Introducing Decision Support Systems

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Contents

Introduction

WHO SHOULD READ THIS BOOK

The advent of powerful yet user-friendly computer packages that contain at their core mathematical and logical models, enables many esoteric management tools to be made available much more widely than ever before. This book is an introduction to this area. It is aimed both at practitioners in the business community and at students studying in Higher Education establishments.

Although the term 'business' is used frequently throughout the book, the contents are equally applicable to managers operating in 'not-for-profit' organisations. This book should appeal to anyone who is involved in creating or implementing Decision Support Systems. This would include accountants, managers in all business functions and computer professionals.

Few assumptions are made about the reader's prior knowledge. However, it is assumed that the reader will have used a computer, and have a feel for what computer systems can do.

ABOUT THIS BOOK

In the 1970s a new view emerged of how computers could be used to help managerial decision making. This view has manifested itself in the form of Decision Support Systems. Such systems contain ideas from several disciplines associated with information technology and decision analysis, and hold much promise for improving the efficiency and effectiveness of managerial decision making. Today, Decision Support Systems are well established in many organisations.

This book begins with a review of the nature of managerial work and of business problems, with particular emphasis on planning and

control. The reason for starting in this way is to establish the framework for the use of Decision Support Systems by managers in business, and to introduce formally the terminology of the subject. Of particular concern are the definitions of information and intelligence, as these are used to define the major divisions of Decision Support Systems that structure the whole book.

A literature review in search of a definition of Decision Support Systems is given in Chapter 3. The outcome is a simple definition that encompasses any computer-based system that helps managers to be better at tackling problems. This broad view enables all aspects of decision making to be covered, and thus includes systems that are often excluded from books on decision support, such as Management Information Systems and those to help group decision-making processes.

In Chapter 4 two broad classes of Decision Support System are identified: Management Information Systems and Management Intelligence Systems. Each of these classes is subdivided into two further subclasses: Management Information Systems into Data Retrieval and Extrapolatory Systems, Management Intelligence Systems into Preference Determination and Scenario Development Systems. Further subdivisions follow. Concise definitions of all the Systems are given. The specific categorisation has been developed because the systems have different objectives and are developed and implemented in different ways.

The tools, techniques and methodologies associated with each type of Decision Support System are considered in Chapters 5 to 8. Proprietary software to support each type of Decision Support System is discussed at the end of each section. The list of computer packages chosen for discussion is by no means exhaustive: it has been compiled from those packages that the author has used and found valuable, and those recommended by experienced practitioners in the field. The dominant criteria that have been used in the selection are that the packages should be good of their kind and should not be domain specific; ie they should have a wide applicability and not be restricted to use in one specialised functional area of business. The emphasis is on microcomputer software, as the features of microcomputers generally make them better vehicles for Decision Support Systems than do mainframe computers. A list of the software packages mentioned

in this book is given in Appendix 4, together with the relevant contact addresses. Data Retrieval Systems are discussed in Chapter 5. Particular emphasis is given to Executive Information Systems, currently exciting great interest.

In Chapter 6 the tools for the creation of Extrapolatory Systems are categorised and described. The tools and techniques available for such systems are those of management science. The selection of the tools has been made on the grounds of popularity and use. However, the complexity of several of the techniques underlying these systems is such that it was not considered reasonable in this introductory text to burden the average reader with their intricacies. Consequently, only a simple treatment has been given. Readers interested in knowing more about the techniques will need to refer to other, suggested texts.

Chapters 7 and 8 deal with the two types of Management Intelligence System. In Chapter 7 Preference Determination Systems are described. Such systems differ from Extrapolatory Systems in that the modelling is not so closely structured; they do not rely on such esoteric techniques, and there is more emphasis on the *process* of decision making. Scenario Development Systems, which place even less constraint on managerial thought processes, are described in Chapter 8.

