S efforts. Where necessary project teams including both MI/S and user personnel are formed.

The culture of the MI/S department is that of a very close group. The senior personnel are similar in age and family circumstances and socialise a good deal. Operational responsibilities have been delegated and there is friendly competition amongst the staff, who feel connected to their systems and their users.

4 I/S Effectiveness

Using the Miller-Doyle instrument, MNF 1 conducted surveys of information systems effectiveness in 1987 and 12 months later in 1988. The average user I/S performance ratings were:

1987 - 4.27
1988 - 4.82

This represents a shift from 7th to 4th in the 12 sets of data analysed. In both surveys approximately 40 senior managers responded along with about 10 MI/S personnel, representing response rates of over 90%. The first survey was run independently of the author by the manager, management services, in order to establish a basis for systems evaluation. In a letter after the first survey, he commented as follows:

> *"I am now busy analysing the results in detail and hope to build the results of this analysis into a strategic information systems plan which is in a development phase ... I am extremely excited about the results so far and firmly believe that*

the next year will see us focussing our energy in the right areas and our target is going to be a '5-star' rating by June 1988" (Private communication July 1987).

At the time of the first survey there was considerable focus on the technical problems of implementation of individual packaged systems. The senior system staff acted relatively in isolation in getting particular systems up and running. There was not much communication between the systems staff and a strong emphasis on the DP world. As a result of the initial survey the focus was shifted towards marketing I/S services to the user community. Simple activities such as lunching with users was encouraged. Also a specific lack of decision support facilities emerged from user responses and this led to the acquisition and deployment of a large number of PCs throughout MNF 1. This action was followed by the launch of a PC purchase scheme linked to interest-free loans.

After a couple of months the management services manager commented:

"the initial DP response of 'we are right and they are wrong' has changed to 'why do they feel that way and what can we do to change their perceptions' .....

We have set in motion an awareness program to change the perceived importance ratings .....

We have started projects where we identify a user group and allocate a DP person as their mentor and support system and it is gratifying to see the returns in the form of user enthusiasm."

As noted above, the results of the second survey (conducted together with the author) show a marked improvement in user performance ratings. There was an increase in ratings for all categories of item in the questionnaire, with the largest increases being in the areas of decision support, management reporting, user participation and responsiveness to change.

During informal discussions with the author at a company function unrelated to I/S, the managing director and two other directors made positive and enthusiastic comments regarding I/S. Another measure of change is the observation that users now refer to "our system" rather than "your DP system".

5 Measures of Fit

The four coefficients of determination linking importance and performance and I/S and

users all increased over the twelve months between surveys:

		r^2 1987	1988
Importance vs Performance	**I/S staff**	**.30**	**.65**
	users	**.25**	**.53**
I/S staff vs Users	**Importance**	**.59**	**.71**
	Performance	**.39**	**.53**

Various organisational factors may have contributed to these changes:

- There was a restructuring in the I/S group with the senior systems person being made the systems controller and taking more of a management role than before.

- The results of the first survey provided a focus for discussion and goal setting within the I/S group.

- Due to the general cultural shifts mentioned earlier, improved communications have been experienced throughout MNF 1.

- I/S used to report formally to the general manager, finance but informally to the technical director. In a sense the group had no home and operated as a closed system removed from the user. The new reporting line through the management services manager to other divisions is clean-cut and more effective in exposing I/S to business issues.

- The conscious attempt that was made to instill a greater marketing thrust among the I/S people.

- The support analysts continued to be responsible individually for each of the four major systems and are expected to do everything in relation to the systems from technical support to marketing and general contact with the users.

- MNF 1 has very little turnover in I/S staff.

- In the subsidiary survey of group characteristics conducted as part of the current study, the MNF 1 I/S group rated itself highest of the eight firms assessed.

- The I/S staff now obtain technical training as well as training in topics such as group management. A need is seen for training in business skills as well.

- The shift into the PC world has been seen asa major contributor to improved communications between I/S and the users.

The user ratings of I/S performance are high, but in relation to the measures of fit found, might be expected to be even higher. It is suggested that at the time of the second survey, the impact of some of the systems changes had not yet worked through. Top management in particular had not started receiving the major benefits, and in fact their ratings were only marginally higher than previously, while the next level of managers had moved significantly upwards in their ratings. By the time of writing this report, about another year has passed, there is a steering committee composed of all the general managers, and it is believed that further improvements in user perceptions have occurred.

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G5 RET 1

1 The Organisation

RET 1 is the largest retailer of clothing, footwear, accessories and household textiles in southern Africa. It is a listed company which in 1988 earned about R60 million on sales of R1,2 billion. The group employs over 10 000 people and operates about 350 stores in a number of strategic business units. These include a specialty retail chain aiming at the upper and middle income groups, a classical merchandise chain targeting the large majority of South Africans with moderate income, a chain of cash stores and an experimental chain of fashion discounters. The group also has a company manufacturing men's and women's outerwear Finally there is a retail services company supplying distribution, quality assurance, store design and development services to the group. Two corporate divisions cover financial, legal, administrative and systems needs and the human resources and public affairs functions. RET 1 is strongly orientated to credit sales and carries almost two million debtors accounts.

According to the 1988 annual report, the first objective of RET 1 is:

> *"to be recognised as the leading specialty retailer of clothing, footwear, accessories and household textiles in South Africa".*

Its strategic plan is centred on the satisfaction of its customers' needs and value expectations and its top priority is to achieve market leadership and profit growth both through organic growth and acquisitions.

The management style within each chain is centralised, but there is an emphasis on participative management and the building of employee partnerships. In general the company is seen to be an excellent one to work for. People work hard, feel respected as individuals and have a high degree of informal freedom to act.

There is a formal three year planning process that is followed within each business unit. The outcomes of the planning process include the detailed budget for the current year plus a three year plan for the future. The group operates on a committee basis with a series of interlinked meeting structures. It is through these committees and forums within chains (eg merchandise efficiency committees) that for instance IT knowledge is imparted throughout the group.

The mission and direction of the group is based upon four "pillars of success", namely merchandising, credit, marketing and information. It is of interest to note that the role of information technology is mentioned several times in the latest annual report:

> *"During the past year the group has invested heavily in technology to provide appropriate solutions to the information needs of each of our businesses ... our strong commitment to the individual has been well supported by our substantial investment in information technology ... the need to improve productivity calls for the use of enhanced technology and further investment in information management systems ... a well-established customer account base, information technology that provides for further improvement in the management of working capital and carefully researched merchandise assortments provide the impetus for achievement of our objectives."*

2 I/S Capabilities and Systems

RET 1 has an IBM 3090 for its major processing requirements and an IBM 3083 as a backup machine and for end-user computing. The group has several hundred PCs, some of which are linked to the mainframe and used as work stations. All stores are either on-line to the mainframe or linked via the back office. The basic software is Adabas and Natural and the group is "just about totally systemised". The bulk of transaction processing systems including credit, cash management, purchase order management, replenishment, distribution, and planning systems are in place. End users are serviced via System W, Supernatural and Arthur. There has not been an emphasis on office automation and currently there is no electronic mail facility; communication is via fax and telephone. There is debate as to the real value of local area networks at the head office level.