The categorisation derived in Chapter 4 is in terms of Decision Support Systems for the individual manager. Chapter 9 looks at an additional area of growing interest, that of group decision support. The special requirements for systems to support group activity are considered. Of particular interest are the requirements for strategic decision support, and the discussion in this chapter complements the discussion of Executive Information Systems given in Chapter 5. The discussions also link to Chapter 13 in which metasystems are considered.

Decision Support Systems have had a chequered career as far as success is concerned. How success for Decision Support Systems can be defined is discussed in Chapter 10.

Different types of Decision Support System require different methods of development and implementation. These requirements are explored in Chapter 11, with the associated considerations of validation treated in Chapter 12. Quantitative scales of measurement are fully described, since the level of measurement has a significant impact on the way

in which Decision Support Systems are implemented, and is a topic very seldom addressed.

It is important to consider the wider, organisational context within which Decision Support Systems, both individual and group, are used. Providing the appropriate problem-solving culture within an organisation lies in the realm of organisational development. Metasystems are now available that could provide part of this culture, and in Chapter 13 three such metasystems are described. The rationale for such a depth of discussion of the methodologies is that these systems are not widely known, yet are at such a stage of development that their use could provide substantial benefits. These systems place their emphasis very strongly on the process of decision making rather than on the tools and techniques employed, and on their concern for consensus and commitment to action.

Chapter 14 is concerned with the very topical subject of Expert Systems. The commonality between Expert Systems and more conventional decision-support tools is explored, and they are placed within the typology of Decision Support Systems.

In Chapter 15 a brief look is taken at the future of Decision Support Systems over the next decade. The prognosis is good.

1 Managerial Work and Business Problems

It would be inappropriate to begin a detailed exploration of Decision Support Systems (DSS) before considering the context in which they would be used. This context is important, because it defines both the potential for decision support and also its limits. To focus discussion, it is necessary to have a definition of DSS. However, the arguments surrounding a considered definition are too complex to develop at this stage, and so they are deferred until Chapter 3. A definition sufficient for our immediate purposes is simply to consider a DSS to be a computer-based system that aids the process of decision making. With this definition, consideration is first given to the nature of managerial work. This is followed by a consideration of the nature of business problems and the ways open to managers to deal with them.

THE NATURE OF MANAGERIAL WORK

In the past, much time and effort has been spent designing systems to help management make decisions but many of the systems have been little used. Partly this was because of the inflated expectations that managers had of the systems. Often, however, the damage was done because the systems were constructed with little appreciation of the context in which they would be used: consequently the systems were inappropriate to the problems facing the decision maker. They were inflexible and too complex, and were created too late. Moreover they demanded too much data input and too much management time. Thus, to guide the development of DSS it is essential to understand the managerial context in which DSS will be used.

Readers wishing to explore further the inappropriateness of many of the early DSS should read the classic articles by Ackoff (1967) and Dearden (1972). Although these articles are somewhat dated, they do highlight many of the common fallacies in the assumptions underlying some of the approaches used in the design and implementation of DSS.

Managerial Roles

Planning and control are undoubtedly major managerial roles and ones demanding considerable information input and interpretation. The characteristics of these roles and their impact on the development and use of DSS will be discussed in Chapter 2.

However, whilst planning and control are fundamental activities for managers, it is important to realise that they are not the only activities in which managers are engaged. In a famous article, Mintzberg (1975) examined the activities of American chief executives and also quoted from similar British studies. He concluded that the classical view of a manager as almost totally occupied in organising, planning and controlling the operations of an enterprise just did not stand up to investigation: a large part of a manager's time was spent performing many other roles. In all, Mintzberg identified 10 roles for the manager. One such role is the figurehead role, in which the manager carries out ceremonial duties. Mintzberg cites the cases of the President of a US corporation greeting touring dignitaries, of a sales manager taking an important customer to lunch, of chief executives presiding at Christmas dinners, and so on.

Another role is in liaison, with the manager making contacts outside his vertical chain of command, and not limiting his contacts to people within his own organisation. Part of this process of liaison is concerned with a manager's role in monitoring and disseminating information. The manager, as head of a unit, is in a position to garner information not available to a subordinate, but which the subordinate needs in order to carry out his job efficiently. The manager is also in the position to act a spokesperson for the unit, passing information to people outside the unit — to his superiors and to other interested parties.