The major drive at the moment is towards decision support systems and end user computing, increasing the functionality of the systems already in place, consolidating, rewriting and enhancing existing systems and providing user education.

The extent of penetration of information systems is summarised in the table below.

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)				*	
MANAGEMENT SUPPORT (monitoring, controlling)				*	
STRATEGIC PLANNING (strategy formulation)			*		
COMPETITIVE THRUST				*	

3 I/S Structures and Processes

I/S is a group function and the group I/S executive reports to the group financial director. The I/S group consists of 200 people and has a formal and multilevelled organisational structure. Turnover of I/S staff is typically 15% per annum. There are five group I/S managers responsible for development, telecommunications, facilities and resources. Below them are systems managers, project managers, project leaders, etc. RET 1 I/S went through a difficult time 3-4 years ago with three changes of chief information officer in a short period of time. Currently there is some concern that at the lower levels within I/S, personnel are "primadonnas" who do not have company loyalty. It has been necessary for the present group I/S executive to introduce a more professional approach to systems development within the group. There is an important objective to encourage loyalty to retailing rather than data processing and currently a good deal is spent on the training of I/S staff. 6% of the I/S salary budget is devoted to technology and business training and each member of staff is expected to spend about 15 days per annum on training. There is specific encouragement for business training. Four MBA students and two honours students are currently on the payroll and eight I/S personnel per year are assigned to the internal Retail Development Programme. There has been an attempt to rotate I/S personnel and business personnel within the RET 1 group but not with much success. Internal specialisation militates against such a policy. While there is a policy to promote from within, this has also proved to be very difficult in practice.

As a company RET 1 is a "here and now kind of business" and at times strategic thinking

is not made explicit enough. However the I/S group follows the strategic planning process of the group, developing an annual budget, a three-year plan and a 10-year scenario. The current plan is updated via input of systems requirements from the strategic business units. The revised plan is then presented in a top management workshop and adapted in light of current requirements. There are formal monthly feedback sessions on the major projects with project team meetings and minutes of reportbacks. There are management activity reports on problems and opportunities, progress reports and user sign-offs on progress. There are implementation reviews. Generally there is constant communication with users and at management level there is informal contact over lunches and so on. Priorities for allocation of the I/S resource are set in common user forums. There is a strong emphasis on cost benefit analysis and priorities are geared to improving the bottom line. While there is a close relationship between users and I/S and several business analysts within the user area have graduated from I/S, it still appears that I/S is driving I/S developments rather than the users. There is a substantial debate on the role of business analysts within RET 1 and there is a feeling on the I/S side that line management should be driving the I/S requirement and should champion new projects. As part of the effort to foster IT knowledge within the user community and improve communications, three day top level I/S/user sessions have been held.

4 I/S Effectiveness

RET 1 has participated in two surveys of I/S effectiveness using versions of the Miller-Doyle instrument. The average ratings of I/S performance have been:

1984 - 4.6
1988 - 4.6

In 1984 RET 1 rated tenth out of 21 retailing firms polled and in 1988 fifth out of 12 sets of data. In discussion the average ratings and the itemised results for I/S and users appeared to accord with the I/S executive's perception of overall I/S effectiveness in RET 1.

5 Measures of Fit

The importance-performance correlations accord with the user performance ratings. In particular the r^2 between importance and performance for the I/S group is .47. Factors that might lead to better fit between importance and performance ratings within the I/S group could include a more directive role in I/S projects by users, whereby they imparted more

accurately their business needs. Despite the strong emphasis on IT in top management pronouncements, the absence of formal plans developed for or with I/S makes achievement of focus difficult.

In the subsidiary evaluation of I/S group characteristics, the RET 1 I/S group generally rated itself third amongst the eight firms participating, slightly ahead of its position in terms of user attitudes. This suggests again that improvements in I/S effectiveness might be sought at the interface between I/S and users rather than within I/S itself.

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G6 MNF 3

1 The Organisation

MNF 3 is a major manufacturer of motor vehicle engines. Originally on-stream in 1980 assembling engines under license from overseas firms, the organisation has taken a series of steps towards backward integration until now some 55% of components used are locally made. The company is currently capable of producing 50000 units per annum in eleven different classes of engine, and consists of two engine plants, an engine block and cylinder head foundry and aluminium centre, and warehousing facilities. MNF 3 employs 2600 people in five divisions and enjoys a turnover of R400 million per annum.

The mission statement of MNF 3 is prominently displayed and starts as follows

> *"We are committed to striving for continuous improvement in productivity in every sphere of our activities."*

Being a new plant, MNF 3 has had the opportunity to incorporate current management procedures and technology from scratch. The core production philosophy is Material Requirements Planning, which has evolved to the broader concept of Manufacturing Resource Planning, both referred to as MRP. Central to the expression of this approach is computerisation and integration of planning, production and logistics processes. Information technology is thus integral to the culture of MNF 3.

After a recent tour of the highly computerised plant as a member of an MBA group, a production engineer reported "it was a dream to walk through the factory. Design, development, and production are to a very large extent computerised. Engines get tracked from the drawing screen right through the production line. Terminals are virtually everywhere, and operators monitor everything."

2 I/S Capabilities and Systems

MNF 3 has two large Unisys computers comprising 48 megabytes of main memory and 10 gigabytes of secondary storage, a PRIME minicomputer for computer-aided design, and some 170 PCs. Most PCs are linked to the Unisys mainframes along with a further 500 peripheral devices. Initially MNF 3 relied on packages and in-house developed systems written in Cobol. They have progressed to Fourth Generation versions of Cobol, ie. Cogen and now Xgen, and virtually all original Cobol code has been replaced.

The major application suite is clearly MRP and consists of modules such as production planning, master production planning, material requirement planning, production control and finished goods inventory and despatching. Other systems include a warranty tracking system, and payroll and general ledger packages. End-user computing is in place and authorised users are able to download data from the central data base to PCs. In practice I/S staff respond to requests and do the necessary extractions and downloading for users. Users then use spreadsheeting, data base and graphics software to conduct their own analyses.

Secretaries use wordprocessing facilities and also statistical routines. At the time of the survey no electronic mail facilities were in place, but this capability will be initiated in the near future. The diagramme below gives a sense of the penetration of I/S into MNF 3.

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)					*
MANAGEMENT SUPPORT (monitoring, controlling)				*	
STRATEGIC PLANNING (strategy formulation)		*			
COMPETITIVE THRUST	*				

3 I/S Structures and Processes

Until about two years ago the I/S department was headed by the I/S manager who had set up the original department in the early eighties. He reported to the director of finance. When he resigned, he was not replaced and the I/S group continued under two managers, the development manager and the facilities manager. The finance director retired about a year ago and a new director has been hired. The split reporting structure still remains and together the sub-departments have a staff complement of about 70.

The general direction for I/S was shaped by the original I/S manager, who was strongly influenced by the growth model due to Nolan. There is a strong emphasis on forward planning of technical requirements and, for instance, careful attention is paid to five-year

capacity planning. The planning process for systems commences with the development manager touring user departments to put together a "wish list". This list is then refined and put before a steering committee consisting of technical, personnel, supplies, marketing and finance directors and now both senior I/S managers. Overall I/S policy is decided by this committee which meets monthly and amongst other things sets systems priorities. Subjective criteria are used.

Development and end-user support is based on project teams. There are a number of project leaders in I/S and they head up teams that include users, representatives of related functions, technical advisors etc. The company adopts a flexible approach to systems development methods and is making more use of prototyping nowadays.

Basic computer awareness courses are provided to users as well as courses on the various PC products in use. There has been a resurgence in the training of I/S staff in management principles and more recently in the specifics of inventory management. The benefits of this are already being experienced with much closer relationships between I/S analysts and user co-ordinators.

I/S staff go through regular performance appraisals and the first priority is internal recruitment and promotion on merit. Annual staff turnover is less than 5%.

4 I/S Effectiveness

MNF 3 has conducted three surveys of I/S Effectiveness using versions of the Miller-Doyle instrument. The average performance ratings were as follows:

1985 - 5.0
1986 - 4.8
1988 - 4.5

The first survey was supervised by the author and MNF 3 rated sixth out of 44 manufacturing companies studied. The second survey was run independently by MNF 3 and covered a large number of managerial and I/S respondents. The third survey was conducted by the author and also covered a large sample. The user rating of I/S performance places MNF 3 sixth out of 12 sets of data analysed.

The data suggests that I/S has been losing favour in MNF 3. It is possible that this has

come about as the fundamental systems have established themselves and other I/S issues have grown more prominent. For instance in 1986 the I/S manager aired a few major concerns, including the problem of meeting growing user demand for end-user facilities, and the need to incorporate the I/S function in the overall strategic planning process of MNF 3. He believed that I/S had slipped from being seen as a strategic resource to the company, simply to being an important one.

Certain more recent events would support this view. The fact that MNF 3 has not moved quickly to consolidate I/S under a new I/S manager (or indeed to appoint an I/S director), the fact that the latest request for computer upgrades was approved only with unusual difficulty, and the fact that only one of the executive directors completed the latest survey document all point to a possible change in perceptions of the role of I/S.

5 Measures of Fit

The importance-performance correlations for I/S and user groups are middling and in line with the user performance rating. In particular the importance-performance r^2 for the I/S group is .39. This suggest a reasonable degree of focus, but with room for greater alignment. In a recent interview with the new finance director and the two I/S managers, it was noted that there was a general need for an overall strategic plan for MNF 3. In a rapidly changing environment, clear direction was not coming from the top, users were not clear on their own needs and therefore could not communicate effectively with I/S. An example was quoted where it had taken several months for users to define their needs for a vehicle tracking system, but once a classic implementation process had been completed many new needs emerged.

It is reported by the systems managers that in general their users have become overly reliant in systems staff for minor troubleshooting and that users should become more active. Currently a strategic planning exercise is underway to establish and communicate corporate direction to functional departments.

Regarding the characteristics of the I/S group itself, responses to the subsidiary group survey place MNF 3 about third on group cohesiveness, measured on scales that tap group climate, regard for each other as people, productivity and participation. This may add further to the idea that more focused input is needed to enhance effectiveness.

G7 FIN 3

1 The Organisation

FIN 3 is one of the two largest life assurers in South Africa. Premium income in 1987 amounted to R4 500bn or 33% of the market. The company is divided into four autonomous business units, employee benefits, individual life, investments, and services and employs 10000 people, 4000 of whom are at its head office. A mission statement has been in existence since mid-1985 and stresses the provision of financial security through life insurance. A major thrust has been growth in assets and premium income. Efficiency, effective service and improved service to clients have been identified as critical success factors. Active efforts are being made to effect a change in culture from one that has been somewhat complacent to one that demands only the best (ie. from "good enough" to "not good enough"). Corporate strategy is discussed between executive and divisional management at formal annual conferences. Input from the line is used by executive management to shape agreed strategy. The latter are free to extend this communication formally or informally within their divisions.

2 I/S Capabilities and Systems

FIN 3 has six mainframe computers from three major suppliers. In part this proliferation is due to a policy shift towards multiple suppliers in an IBM environment. There are two different communication networks for different host equipment and about 4500 devices, including approximately 1000 PCs are connected to the mainframes. The IDMS data base management system is used. All major operational and product-related functions are computerised and there are some 20 million lines of Cobol code to be maintained. The processors are grouped into three distinct domains, production, development and information centre. Production is fully centralised and handled in batch mode under MVS. It is orientated towards efficiency and maximum utilisation of hardware resources. There are no stated plans to distribute routine production to regional sites. The information centre environment supports end-user computing via an IBM mainframe operating under VM. There are some 2000 registered users of this facility, largely in the investment, actuarial and employee benefits sides of the business. Specialised software such as APL and AS are in use and expert systems are also under development. An electronic mail system is provided and there are various local area networks linking PCs together. Several decentralised information centres with support staff are provided.

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)				*	
MANAGEMENT SUPPORT (monitoring, controlling)				*	
STRATEGIC PLANNING (strategy formulation)			*		
COMPETITIVE THRUST			*		

3 Information Systems Structures and Processes

FIN 3's Computer Services Division reports through the General Manager (Services) to the Managing Director. A number of central functions are performed by the 350 employees of this division, including computer operations and planning, information centre, development services, data administration and technology development. However, most systems development personnel have been moved into the four autonomous lines of business where they design and develop software applications and service end-user requirements. The computer services group exercises an overall strategic influence through centralisation of mainframes, common networks, data administration and recruitment, and training of all information systems staff. Central processing costs are recovered through chargeout systems. Service level agreements are agreed between users and I/S and performance is monitored accordingly.