The theme of Mintzberg's study is the homogeneity of management work: that although the specifics will change from manager to manager, the broad patterns of work will remain the same. Stewart (1967) has looked closely at how British management spends its time. Whilst her

work and that of Mintzberg are in agreement about the general nature
of managerial activity, Stewart's emphasis is on the variability of the
work patterns between individual managers. Her first study covered
the activities of 160 British managers in a wide range of jobs. She found
for example, that 28 managers in the sample spent less than 20% of
their time on paperwork, while 10% spent over 60% of their time on
it. The figures for time involved in telephoning, informal discussion
and committee meetings show a similar variation.

The same holds for the interactive component of the manager's work.
Stewart found that the average time a manager spent working alone
varied greatly: four managers spent less than 10% of their time work-
ing alone at one extreme, with another four spending more than 70%
working alone at the other. On average, a manager spent 26% of his
time with immediate subordinates but again this simple figure masked
a large variation: two managers apparently spent no time with subor-
dinates while five spent over 50% of their working time in this way.

The Pressures of Managerial Work

Not only does Mintzberg's work show that a manager has many roles
to play, it also highlights the fragmentary nature of management work.
In his words, management activities are characterised by 'brevity, variety
and discontinuity'. In support of this contention he cites his research
findings in which half of the activities engaged in by the chief executives
lasted less than nine minutes, and only 10% exceeded one hour. Stewart
found that the managers in her study worked for half an hour or more
without interruption only about once every two days.

This brevity and discontinuity suggest a hectic pace and Mintzberg's
work confirms this: coffee breaks and lunches were inevitably work
related and the chief executives in his study met a steady stream of callers
and mail from the moment they arrived in the morning until they left
in the evening.

Management work is thus characterised by many brief segments of
action following one another at a hectic pace. These segments may be
ad hoc, one-off activities, but more often than not they will form part
of a continuous thread of problem-solving actions. Mintzberg found that
the chief executives he studied supervised as many as 50 projects at
the same time and to quote Mintzberg again, the chief executive "is
like a juggler, he keeps a number of projects in the air: periodically,

one comes down, is given a new burst of energy, and is sent back into orbit.''

An oft-quoted phrase is 'information is power'. Whilst a manager will get some of his information from written sources − computer printouts, company statements and trade magazines for example − much comes to him aurally. There is very strong evidence that managers greatly favour obtaining information aurally, through meetings, one-to-one discussions and telephone calls. One reason for this is that managers like both the richness of the information available from informal sources and its timeliness, and very often this must come aurally from the web of contacts that any good manager cultivates. Usually this information is fragmented and 'soft' (gossip and rumour), and as such is difficult to handle in a systematic way. A consequence of this is that decision making that relies on such information is difficult to delegate.

A final point to come from the Mintzberg and Stewart studies is that management work is highly interactive, not reflective: in Mintzberg's study, scheduled meetings were the single most time-consuming element. These studies are complemented by that of Lawrence (1984) who investigated how British middle management spent its time at work. His findings, although concerned only with production management, give credence to the reply often given by secretaries when one tries to phone a manager − ''he's in a meeting''. Lawrence found that approximately 50% of a manager's time is spent at meetings or in formal discussions, with only around 10% spent at 'desk work'.

The empirical studies of management work patterns by Mintzberg and Stewart illustrate the range of activities in which managers are involved. Whereas formal planning and control is an activity where DSS may be heavily used, most of the other activities of managers do not readily lend themselves to the use of DSS, or indeed to any form of information technology. Consequently, the scope of DSS in the totality of a manager's professional life is rather limited. Stewart's work indicates a high variation between individual managers, and it is suggested that this variation comes about in part by choices made by the managers themselves. The content of his work and the patterns of work activity of one manager may lend themselves more to the use of DSS than do those of another manager: in any event the approach is likely to differ from manager to manager and this should be taken account of in using and developing DSS.