FIN 3 has used different I/S planning processes. Currently needs filtering up from the business units are vetted by a central technical planning team made up of business unit systems managers and computer services staff. Proposals are then passed to the information systems steering committee, consisting of assistant general managers representing all the business units, where priorities are set and approvals granted. In the case of major developments, recommendations are passed on to the executive committee for financial approval. The Tetrarch planning methodology is currently used in some areas, but has been found to be cumbersome and time consuming. Systems development in the MVS environment follows the traditional systems development life cycle and currently the IEW methodology is under test in the areas of systems and data base design.

3.1 Employee Benefits Division

The I/S effectiveness survey reported here was confined to the Employee Benefits unit of FIN 3 and the following commentary is confined to that division. The systems manager reports to an Assistant General Manager within the division. The systems group consists of 115 professional I/S personnel. It is structured into three systems development groups servicing subunits within the division and sections handling data base, end user support, total office systems and I/S planning. The systems development component of the Tetrarch methodology is in use (T2). There is an annual business planning process that finalises business plans in March. After this the I/S people visit users to put together I/S requirements and budgets. I/S staff are put into project and maintenance teams. I/S staff lead systems project teams and users are involved but not as formal team members.

Users have moved into I/S at different levels but I/S staff have not transferred into user areas. I/S staff are recruited both internally and externally and subjected to various psychometric tests to ensure they have the right profile for the group. About half of the I/S employees are graduates. Once on board, staff training is planned at an individual level and there is extensive business and technical training offered. Training is also offered to users but user resistance to take up the training is experienced. Users also complain about the training provided.

4 I/S Effectiveness

FIN 3 has been surveyed three times using versions of the Miller-Doyle questionnaire. The average I/S performance ratings were:

1983 - 4.0
1986 - 4.0
1987 - 4.2 (Employee Benefits only)

In 1983 this rating was 19th out of 21 financial services companies polled. In 1986 the rating was 7th out of the seven companies polled. The qualitative score based on user and I/S interviews in the 1986 study of the overall I/S function also placed FIN 3 last out of seven. That researcher's comments are summarised as follows:

- scored high on technical competence and adequacy of I/S resources; appeared to have the greatest investment in I/S.

- quality of output only average.

- lip service paid to steering committees, top management support and decentralisation; little evidence of operationalisation of the concepts.

- executives well versed in latest I/S management techniques but very little has been implemented.

- decentralisation of I/S development staff to secure more user involvement rated well in interviews but user involvement rated low in the survey instrument - interpreted as a general lack of implementation of the concept.

- the size of the company, conservative management style and organisational culture are inhibiting the recognition of I/S as a strategic resource (Emanuel 1986).

The latest performance rating is 8th out of 12. The interviewee (systems manager) commented that at the time of the survey I/S plans had not been well communicated. There had been a perception that management did not want to participate in I/S decision-making. There was user resistance to and complaints about training. I/S staff appeared to underestimate user ability in I/S and attempted to "go it alone". This may have led to I/S being spread too thinly and losing focus. Subsequent to the survey, more emphasis appears to have been placed on I/S. The systems manager now has a regular one-hour slot at the monthly divisional executive meeting and this committee has become a de facto I/S steering committee. Additional focus has been placed on achievement of error-free production output. This is in line with the general shift in corporate emphasis.

5 Measures of Fit

FIN 3 is unusual in that in the 1987 survey average I/S and user performance ratings were identical and there are particularly high correlations between I/S and user perceptions of importance and performance ratings. There is also a good correlation between the perceptions of gaps between importance and performance on particular items. Where there is *no* correlation in either group is between importance and performance, ie. the perceptions of "fit".

An interpretation is that I/S and users are indeed close in their assessments of individual

aspects of I/S, possibly as a result of both formal and informal communications (and frustrations). What seems to be missing is a "strategic" perspective, both in principle and in practice; either the need for a match between business needs and I/S capabilities has not been seen, or the intention is there, but internal factors or external constraints have prevented practical achievement of "fit". The resistance to user training and lack of management and user participation are consistent with these interpretations, as is the attempt on the part of I/S to go it alone.

Further data that is relevant to this discussion comes from the subsidiary survey of I/S group characteristics. The FIN 3 I/S group rates itself second lowest out of eight firms on all measures (group climate, regard for each other as people, productivity, participation). This suggests low morale and possibly a sense of the group having given up on I/S. Private communications from senior employees recently resigned included the following:

"there is so much communication and democracy that nothing ever gets done".

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G8 FIN 4

1 The Organisation

FIN 4 is a major building society with assets in excess of R7 billion and employs about 5000 people. The company adopted a Vision Statement in 1983 that stresses a socially responsible non-racial stance in a multiracial first world-third world society. The credo commits the company to providing savings facilities for all and "home ownership for all" by making loans available to the full spectrum of prospective homeowners. Implementing this vision has resulted in FIN 4 having the lowest average bond balance, the lowest average savings balance and the largest number of clients in the industry. One consequence of this vision is that, compared with similar institutions, FIN 4 has a low return on assets. It has also resulted in an extremely rapid growth in transaction volumes. Since 1985 volumes have doubled to the current level of 12 million a month. Transaction costs have remained high however and it is only recently that the beneficial impact of productivity programmes, retrenchments and other measures are starting to reflect in improved financial performance.

FIN 4 has a head office in which, amongst other functions, I/S is located, and eight regions effecting day-to-day operations. The regions each have specialist support in the accounting, human resources, training and marketing areas. A decentralised management style is evident. There is an openness of communications and encouragement for participative management through focus groups and staff suggestion schemes. Goal setting and monitoring is achieved through formal Management By Objectives. Staffing policy is characterised by equal opportunities, affirmative action and increased recruitment of graduates.

2 I/S Capabilities and Systems

FIN 4's annual operating budget for I/S is approximately R80 million. It currently operates five Burroughs mainframe processors to which 2500 ATMs and teller and enquiry terminals are attached. The firm has reached this point after growing consistently in its Burroughs computing capacity since the early 70s. Critical events were the major delays in implementing its first on-line systems in 1975 and the total loss of a morning's transactions in 1985. A year was needed to recover from the latter catastrophe. A database management system is in place and three fourth generation languages are in use. Information centres have

recently been opened in each region and provide subsidiary databases and reporting tools for users. The databases are updated weekly.

All services which FIN 4 offers are computer-based. The major systems include Bonds, Savings, Fixed Deposits, Indefinite Paid Up Shares, Fixed Period Shares, Subscription Shares and Payroll. These are all real-time on-line systems. While I/S is used to a great extent at the operational and management support levels, there has been little use of I/S in the strategic planning area or to achieve competitive advantage.

Standalone PCs exist throughout FIN 4 and extensive use is made of spreadsheet packages. Mainframe data is available from the regional Information Centres. Messages can be transmitted via the network, but no electronic mail facilities are available.

Overall penetration of I/S into FIN 4 is shown below.

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)				*	
MANAGEMENT SUPPORT (monitoring, controlling)				*	
STRATEGIC PLANNING (strategy formulation)		*			
COMPETITIVE THRUST		*			

3 I/S Structures and Processes

I/S at FIN 4 has a complement of 240 people. During 1987 the I/S structure was split in two with a head of Information Services and a head of New Systems Development. The head of Information Services reports through the Deputy MD to the MD and has the computer network, computer services, information centres and branch support functions reporting to him. The head of Systems Development reports through a Senior GM to the MD and has the applications project teams (analysts and programmers), decision support systems, I/S training and human resources reporting to him.

Typically FIN 4 has followed a "bottom-up" planning process with the general manager,

systems development, assessing the needs of the users and deciding priorities in consultation with his Senior General Manager (FIN 4 does not have an I/S steering committee). For their part users are at the "telling" phase and are content to express the needs and wait for I/S to deliver. About a year ago a major planning exercise was conducted with the assistance of outsiders and generated an extensive list of priorities for I/S. Little attention appears to have been paid to these findings.

Recognising that I/S-user communications and coordination needed to be addressed, liaison people were appointed in I/S so that users had a direct line when queries arose. This has proved most successful.

A great deal of attention is being devoted to recruitment, training and development of systems personnel. This is more evident in the systems area than in services. There is encouragement to visit and speak with users. However formal training for I/S staff is confined to technical skills. User training in I/S is confined to the use of specific systems.

4 I/S Effectiveness

FIN 4 has participated in two surveys supervised by the author and using the Miller-Doyle instrument. Average performance ratings were:

1983 - 4.3
1988 - 3.9

In 1983 FIN 4 I/S performance was assessed to be about 12th out of the 21 financial companies surveyed. In 1988 the 3.9 rating places it 9th out of 12. The 1988 survey was very extensive, covering almost 576 employees in Head Office and the regions, the highest eleven job grades and all major functional areas. The response rate was 52%, but there were an unusually large number of "mechanical" responses and missing values for particular items. Only 33% of the questionnaires issued were deemed usable by the researchers (Jacobs & Linley 1988). There was, however, a good deal of commonality in the evaluation of I/S across all levels and functions and between I/S and users, indicating a pervasive negative attitude.

The quantitative survey was complemented by structured individual interviews with six senior executives and I/S managers and three structured workshop sessions. One workshop was confined to senior executives and user managers, the second to I/S

managers and the third combined general managers and I/S managers. All individual interviews and workshops were characterised by candour and openness except for the joint I/S/user workshop which the researchers described as follows: "The tension in this workshop was significantly higher than in the other two workshops. Apart from one fairly heated exchange, the participants remained guarded throughout" (Jacobs & Linley 1988, p.119). This has been attributed to the fact that there had been very limited contact between senior managers in I/S and the user areas for at least a year prior to these workshops and indeed even between the two I/S divisions. The qualitative input from the workshops fully corroborated the survey data and revealed an attitude that I/S was below minimum acceptable levels. One of the researchers has noted "Everyone agrees there is a problem and knows what it is". What appears to be lacking is an agreed approach to tackling the problems, which include the upgrading of basic operational systems to provide an effective service to users, the need for more top management involvement and a steering committee. It is also suggested that senior management have not created an appropriate climate for I/S and as a result users do not recognise their responsibilities in this area.

5 Measures of Fit

In the questionnaire survey, the correlation between I/S and user ratings of importance of I/S, the performance of different aspects of I/S, and the gaps between them, were quite high and statistically significant. This supports the view that there is agreement as to where the problems lie. However there was little or no correlation *between* importance and performance ratings for either I/S or users, ie. the measures of fit between business needs and I/S capabilities. This suggests that at a detail level, the problem areas are well perceived by all respondents, but that a management or "strategic" perspective is lacking. Overall it is contended by the researchers that there is no alignment between the mission of the company and I/S strategy.

The senior staff in both I/S groups responded to the subsidiary survey of I/S group characteristics and they rated themselves lowest of the eight organisations polled. The latter finding applied to the two I/S groups separately and the combined scores, providing an additional perspective on the I/S problems facing FIN 4.

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G9 FIN 5

1 The Organisation

FIN 5 has been described as a leading independent listed South African composite insurer. It offers both short term cover, including fire, accident, motor and marine, and life cover. Recently it merged with another short term insurer in a significant transaction that increased its asset base by approximately 50%. The organisation is in the top ten short term insurers. FIN 5 has its origins in the U.K., shows characteristics of the British tradition of paternalism and has been described by its senior management as a benevolent autocracy. The company projects a conservative image with considerable corporate discipline and control and is seen as a professional company, focusing on profitability rather than growth. In fact, while remaining highly solvent and profitable over the last few years, its market share has been steadily eroded by the competition.

In the past the strategic orientation of the firm has been towards internal stability and control, but recently management's thinking has shown a marked shift towards growth and adaptability in a volatile market. Since the recent merger, there has been a period of intensive introspection with a long and successful series of management workshops to build a common culture, define strategic directions and agree operational plans for the future.

FIN 5 employs about 600 people. Its head office is still split between two cities as a result of the merger and there are regional offices in the major centres. Branch management show frustration at the degree of head office control and are openly pushing for greater regional autonomy.

2 I/S Capabilities and Systems

FIN 5 made a late entry into the data processing world. Prior to 1979, only accounts were computerised and these were handled by a bureau. Bureau applications grew over the next few years, while at the same time the company tried to define its needs for an in-house I/S function. In 1983 a PR1ME computer was acquired and since then there has been substantial growth in its hardware base, a shift away from bureau services and the development of a national network. PR1ME data base and fourth generation software are used. The role of I/S in FIN 5 remains at the level of transaction processing with the main

applications revolving around debit collection and statement generation. Motor and travel insurance policies are computerised and a package for life policy administration is in place. On-line data entry and limited query functions are in place at the branches. The penetration of I/S is shown overleaf:

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)				*	
MANAGEMENT SUPPORT (monitoring, controlling)		*			
STRATEGIC PLANNING (strategy formulation)		*			
COMPETITIVE THRUST		*			

At the time of the last survey a small number of PCs had been placed in the regions. Since then this number has grown to 70-80 widely dispersed through the company. Uses are for wordprocessing, spreadsheeting and in about half the cases, mainframe access. A company loan scheme has led to about 90 home PCs being purchased.

3 I/S Structures and Processes

The following comments apply at the time of the 1987 I/S effectiveness survey. The I/S department is centralised and employs about 40 people. Staff turnover is very low. The I/S group is headed by the Systems Manager who reports to the Assistant General Manager, Services, who reports to the MD. There has been no strategic or long range planning for I/S. While I/S management sees the need, the climate is such that there is virtually no support for I/S at any level of management. Thus user involvement is minimal as well. A user steering committee is in place, having been formed as a result of the merger. It is composed of managers directly concerned with particular issues of the time (eg the rationalisation of systems) who are charged with the general functions of an I/S steering committee. The committee meets at two to three month intervals for a day at a time. It tends to get overly involved in detail and the parochial interests of the members, so they do not serve as an effective means to provide overall direction.

There is little evidence of other I/S processes such as I/S or user training, formal project

management, performance monitoring and reporting etc. In an effort to promote end-user computing, each branch has been given a PC, a printer and spreadsheet and word-processing software (cf. section 2). There has been no training, however, and some branch personnel do not know what to do with the equipment.

Subsequent to the I/S effectiveness survey a number of changes took place. There was a restructuring and the AGM Services became the AGM I/S and Organisational Development. Three managers report to him responsible for systems, business analysis and the information centre. A reconstituted I/S Steering Committee meets every 6-8 weeks. It is chaired by a senior branch manager and all functional departments are represented by people authorised to commit to the decisions taken. The meetings address and set priorities and serve as a forum for feedback from the I/S department. It is reported that communications have improved considerably and there is a sense of greater equity in allocation of I/S resources. Another mechanism introduced is that of branch representatives who act as a link between branch personnel and I/S. These representatives act as conduits for complaintsand requests.

On the development side, the IEW tool has been acquired and a project team assembled to use it for top-down I/S planning and development. A commitment to evaluate FIN 5's needs from a strategic viewpoint has been obtained.

4 I/S Effectiveness

FIN 5 has participated in two surveys supervised or conducted by the author and using versions of the Miller-Doyle instrument. The average I/S performance levels were as follows:

1983 - 3.4 (10-15 respondents)
1987 - 3.8 (77 respondents)

In 1983 FIN 5 showed the lowest rating of the 21 financial services companies surveyed. The 1987 rating, although higher, is 10th in the 12 sets of data obtained. These ratings can be seen in light of FIN 5's relatively recent and painful entry into the I/S arena. The first blow was a 1000-page consultants' report in 1980 which represented a tender for a "total" I/S solution. Only one supplier was willing to take on the project and assembled a project team. The task proved too complex and after six months and several hundred thousand rands, the project was dropped. The supplier attempted unsuccessfully to recover a

portion of its costs. Perhaps as a result of this management and users distanced themselves from systems. I/S proceeded slowly and cautiously thereafter, with little knowledge of company direction to assist them.

The second blow related to the merger. The then I/S manager committed to an unrealistic schedule for consolidating the systems of the two companies and this together with a failure to unite the two I/S groups led to 18 months of turmoil. The second survey took place at about the end of this period. It is noteworthy that perceptions of I/S captured in this survey deteriorated the further up the hierarchy respondents were. Discussion of the results of the survey at a management workshop surfaced considerable acrimony and hostility on the part of very senior managers.

The changes instituted as a result of this survey are claimed to be having very beneficial affects and the systems manager is planning to conduct a follow-up survey which he expects to confirm this.

5 Measures of Fit

Responses to the survey questionnaire were not obtained from I/S staff so it is not possible to quantify the extent of fit between I/S and users or between I/S perceptions of importance and performance. However, the coefficient of determination linking importance and performance for the user group is 0.11, which is statistically significant, but very low. Given the almost total lack of communications between management and I/S over an extended period of time, severe operational problems and the turnover of senior I/S staff, it is extremely unlikely that the I/S group could have a clear perception of business needs and associated systems requirements. The fact that I/S activity was restricted to basic transaction processing work and end-user computing was almost nonexistent supports t

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G10 PUB 2

1 The Organisation

PUB 2 is one of three large academic hospitals in the province. Within its region it staffs and administers several smaller hospitals providing maternity and other services. PUB 2 has some 1700 beds and employs 10700 medical, paramedical and administrative staff. It admits about 80000 patients annually and sees 1,35 million outpatients. Its annual expenditure is of the order of R280 million. PUB 2 has gained an international reputation for excellence in patient care, basic and post-basic education and medical and nursing research.

As part of an strategic information systems planning exercise in 1981, the top management of PUB 2 derived the following mission statement:

> *"The hospital seeks, as a referral centre, to provide comprehensive health care of the highest quality and to offer teaching, training, research and specialist diagnostic and therapeutic services".*

Long term goals flowing from this mission statement were also documented at the time. PUB 2 has a complex set of organisational relationships with the provincial authority and the university to which it is attached. Medical posts are joint province/university appointments, while nursing, paramedical and administrative posts are provincial. The PUB 2 organisational structure is also complex, resembling a matrix structure. There are administrative groupings such as nursing, engineering and secretarial, a large number of clinical departments, and medical superintendents administering the various wards. The large number of distinct departments creates a very broadly based and flat structure.

2 I/S Capabilities and Systems

PUB 2 is linked to the PUB 1 central computer facility via a large number of terminals and makes extensive use of the central system for patient administration and other software installed there. The PUB 1 batch systems for stores, personnel, payroll, fees administration etc are also used. PUB 2 uses the Mapper fourth generation language available on one of these machines for prototyping and implementing its own on-line systems. Amongst others these include a highly successful equipment acquisition system, an extensive nursing administration system, and a number of laboratory reporting systems. There are also

several minicomputers at PUB 2 including Wang, Dec Vax, HP, IBM and Data General. These have been acquired over time to address specific clinical and management needs and are located in various departments such as chemical pathology, haematology, radiotherapy and cardiology. A de facto move to distributed data processing is thus evident and, somewhat after the fact, there are serious attempts underway to create a computing network to link these dispersed facilities.

Most of the 18 "homegrown" systems have been developed by the PUB 2 I/S group who also service a steady flow of requests to generate special reports. Ateast 150 PCs exist in PUB 2 and standards have been laid down for PC hardware and software. However, end-user computing for management support is at a very early stage. Decisions on interoffice communication have been awaiting announcements on standards from the Commission for Administration.

The general penetration of I/S in the organisation is shown in the diagramme below.

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)			*		
MANAGEMENT SUPPORT (monitoring, controlling)			*		
STRATEGIC PLANNING (strategy formulation)	*				
COMPETITIVE THRUST	*				

3 I/S Structures and Procedures

The PUB 2 I/S group was formed in 1977 to meet I/S needs specific to the hospital. It now has a staff of 15 providing advice on I/S and computers, operating computing facilities, developing and maintaining systems, providing training and undertaking research in medical informatics. Staff turnover has increased from 18% to 25% per annum. A previous head of I/S reported three years ago that the staff complement of I/S is "still far short of the number of staff needed to produce and handle the information systems required for the hospital". Due to a general freeze on posts, however, there has been no addition to

the department's staff complement since then. Recently the reporting line of the head of I/S has shifted from administration to a medical superintendent in order to enhance user acceptance and cooperation. However it has also been noted that the department sits between four masters, the PUB 1 computer group, PUB 1 hospital administration, PUB 2 administration and PUB 2 end-users, thus being subjected to conflicting and possibly divergent forces.

As mentioned above, an overall information systems planning exercise was conducted in 1981. This was at the instigation of a medical superintendent who used the study for academic purposes and was guided by the author. The whole top management team of the hospital participated for approximately half of their working days for several weeks and produced a wide-ranging strategic perspective on the hospital and its information needs. Some of their recommendations have been successfully implemented, but most not. This can be attributed in part to lack of staff and resources. However it was recognised at the time that the project team lacked PUB 1 representation. PUB 1 consciously kept a distance, ostensibly not to signal preferences for one institution's initiatives, and not even tacit support was received.

PUB 2 has a senior level I/S advisory committee that meets monthly under the chairmanship of a senior medical superintendent. Amongst other duties, this committee evaluates requests for new systems. Generally I/S development has proceeded in "bottom-up" fashion with the I/S gro particular applications as they come up. In the past, PUB 1 funding rules have favoured expansion of existing services rather than acquiring new services, thus possibly entrenching ineffective solutions.

One senior medical staff member has criticised management for lack of insight into I/S development, clinging to old ideas about centralisation of computing, and the lack of an up-to-date published I/S plan. A recent head of Medical Informatics has, however pointed to the very positive initiatives launched at the management level.

4 I/S Effectiveness

PUB 2 participated in the effectiveness study conducted by the author under the aegis of PUB 1. 70 usable responses were received, including 9 from the I/S group (representing most of the senior staff here). Several forms from senior managers were returned blank

or with comments indicating no involvement with computers. Responses covered a very broad spectrum of senior administrative and clinical staff at the hospital. The average I/S performance rating was 3.77, 11th out of the twelve sets analysed and only marginally higher than PUB 1. This result is despite stated commitment from the top, encouragement for the I/S group and a strong recognition amongst steering committee members of the importance of medical informatics to health care. Aspects that may be countering this positive thrust include the chronic shortage of I/S resources, minimal support from PUB 1, and progressive pressure on all functions in the hospital to deliver day-to-day health care at the expense of any investment in future effectiveness. The centralisation of computing policy and the classification of computing matters as "secret" are also contributory factors.

5 Measures of Fit

Correlations between I/S importance and performance ratings amongst the I/S and user groups are very low, indicating a lack of fit between these perceptions. It is noticeable however that the importance- performance r^2 for the I/S group is .26, somewhat higher than might be expected at a user performance rating of 3.77. It might be that this performance rating is unusually low, but it can also be noted that the I/S group rates itself relatively high on group effectiveness and cohesiveness. This suggests that, despite support from the top, the I/S group is being frustrated in its attempts to do what it would like to. This is supported by feedback from a group discussion with I/S representatives from PUB 2. Strong feelings were expressed regarding budget restrictions, lack of knowledge of corporate goals, low management rating of the importance of I/S (although not confirmed in the survey), lack of training opportunities, and the need to adhere to rigid rules and procedures. The situation is further complicated by differences between the needs of the administrators and clinicians in PUB 2. Up to 1985 top priority had been accorded to clinical systems, but since then there has been an emphasis to cost containment support. While these policies are discussed and agreed with senior clinical staff it is felt that communications to lower levels is ineffective. Users who want clinical systems have thus not developed an appreciation for these policies and the importance of administrative systems to the functioning of the hospital.

In general the negative attitudes of the group appear to focus outside their own institution and they seem to be banding together in the face of the "common enemy". However, communication between I/S and users is felt to be getting worse, especially with official

element of secrecy accorded to I/S matters. Conclusions drawn by two medical doctors who studied I/S at PUB 2 in 1986 include the following quote:

> *"At PUB 2 one sees the traditional bureaucratic leviathan that has failed to plan strategically ... that the system works at all is a tribute to a few people ... the move to distributed data processing is an ad hoc process fueled by the ambitions and maneuvering of the politically adroit."*

To end on a more positive note, the current emphasis on I/S at a management level may counter some of the past problems, achieve a better fit in the perceptions of clinical and administrative staff and greater I/S success.

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G11 PUB 1

1 The Organisation

PUB 1 is the public authority overseeing health and hospital services throughout the province. It is the largest component of the provincial authority which also controls public entities such as roads, community services, library services, local authorities, nature conservation and the department of works. PUB 1 is the controlling body for three major academic hospitals and about 140 other institutions including regional hospitals, community hospitals, ambulance and regional laboratory services (this total does not include community health centres, clinics, district surgeons and other units). Together these entities employ some 56000 staff and the expenditure budget controlled by PUB 1 is in excess of R1,5 billion. The three academic hospitals account for just less than half of this budget.

Whereas previously legislative authority was vested in the province, with the abolition of Provincial Councils this function has now been transferred to parliament. Executive authority remains with province which has to operate within the National Health Plan. Policy is made jointly at the level of central government and the provincial administrations act either as agents or in their own right to execute this policy. Certain decision-making functions (eg computer facilities, systems and staffing matters) are now directly administered at the national level. Provision of hospital services including the three academic hosp is now a "general affair" and service is provided to all race groups from primary to tertiary health care level.

PUB 1 is divided into two main directorates, operations and professional services, consisting of approximately 180 staff. There are also four fairly autonomous regional offices employing about 200 people and the teaching hospital complexes are regarded as regions as well. The heads of the academic hospitals and the regional directors of medical services report to the Executive Director. The operations directorate includes personnel and financial administration, services and amenities. PUB 1 computer services have traditionally been provided by the work study group in the department providing general provincial services. This group is now called Admin Advisory Services and has a Computerised Information Systems staff as well as the traditional workstudy group. Computer processing is carried out on central computing equipment controlled by the national Commission for

Administration.

Although PUB 1 does not have a formal mission statement, there is a national mission statement for Health and recently work has been done to develop a mission statement for the provincial group. In terms of the Health Act there are specific legislated goals which define the role of the organisation. PUB 1 operates under extreme financial constraints and is strongly bureaucratised. Given the diversity of services offered and the intricate interlinking of functions and duties, there is an extensive committee structure, rigorous procedures for tendering for goods and services, and an extended budgeting procedure. There are also considerable differences in the cultures and attitudes of the major academic hospitals which impinge on the working of PUB 1. As a result change comes very slowly. The provision of health services is strongly influenced by political events. Issues such as the degree of authority vested in the provincial authority by central government, own affairs legislation, the new dispensation for Health, central funding etc all contribute to frustration in this area.

2 I/S Capabilities and Systems

Until recently the provincial authority operated two large Unisys 1100/72 computers, one providing batch services and the other on-line services to PUB 1, the academic hospitals and other divisions within the province as well. One of the outcomes of the "new dispensation" for health care has been the assumption of control over main frame computing by the national Commission for Administration. All processing is now provided on a bureau basis and information regarding the current or planned configuration of these computers is treated as a strategic issue and not divulged. It must be assumed, however, that maintenance and upgrading of the original equipment continues and there is a suggestion that mainframes from other suppliers have also been installed. The local computers form part of the nationa data communications network (Govnet).

The major applications in place include debtors and creditors, stores, and human resource systems, the payroll system serving about 50000 employees, and a fees system servicing six million accounts. All of these systems have been in place for some years and are batch run Cobol systems. There is also a patient administration system used by the academic hospitals. This system has Cobol-based batch elements and on-line modules for patient admissions, lab reporting, patient transfers, file management etc. written in Mapper.

In the last 12-18 months, end-user computing has been growing rapidly in PUB 1. Several PCs are in use, some of which have links to the mainframes. A variety of pharmaceutical functions, establishment controls and the PUB 1 budgeting procedure are handled via PCs. End-user computing is virtually nonexistent in PUB 1. There is no interoffice communications system but limited head office-regional communications facilities are in place.

The overall penetration of I/S is summarised below:

PENETRATION OF INFORMATION SYSTEMS AND TECHNOLOGY

	no use at all	just starting	to some extent	to a great extent	industry leader
OPERATIONAL SYSTEMS (cost reduction)				*	
MANAGEMENT SUPPORT (monitoring, controlling)		*			
STRATEGIC PLANNING (strategy formulation)	*				
COMPETITIVE THRUST	*				

3 I/S Structures and Processes

There is no dedicated I/S component in PUB 1 although a small number of individuals within Admin Advisory Services manage the common administrative systems, conduct preliminary needs assessments, draft policy documentation, handle complaints and coordinate requests. Previously major systems analysis and design has been conducted for PUB 1 by the work study group in which there are programmer positions. Other systems (eg the patient administration system) have been contracted out to the hardware supplying company. When particular systems have been undertaken they have been managed according to the traditional systems development life cycle approach.

Until recently there has been no long term strategic I/S planning activity. However, towards the end of 1985 a senior manager in PUB 1 became interested in I/S planning and, through the author, promoted the idea of critical success factors. As a result a project was launched to engage consultants to develop an I/S plan for PUB 1. After protracted negotiations and delays occasioned by the entry of the Commission for Administration and the Treasury into the approvals process, money was eventually voted for the study and late in 1988 the

tender was awarded and work commenced. The project was concluded at the end of May 1989.

At a national level, interest in I/S planning has also arisen and a directive has been issued that all provincial authorities must produce "master systems plans". This information will be used to guide long terare and software policy. The work study group has been charged with pursuing this project and is undergoing initial training in I/S planning techniques. (In fact the above PUB 1 study preempted the general planning requirement and will serve as input for its area).

There is a complex process of needs definition, and approval of requests for new computing equipment or systems services within PUB 1. Any request valued at over R20000 is first studied within Admin Advisory Services in the operations directorate. From there it is passed across to the work study group (now termed Management Advisory Services) who submit their recommendations to an interdepartmental Computer Advisory Committee. This committee forwards its recommendations to the Commission for Administration in Pretoria for final approval and authorisation of expenditure.

There is no I/S training as such for either the providers or users of I/S in PUB 1 other than task-related training and the initiative described above. Recently, however, the Commission for Administration, through its Institute for Training, has started to deliver computer orientation and PC courses for users. Recruitment for I/S-related posts is internal. Applicants are tested for aptitude and if successful are trained. Salaries are regarded as good, but environmental factors are criticised and there has been an increase in staff turnover lately.

4 I/S Effectiveness

As part of its larger programme to enhance provision of information services, PUB 1 agreed to participate in the current I/S effectiveness study. It also made all hospitals under its control available for study. 14 of the top management in PUB 1 completed the survey questionnaire and their average rating of I/S performance was 3.68. This is the lowest average rating of the 12 sets of data analysed. It was also possible to obtain an evaluation of I/S in the health service from the whole work study group, 11 responses in all. The average rating here was 3.95, representing the lowest rating from an I/S-related group

encountered.

These ratings support the widespread concern expressed by many senior personnel consulted by the author over several years regarding information support in this sector. For an organisation of such size, complexity and criticality in the services it renders, it is clear to many that information systems support is woefully lacking. Various explanations have been offered for the seemingly intractable nature of the problem. Lack of funding and rigid rules and regulations laid down at the national level certainly contribute. The case history of the patient administration system points to the impact of differences in character of the participating academic hospitals. Specifications for this system were initially completed in 1972, but years of argument on detail ensued and it took some 15 years before the system neared its potential. The fact that it is only in 1989 that the job category "analyst" has been approved is a further indication of lack of attention to I/S. At a discussion group of 20 or so I/S-related staff at PUB 1 and the academic hospitals, it was stated that budgets were apportioned away from I/S, implying that low priority was accorded this function at regional management level. There was also poor coordination of existing I/S initiatives.

5 Measures of Fit

There is no significant correlation between I/S importance and performance ratings for either management or work study personnel responding to the survey. This suggests that apart from budgetary and other constraints there is also a widespread lack of insight into potential of I/S in support of health care administration. It has been suggested that inflated perceptions of the power of computers in the past were dashed when things did not work out as expected and led to general disillusionment with computers. In light of this, the current I/S initiative assumes pioneering proportions and, if it is sustained, could serve a major educational function in this organisation.

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